



**COLORADO DISCHARGE PERMIT SYSTEM (CDPS)
FACT SHEET TO PERMIT NUMBER CO0048003
PIONEER NATURAL RESOURCES, LLC, WEST SPANISH PEAKS
LAS ANIMAS COUNTY**

Colorado Department
of Public Health
and Environment

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I. TYPE OF PERMIT

- A. Permit Type:** Industrial Minor, First Renewal (of individual permit; formerly COG900018)
- B. Discharge To:** Surface Water

II. FACILITY INFORMATION

- A. SIC Code:** 1311 Crude Petroleum and Natural Gas
- B. Facility Location:** Approximate Middle Point of Operation Latitude 37° 10 ' N, Longitude 104° 59' W.
- C. Permitted Features:**

Permitted Feature ID.	Sampling Point	Permitted Feature Type	Main Drainage	North	West
005	end of discharge pipe	External Outfall	Parras Canyon, North Fork of Purgatoire	37.20327004	-104.9459200
245	sampling valve	External Outfall	Parras Canyon, North Fork of Purgatoire	37.19579300	-104.9471760
241	sampling valve	External Outfall	Guajatoyah Creek, North Fork of Purg.	37.20917200	-104.9876710
UST1	Instream	Instream (Ambient)	Guajatoyah Creek	To be provided in final permit	To be provided in final permit

The location(s) provided above will serve as the point(s) of compliance for this permit and are appropriate as they are located after all treatment and prior to discharge to the receiving water.

D. Facility Flows:

Outfall	Flow, MGD	Flow, cfs
005	0.254	0.39
241	0.026	0.04
245	0.181	0.28

E. Major Changes From Last Renewal:

The segment standard for boron has increased from 0.75 mg/l to 4 mg/l. Total recoverable trivalent chromium (chronic) was added to the segment.

The Division modified the approach for the implementation of the “initial effluent discharge concentration” for SAR.

WET testing, total recoverable iron, and SAR modification requests are addressed.

Temperature monitoring has been added to outfall 241 to Guatoyah Creek. Associated instream (upstream) temperature monitoring is required.

The following parameters were removed from the permit: dissolved trivalent chromium, dissolved manganese, and dissolved silver. Annual reporting for a number of parameters that were not in the previous permit have been added.

Reporting for a number of parameters that were not in the previous permit have been added.

III. DISCUSSION OF REQUESTED REVISION TO EFFLUENT LIMITATIONS FOR SAR/EC, IRON, AND WET

This renewal addresses all requests submitted in the modification form for this facility received throughout 2013. The requests are addressed in turn below.

Requested revision of SAR/EC requirements

The facility requested revision of their SAR/EC permit limits, through submittal of a permit modification request dated August 6, 2014. The Division did not act on the modification request due to the timing of the pending renewal and incorporated consideration of the permit revisions requested through the modification request into the permit renewal process. The facility provided additional information regarding their request as comments on the draft renewal permit.

In the modification request dated August 6, 2014, the permittee stated that they have experienced compliance issues meeting the EC and SAR values that were modified in the permit effective April 1, 2014. The permittee requested that the Division “include a compliance schedule for SAR and EC with ‘report only’ requirements that will provide Pioneer with adequate time to assess how to comply with SAR and EC limits and to gather

additional data to support revised SAR and EC limits. The suggested compliance schedule as outlined in the modification is as follows;

- For a 24-month period, Pioneer's SAR and EC will be tested monthly at each outfall, and will report the monthly average on DMRs as "report only;"
- After 12 months, Pioneer will submit the results of its SAR and EC sampling and testing to the Division, noting any seasonal and field variabilities; and
- After 24 months, Pioneer will report its SAR and EC results to the Division and provide recommended steps for SAR and EC compliance, and a schedule for compliance.

For development of the draft permit, the division interpreted the modification request as a request to remove the current effluent limits from the permit. In their comments on the draft Pioneer stated that they “did not suggest that the existing EC/SAR levels should be discarded. Importantly, during this time the Level 1 (soil salinity) and Level 2 (Purgatoire River water quality) monitoring programs in the permits would remain in effect, documenting that initial effluent discharge concentrations were maintained and agricultural uses were protected in the downstream Purgatoire (segment COARLA05b).” The permittee acknowledged that “it has been standard procedure by the Division to retain numeric discharge limits in permits subject to compliance schedules, but those limits do not take effect until the compliance schedule expires. “

The letter also details:

Under Regulation 61.8(3)(b), permits should include terms and conditions that establish a:

Schedule of compliance where the Commission has adopted new standards, adopted temporary modifications, adopted revised standards that have become more stringent, or where the Division has developed new interpretations of existing standards including, but not limited to, implementation requirements through approved TMDLs and Wasteload Allocations and anti-degradation reviews.

Further, the request states that historic SAR/EC data at the outfalls was collected quarterly so it was not a robust, statistically valid data set from which to extrapolate monthly limits. The Permits require increased frequency of SAR and EC reporting- i.e., monthly reporting, as opposed to quarterly reporting. Further, certain historic SAR data were mistakenly discarded because they were assumed to be "outliers" and not representative.

The request states that Regulation 61.8(8)(a)(i) provides that permits may be modified based on exceedances of permit limitations. It is not currently feasible for Pioneer to come into compliance with the SAR limits in the Permits because new data demonstrates unavoidable variability in laboratory data and field conditions, at the same time that field operations have continued without significant changes. Pioneer compiled this new data in part because Pioneer has been monitoring SAR and EC levels at an increased frequency, i.e., on a monthly basis, as opposed to on a quarterly basis, pursuant to the new permit limits.

The request states that the recent data also shows considerable variability in laboratory results. For example, Pioneer has fluctuations in SAR levels at the same outfall. This is likely due to the differences in geology in the coal formations from which the coal bed methane gas is derived. USGS conducted a "robust chemical suite of analyses in the groundwater, including sodium, calcium, and magnesium, at 87 well locations within this region" and demonstrated considerable variability in groundwater quality that predates any coalbed methane development in the region. See USGS, Geldon and Abbott, 1984.

In their comments on the draft permit, the permittee states that “more restrictive EC/SAR limits are unnecessary” and that “levels of EC and SAR in the Purgatoire River have satisfied agricultural (irrigation) use requirements at their points of use. This is evidence that historic CBM water management practices have been protective of the water.

They also state that “Pioneer recognized the need for caps on flow and EC/SAR, yet under the Division’s modifications, some outfalls would immediately exceed flow and SAR limits.” The permittee suggests “ a tributary-based approach” with “caps on flow and EC/SAR for each tributary, based on historic flows and loads, would maintain historic levels of compliance while allowing for some variability (natural and operational) within and among the outfalls within each tributary.”

Discussion of Request

Based on the record, the Division has determined that numeric effluent limitations are necessary and appropriate for EC, SAR and flow. The following includes a discussion of the background, data analyses, and EC, SAR and flow effluent limitation in this permit.

Background

Legal Framework

Section 503(4) of the Water Quality Control Act, §§ 25-8-501, et seq., states,

No permit shall be issued which allows a discharge that by itself or in combination with other pollution will result in pollution of the receiving waters in excess of the pollution permitted by an applicable water quality standard unless the permit contains effluent limitations and a schedule of compliance specifying treatment requirements. Effluent limitations designed to meet water quality standards shall be based on application of appropriate physical, chemical, and biological factors reasonably necessary to achieve the levels of protection required by the standards.

Effluent limitations for EC and SAR implement the narrative water quality standard for discharges to surface waters that are subsequently diverted for crop irrigation. The Division’s Clean Water Permitting Policy 24 “Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops” states:

The following narrative standards and agricultural beneficial-use definitions from Regulation No. 31 are the starting points for the selection of the appropriate levels of protection that should be provided in permits for discharges to surface waters.

Section 31.11(1)(a)(iv) State surface waters shall be free from substances attributable to human-caused point source or nonpoint source discharge in amounts, concentrations or combinations which are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life

Section 31.13 State Use Classifications. Waters are classified according to the uses for which they are presently suitable or intended to become suitable. In addition to the classifications, one or more of the qualifying designations described in section 31.13(2), may be appended. Classifications may be established for any state surface waters, except that water in ditches and other manmade conveyance structures shall not be classified.

Section 31.13(2) Agriculture. These surface waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado and which are not hazardous as drinking water for livestock.

Given the above narrative standards, two types of protection are required.

- One type of protection is “no harm” to plants (i.e., irrigated crops in this application). Many measures can be employed to assess when a plant is harmed by the quality of irrigated water – such as germination rate, growth rate, crop yield, foliage imperfections, and moisture stress.
- The other type of protection is for “no harm to the beneficial use” which for irrigated agriculture is for “crops usually grown in Colorado.”

Additional regulatory provisions in Regulation No. 61 regarding the derivation of effluent limits include the following:

Regulation 61.8(2)(b)(i)(G)

When developing water quality-based effluent limits under this paragraph, the Division shall ensure that:

(I). The level of water quality to be achieved by limits on point sources established under this paragraph is derived from, and complies with all applicable water quality standards...

Regulation 61.8(2)(b)(i)(F)

Where a water quality standard has not been established for a specific chemical pollutant that is present in an effluent at a concentration that causes, has the reasonable potential to cause, or measurably contributes to an excursion above a narrative water quality standard, the Division must establish effluent limits using one or more of the following options:

(I) Establish effluent limits consistent with the requirements set forth in section 14(4) of the Basic Standards, Regulation No. 31...

Regulation 31.14(4)

Where no statewide or site-specific numeric standard exists for a constituent of concern, the Division may establish effluent limitations or other permit conditions for such constituent if necessary to comply with the narrative standards in section 31.11(1). Such effluent limitations shall be developed in a manner consistent with the Commission's methodology for establishing numeric water quality standards and, if applicable, shall be consistent with the criteria contained in table I, II and III of this regulation. In such circumstances, upon the request of any interested person, the Commission may hold a rulemaking hearing to consider the adoption of a numerical standard, which would then be binding.

Regulation 61.8(2)(b)(iv):

The permit shall be written with effluent limitations that respect the methods by which water quality standards were derived, and the degree of variation of water quality that exists in the relevant stream segment or ground water on a seasonal basis or otherwise. The existence of water quality standards, particularly where based on ambient stream data, does not necessarily prohibit at all times discharges that may result in pollution of the receiving waters in excess of the applicable water quality standards.

Historic Permit Actions and Effluent Limitations

The permit that became effective February 1, 2010 was the first permit to address EC/SAR. In that permit the Division implemented the narrative standard described above per the division's Clean Water Permitting Policy 24 "Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops." In that permit the effluent limitation for EC was 1.8 ds/m and SAR effluent limitation was capped at a maximum of 6.8.

The effluent limits were established in accordance with the finding that these discharges, will cause, have the reasonable potential to cause, or measurably contribute to an excursion of the narrative water quality standards of "no harm to plants: and "no harm to beneficial uses." 5 CCR 1002-61, § 61.8(2)(b)(i)(F). The Division recognized that Pioneer would not be able to meet these new limitations, and pursuant to the division's Clean Water Permitting Policy 3 "Permit Compliance Schedules" included a 4.5 year compliance schedule with interim milestones designed to facilitate compliance with the permit limits. These limits were scheduled to become effective on January 31, 2014, but were subsequently extended to August 1, 2014.

In July 2012, Pioneer requested modifications to the permit for EC and SAR effluent limits on the basis the instream EC and SAR levels in the Purgatoire River supported agricultural irrigation uses. July 12, 2012 letter to the Division, Ronda L. Sandquist. The approach in the permit modification request based on the ambient water quality was a fundamentally different than the established effluent limitations in Clean Water Permitting Policy 24.

In response to this modification request and after analyzing the data, the division developed a draft permit modification, received public comment, reviewed those comments and determined appropriate changes to the draft, responded to the comments, and issued the permit modification. The permit modification became effective April 1, 2014.

The division revised the EC effluent limit from 1.8 dS/m to the maximum effluent discharge concentration (minus outliers) at each outfall for the period of record; and changed the limits for SAR from a cap of 6.8 to the maximum effluent discharge concentration at each outfall for the period of record (collectively, "maximum concentration effluent limitations"). As a result of the modification, the EC effluent limitations ranged from 1.82 dS/m to 4.3 dS/m, and the SAR effluent limitations ranged from 48 to 97. The Division used the effluent discharge concentration for each outfall from January 1, 2010 through September 30, 2013 ("period of record") to establish the maximum concentration levels.

The compliance schedules were removed because the modified permit limitations reflected the maximum concentrations of the permittee's effluent. When the permittee requested this modification it submitted that the data during the period of record was representative of the variability in the concentrations of its discharge. Accordingly, the concentrations in the permittee's effluent should have been below its historic maximum, which represented the upper bounds of its variability.

Additionally, flow limitations were added to each outfall. Flow limits were established at the maximum effluent discharge flow (30 day average) reported during the initial effluent discharge period of record (January 1, 2010 through September 30, 2013). The effluent limitations for flow were added to allow operational flexibility while ensuring that operational and discharge changes do not result in a decrease in water quality.

Summary of Effluent Data

The Division reviewed discharge data from January 1, 2014 through September 30, 2014 and found that no outfalls exhibit exceedances of the maximum concentration effluent limitations. Note that the modified SAR effluent limits became effective on April 1, 2014, and at that time the monitoring frequency for SAR increased

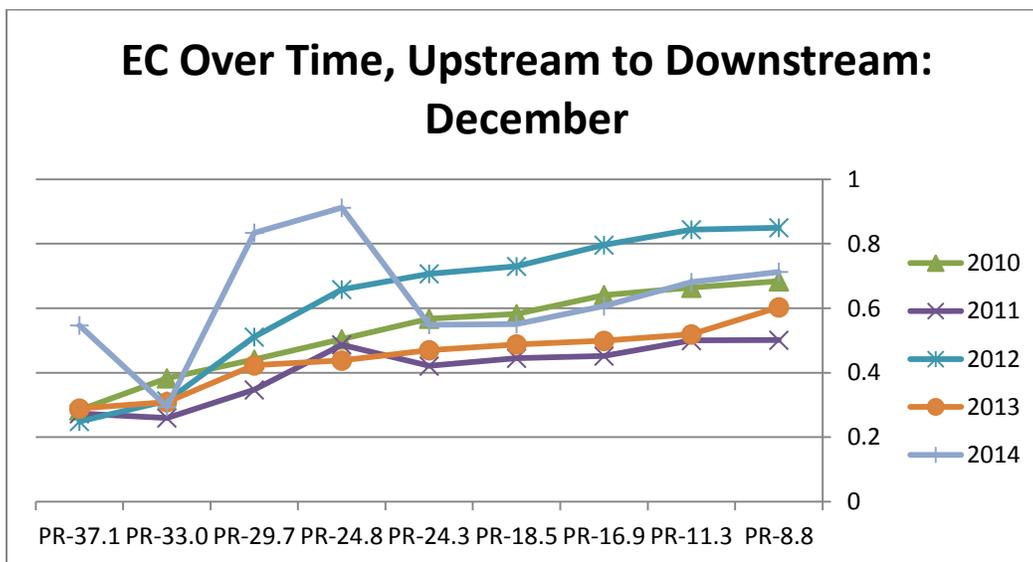
from quarterly to monthly. Up to 7 values are available for each outfall for the calendar year 2014, depending on whether a discharge was continuous during that time period or not.

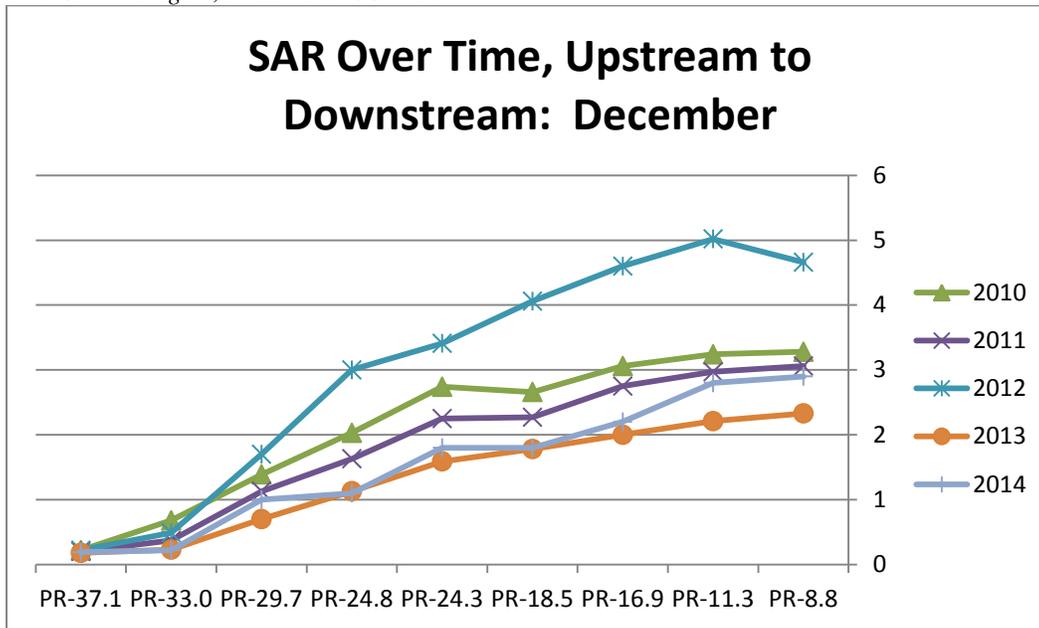
Data Analyses

Ambient Data Analysis

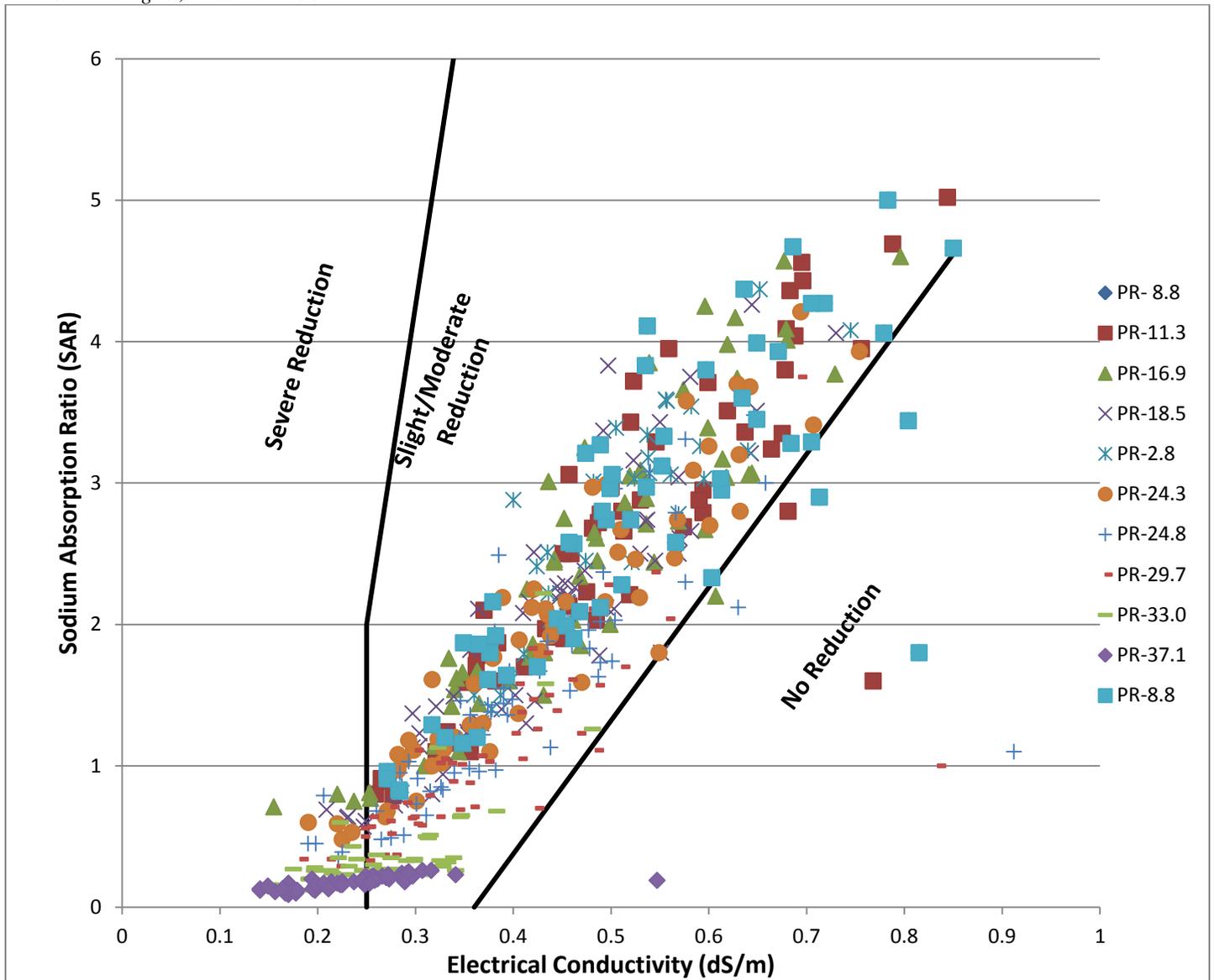
In continuing with the approach of establishing effluent limits to characterize the historic effluent discharge concentration, as opposed to returning to a strict application of the effluent limitations established by Clean Water Permitting Policy 24, the division analyzed available ambient stream data and soil analyses to determine whether ambient water quality remains at an acceptable level to support irrigation uses.

The division concluded that ambient stream data continues to demonstrate a positive relationship between the discharge of CBM water containing high levels of EC and SAR, and a corresponding increase in ambient EC and SAR levels. The following chart illustrates a relative increase in instream EC and SAR levels from the most upstream station, which is located above any CBM influence, to the most downstream station, which is location below all CBM influence and directly above Trinidad Reservoir. Data is presented for the month of December. A similar positive relationship exists seasonally.



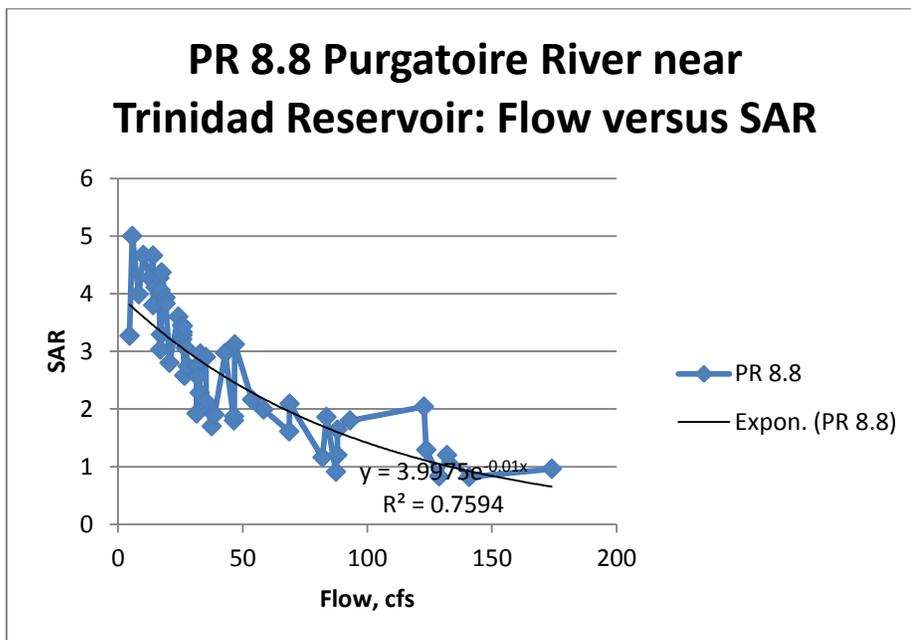
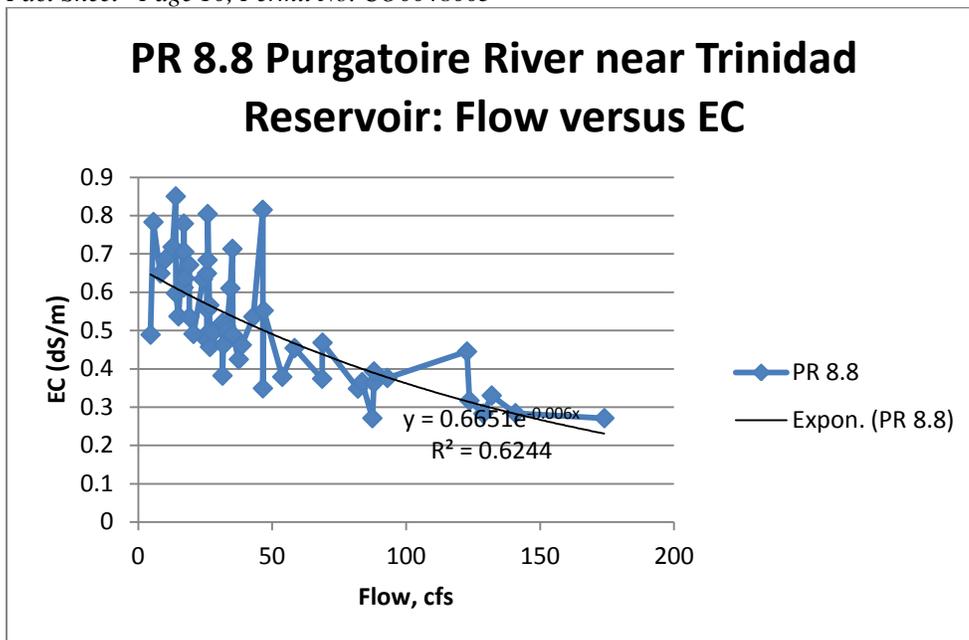


The division analyzed the five years (2010 through 2014) for which ambient stream data are available for EC versus SAR levels to determine if those remained at an acceptable level during the five year period. When the division revised the effluent limits in 2014 to depart from the values based on published science as described in Clean Water Permitting Policy 24, the division agreed with the conclusion put forth by the permittee, that EC versus SAR levels were acceptable with the CBM influence. That while these levels span both the “safe” and slight to moderate reduction in infiltration zone” ambient levels available demonstrated the same thing. An updated analysis confirms this is still the case.



Purgatoire River In stream Irrigation Conditions

The division analyzed the five years (2010 through 2014) for which ambient stream data are available for relationships between ambient stream flow and ambient EC and SAR levels, and concluded that a strong relationship exists.



In other words the relative amount of instream dilution available is a significant factor in determining EC and SAR levels at the point of an irrigation intake.

In accordance with the current permit the permittee is required to conduct soil analyses to monitor soil conditions given the implementation of EC and SAR discharge limits based on maintaining initial effluent discharge concentrations. The permittee was required to conduct initial sampling by October 31, 2014, and then submit results of the initial sampling and first sampling event for the after-irrigation season by December 31, 2014. The results of the sampling were compared to values provided by the U.S. Department of Agriculture, Natural Resources Conservation Service. “*Soil Survey of Las Animas County Area, Colorado, parts of Huerfano and Las Animas Counties*” (2009) which are summarized as follows:

Soil Type	Salinity Maximum	Normal SAR Value
MaW—Mauricanyon	2 dS/m	About 1

clay loam, 0 to 2 percent slopes, wet		
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The results of the soil sampling indicate that EC is below the USDA maximum value. Soil EC was less than 1.0 dS/m at all depths in both fields with an average root zone salinity of 0.3 dS/m. However the SAR values indicate an increase over other normal soils in the vicinity. The soil SAR ranges from 1.2 to 1.5 and 0.9 to 1.3 in the two fields sampled. This is potentially due to the cumulative amounts and concentrations of water laden with sodium. The pH ranges from 7.6 to 8.0 and 7.2 to 7.7 in the fields. There is no corresponding reference value for pH included in the USDA publication.

The values were also compared to values included in Table 1 of the fact sheet to the permit modification that became effective April 1, 2014, which are repeated below:

Table 1: Salinity Classification of Soils.

Soil Classification	EC (dS/m)	SAR	pH
Normal	<4	<13	6.5 - 7.2
Saline	>4	<13	<8.5
Sodic	<4	>13	>8.5
Saline-sodic	>4	>13	<8.5

(1) Brady, N.C. 1990. The Nature and Properties of Soils. 10th edition. (2) Waskom, R.M. and others. Diagnosing Saline and Sodic Soil Problems. Colorado State University Extension Publication No. 0.521.

The results of the soil sampling do not conform to a soil classification listed in this reference.

The division concluded that the results of the soil sampling do not inform a change in approach for establishing effluent limits to characterize the initial effluent discharge concentration at this time. The soil sampling results are limited, and the current permit and this renewal permit include requirements to continue with the soil sampling annually, both pre-irrigation and after irrigation. This information will be available to inform future permit actions.

The division used these initial results to inform the specification of benchmarks in the renewal permits. The current permit states the following:

Benchmark values for those parameters shall be set to half of the soil classification values or two-fold increase in the actual field values, whichever is more stringent, provided in the Brady (1990) to prevent soils from a change in soil salinity classification provided by Brady, 1990.

The results of the sampling did not conform to a soil classification listed in Table 1. Therefore the Division expressed the benchmarks as a two-fold increase in the actual field values. For EC this resulted in a benchmark of the average root zone salinity of 0.6 dS/m. For SAR the division calculated the mean of the range of SAR values at 1.2 (data from Table 2. Composite soil sample data from the Purgatoire River fields. Submitted as part of fall soil sampling results for irrigated soils along the Purgatoire River), and calculated a two fold increase to be at 2.4 SAR.

As such the division determined that a continued departure from the published science based effluent limitations for EC and SAR, and establishment of effluent limits based on an initial effluent discharge concentration, remains appropriate.

Noting the field variability described by the permittee, the Division explored options for revising the establishment of effluent limitations and evaluation of compliance for limits for SAR which, would expressly

allow for variability and for slight single value exceedances of the current permit limits to be considered compliant.

EC, FLOW and SAR Effluent Limits Established in this Permit

EC Effluent Limit

The Division did not revise its approach for EC in this permit. During the previous permit term no outfalls exceeded the EC effluent limit, and as such, the Division did not have sufficient information to substantiate a change in approach.

Flow Effluent Limit

The division did not revise its approach for flow in this permit. During the previous permit term no outfalls exceeded the flow limit, and as such, the Division did not have sufficient information to substantiate a change in approach.

SAR Effluent Limit

For SAR, the Division applied the lower confidence limit (LCL) method in this permit for the purpose of determining compliance with the SAR effluent limitation. The method was first developed by the division for use in the 303(d) listing methodology. A copy of this method is attached to this Fact Sheet as Appendix B. Like ambient water quality data, most discharge water quality data are not normally distributed. Therefore the non-parametric test developed for assessment of ambient stream data has been applied to discharge effluent data in this case.

The LCL method is based on a statistical comparison of ongoing effluent discharge concentrations (effluent data obtained to test compliance) to initial effluent discharge concentrations (the data set used to establish the effluent limit). Initial effluent discharge concentrations were based on the first set of effluent data (January 2010 through September 2013). From that set, the concentration corresponding to a single percentile – 85th in this case – was used to characterize the data set. The 85th percentile was selected because it conforms to the regulatory convention for chronic conditions when assessing stream data and for the establishment of many ambient based standards. There are additional reasons for using 85th percentile concentration: there is regulatory precedent, it locates a relatively high concentration (as opposed to the median), and it serves as a surrogate for a 30-day average concentration with a 3-year recurrence interval.

The 85th percentile concentration from the initial data set becomes the benchmark (i.e., it becomes the permit limit) for testing future compliance data. Consequently, it is important that it is “representative” of effluent conditions being characterized. In this case, representative data included all SAR data available for the effluent for the same period of record that the Division used to derive the maximum concentration effluent limitations (i.e., January 2010 through September 2013).

Once the permit limit has been set with the initial data set, which in this case is the 85th percentile concentration, it is possible to measure compliance with a new data set. Compliance is measured by asking the question: is the 85th percentile concentration of the new data set significantly greater than the permit limit? The method allows for variability in effluent discharge concentrations and accepts the possibility that the 85th percentile will exceed the permit limit, as long as it is not significantly greater. The statistical criterion in the permit is established at a 99% level of confidence. Thus, if the LCL method shows that 85th percentile concentration of the new data is significantly greater than the permit limit, it means that the data demonstrates with a 99% level of confidence that the effluent is not in compliance with the limit. Note that a different (slightly lower) level of confidence is applied to the use of this method in the 303(d) listing methodology. The division selected a higher level of confidence for use in the permitting framework intentionally, so that a greater

level of confidence would be behind the finding of an effluent limit exceedance, than for the finding of waterbody impairment.

Applying a statistical test, such as the LCL method, to an effluent limit allows for flexibility that is not captured by a discharge concentration alone. Under the LCL approach, the discharge concentration that is set as the effluent limit can be exceeded, up to a point, without triggering an effluent limit exceedance. Under the LCL approach the Division was able to develop the permittee's effluent limit based on historic effluent data, rather than revert to the static numeric limits established in Clean Water Permitting Policy 24, and was able to build in a statistical safeguard that was not applicable under the maximum concentration effluent limitation approach.

Using this method, if the LCL concentration of the reported value (e.g., 85th percentile) exceeds the effluent limitation, then the reported value is significantly larger than the effluent limitation and there is a high degree of confidence (99%) that the reported value should be considered non-compliant.

The Division assigned a six-month averaging period to the effluent limit, to facilitate a sample size of at least five samples. As described in Appendix B, a sample size of at least six samples was selected for the purpose of making 303(d) listing decisions, and when there are at least five samples, no additional supporting information is required because conclusions are equally reliable whether sample size is five or ten or fifty. As described in the permit, all samples collected during the averaging period are used to calculate the LCL concentration. This six-month averaging period should not interfere with operational decisions because the permittee can either decommission outfalls at the end of the reporting period, or collect additional samples in advance of any planned decommissioning to ensure that the minimum of five samples needed to report the LCL concentration will be available.

In summary, the Division determined that an 85th percentile effluent limit for SAR, with compliance determinations made based on an LCL concentration, was appropriate in this case based on the following:

- The applicable water quality standards in this case are narrative standards adopted for prevention of toxicity to plants, irrigated crops, and for prevention of harm to the beneficial use, irrigated agriculture
- For this permit, the SAR effluent limits are derived to characterize historic effluent discharge concentrations. This is analogous to the derivation methodology for ambient-based standards. The statistical methods applied in this permit of an 85th percentile value for establishment of an effluent limit for SAR is consistent with the standard practice used to derive ambient based standards.
- The slight exceedances of SAR under the current permit are within the degree of variation expected for the discharge, and because these variations have triggered permit violations, this is a cause for a change in approach that expressly allows for variability.
- The statistical method applied in this permit for compliance determinations for SAR, is intended to only make a finding of non-compliance when there is a high degree of confidence (99%) that the reported value represents a significant departure from the effluent limit.
- The evaluation of the quality of water for irrigation is complex and involves interactions of water quality, flow, plant tolerances, soil types, and agricultural management practices. The two measures of water quality, EC and SAR, used in discharge permits to control levels of salts, are measurements of the relative concentrations of several ionic components which are not constant from outfall to outfall, and are known to transform once discharged into the natural environment. Site-specific studies and data analysis conducted from January 2010 through September 2013 provided basis for establishing maximum concentration effluent limitation for the period of record. The division adopted this approach based on a showing that the ambient stream condition was acceptable to support the irrigation use at these discharge concentrations. These maximum concentration effluent limitations were established through a permit modification that became effective April 1, 2014. The

effluent limits established in this renewal maintain an approach based on historic effluent concentrations and ambient water concentrations that support agricultural irrigation uses.

- The approach used for this permit continues the monitoring and reporting requirements contained in the current permit. The monitoring requirements are intended to provide information to continue to verify that the water quality condition in the ambient receiving water is acceptable to support the irrigation use and to directly assess the potential for salt accumulation of irrigated parcels downstream of the CBM discharges. The special reporting requirements (benchmark trigger levels) are in place to alert the division to significant changes in the ambient water quality or soil conditions during the permit term. Significant changes in ambient water quality or soil conditions would trigger the division to revisit the effluent limitations.

Compliance Schedule

The Division also evaluated the appropriateness of a compliance schedule with the revised effluent limits and method for compliance determinations.

The permittee requested a compliance schedule to provide “adequate time to assess how to comply with SAR and EC limits and to gather additional data to support revised SAR and EC limits”. A compliance schedule would only be appropriate to provide adequate time to comply with an effluent limit. A compliance schedule is not appropriate to provide time to revise an effluent limit. The following provisions regarding the establishment of effluent limitations and the use of compliance schedules operate in this case:

Per the Colorado Water Quality Control Act;

“Schedule of compliance” means a schedule of remedial measures and times including an enforceable sequence of actions or operations leading to compliance with any control regulation or effluent limitation.”

EPA’s has established principals regarding compliance schedules which are incorporated into the Colorado policy. Three of these principals are as follows;

- Any compliance schedule contained in an NPDES permit must be an “enforceable sequence of actions or operations leading to compliance with a [water quality-based] effluent limitation [“WQBEL”]” as required by the definition of “schedule of compliance” in section 502(17) of the CWA. See also 40 C.F.R. § 122.2 (definition of schedule of compliance). And;
- Any compliance schedule contained in an NPDES permit must include an enforceable final effluent limitation and a date for its achievement that is within the time frame allowed by the applicable State or federal law provision authorizing compliance schedules as required by CWA sections 301(b)(1)(C); 502(17); the Administrator’s decision in *Star-Kist Caribe, Inc.* 3 E.A.D. 172, 175, 177-178 (1990); and EPA regulations at 40 C.F.R. §§ 122.2, 122.44(d) and 122.44(d)(1)(vii)(A).
- In order to grant a compliance schedule in an NPDES permit, the permitting authority has to make a reasonable finding, adequately supported by the administrative record, that the compliance schedule “will lead to compliance with an effluent limitation . . .” “to meet water quality standards” by the end of the compliance schedule as required by sections 301(b)(1)(C) and 502(17) of the CWA.
- A compliance schedule based solely on time needed to develop a Use Attainability Analysis is not appropriate, consistent with EPA’s letter of February 20, 2007, to Doyle Childers, Director Missouri Department of Natural Resources, nor is a compliance schedule based solely on time needed to

develop a site specific criterion, (underline added) for the same reasons as set forth in the October 23, 2006, (referenced in Paragraph 10) and February 20, 2007 letters.

To grant a compliance schedule in a CPDES permit, the permitting authority has to make a reasonable finding, supported by the administrative record that the discharger cannot immediately comply with the WQBEL upon the effective date of the permit. 40 C.F.R. §§ 122.47, 122.47(a)(1).

For existing sources, the Division first evaluates appropriateness of a compliance schedule on the basis of necessity. The necessity determination is made on the basis of whether associated effluent limits can be met. In conducting this analysis, the Division evaluated two scenarios with available effluent data. 1) January – September 2014, which was the data available for development of the draft permit, and 2) July – December 2014, which represents a 6 month monitoring period commensurate with the renewal permit, and the most recent 6 month period of data available for development of the final permit. No outfalls would exhibit exceedances of the revised effluent limits, using the LCL concentration method so the Division determined that the necessity test has not been made and a compliance schedule was not considered further.

Proposed Revision of Iron Effluent Limitations Based on Iron Trading

The facility has requested a modification to iron limitations, dated December 13, 2013. The Division postponed the review and incorporation of the modification request in order to coincide with this permit renewal.

This particular discussion will focus on the Perras Canyon and Guajatoyah Creek, as the outfalls within this permit (CO0048003) discharge into this watershed. The impact of stream stabilization for those outfalls from other facilities will be discussed in those permit Fact Sheets.

With the December 2013 modification request, the permittee proposes to implement stream bank stabilization to reduce the iron loading to the Purgatoire Watershed as a whole, and to generate loading “credits” for the basin. The report estimates that nearly 14,000 pounds of total recoverable iron will be reduced to the Purgatoire Watershed. The facility cites the Colorado Pollutant Trading Policy (WQCD, October 2004) as the basis for the iron trading proposal. The proposal includes an assessment of streambank erosion and the associated levels of total recoverable iron in the stream. The iron, the proposal indicates, should be reduced if the amount of streambank erosion decreases. The restoration focuses on a stretch on streambanks along the South Fork of the Purgatoire from Torres Canyon to Cherry Canyon. The proposal suggests that the stream project could offset iron contributions on the Purgatoire River and thereby improve the water quality in the Purgatoire Watershed as a whole. With the reduction of the iron loading from stream bank erosion, the facility would gain credits to help offset their own contributions of total recoverable iron to the Purgatoire River. Specifically, the anticipated limitations for iron calculated by Tetra Tech were outlined to be 1421 µg/l for the 30 day average and 377 µg/l for the ADBAC (2 year rolling avg).

The modification includes a proposed construction date of the stream bank stabilization “as early as” April 30, 2015, and the effectiveness of this proposal will not be verified until another two to five years after construction is completed. Hence the proposal does not propose a date when the stream bank stabilization will realize any “credits” to apply to any of the facilities.

This modification request is a result of investigations and options investigated by the facility under the current compliance schedule for meeting final iron limitations of 1,805 ug/l (30-day avg) and 150 ug/l (2 yr rolling average) by July 1, 2015. In the compliance schedule, the first interim milestone was due October 31, 2010. The report submitted by Pioneer identified strategies that were to be fully evaluated (and one selected) during the compliance schedule period. In that report, the facility identified the following as potential options to meet the final iron limitations;

Enhanced oxidation/aeration
Settling and filtration;
Ponds, settling, and flocculation; and
Watershed-based trading/iron offsets

With the 2011 submittal, the iron trading proposal was researched, along with the options presented in the first report. The facility found that settling and filtration testing did not result in a large enough reduction in iron. Settling the discharge alone did not appear to have any significant effect on the levels of total recoverable iron in the discharge either; however the addition of chemical flocculants were not explored in this compliance schedule. The facility indicated that oxidation occurs naturally when the CBM water is brought to the surface. The permittee decided to pursue the iron trading option further.

The 2012 compliance schedule submittal removed the settling and filtration option. The oxidation option, while occurring naturally, would not provide enough reduction in order for the discharges to comply with future limitations. The ponds, settling, and flocculation was addressed, but without testing any flocculants, and was dismissed as not being effective enough to comply with final permit limitations for iron. The 2012 compliance schedule selected the iron trading option.

Discussion of Request

The Division disagrees with the applicability of the iron trading proposal for this permit (CO00480003) for the following reasons;

Water Quality Based Limitation

- The proposal focuses on a specific stretch (noted above) of the South Fork of the Purgatoire River, on the basis that stream bank stabilization would improve the water quality for total recoverable iron in the “Purgatoire River Watershed.” However, the outfalls in this permit discharge into Perras Canyon and Guajatoyah Creek, both tributaries of the North Fork of the Purgatoire. While the South Fork of the Purgatoire is within the larger Purgatoire “Watershed”, the “watershed” consists of five different watersheds within the Purgatoire Basin as designated by the WQCC. These are as follows; Guajatoyah Creek (COARLA05a), the South Fork of the Purgatoire (COARLA05b), the North Fork of the Purgatoire River (COARLA05b), the mainstem of the Purgatoire River (COARLA05b), and Lorencito Canyon (COARLA04b). The South Fork of the Purgatoire River is a different “watershed” from the North Fork of the Purgatoire River and Guajatoyah Creek as designated by the Water Quality Control Commission, and because these are two separate tributaries to the Purgatoire River, the water quality and water flows in the South Fork do not communicate with Perras Canyon or Guajatoyah Creek (or the North Fork) and have no bearing on their water quality. Therefore, stream bank stabilization and any associated load reduction (credits) of total recoverable iron in the South Fork will not affect Perras Canyon, Guajatoyah Creek, or the North Fork and would not function to improve the water quality in those receiving waters. Thus, stream bank stabilization “credits” from the South Fork cannot be applied to the Guajatoyah Creek or North Fork “watershed” The Colorado Pollutant Trading Policy (WQCD, October 2004) , Section IV. also discusses the appropriate geographic considerations of trading as generally “within a single stream segment (p.5).”
- While the Division acknowledges that trading can function to improve water quality within a watershed in certain instances, the policy does not indicate that trading can function to nullify, or in any way allow exceedences of the water quality standards . In fact, The Colorado Pollutant

Trading Policy (WQCD, October 2004) , Section VI. expressly *prohibits* the “utilization of credits in such a manner that would cause or contribute to a violation of water quality standards” (p.6). In the North Fork Watershed (Parras Canyon and Guajatoyah Creek), the Water Quality Control Commission recently assigned a chronic numeric standard of 1,000 ug/l for total recoverable iron to the segment (COARLA05a). Because this Canyon is a zero low flow stream discharges within this watershed must be controlled at 1,000 ug/l to prevent an exceedence of the assigned standard. Applying credits to discharges in the North Fork, and allowing effluent limits in excess of 1, 000 ug/l would be allowing exceedence of instream standards in localized reaches e.g. ‘hot spots’ and is not consistent with the scope and purpose of trading. Any discharge in exceedence of 1,000 ug/l (30 day average) would be a violation of the water quality standard.

- Iron trading is not need for these outfalls as the limitations for TR iron can be attained in all outfalls in this permit for the WQBEL

Antidegradation-Based Limitation for TR Iron

This permit includes a consideration of the Purgatoire River solely for an antidegradation analysis. However, antidegradation-based limitations for iron were included in this permit based on the North Fork of the Purgatoire, not the Purgatoire itself. While the Division acknowledges that stream bank rehabilitation projects on the South Fork of the Purgatoire have the potential to reduce loading, and subsequently to increase water quality for total recoverable iron on the Purgatoire, no impact to the North Fork is possible. Note that the ADBAC in this permit renewal is 363 ug/l (2 year rolling average) versus the current permit 2 year rolling average limit of 150 ug/l. Outfall 241 is able to meet this new ADBAC limitation.

Compliance Schedule Proposal

The modification includes a proposed construction date of the stream bank stabilization “as early as” April 30, 2015, and the effectiveness of the project would not be verified until another “two to five” years after construction is completed. The modification request does not propose a date when the stream bank stabilization will generate any “credits” to apply to any of the facilities, and no defined process of measuring credits. Although the project is not applicable in this watershed, note that compliance schedules must include specific dates for compliance with limitations, regardless of their source. A method of determining credits also must be established.

Further, during the compliance period other options for meeting limitations were identified, but not comprehensively researched. Additional investigation on some of these options (e.g. enhanced oxidation, flocculation, etc) may be warranted. Please see Section VII.D of the Fact Sheet for a discussion of compliance schedule.

Requested Revision of Whole Effluent Toxicity (WET) Requirements

The facility requested revision of their effluent limits for Whole Effluent Toxicity, through submittal of a permit modification request dated December 18, 2013. The Division did not act on the modification request due to the timing of the pending renewal and incorporated consideration of the permit revisions requested through the modification request into the permit renewal process. The facility provided additional information regarding their request as comments on the draft renewal permit.

Excerpts from the WET request follow below:

Biological monitoring has found that aquatic life communities are only sustained in the Purgatoire River, not the upgradient tributaries. Therefore acute WET testing at discharge outfalls in the tributaries will be protective. Testing at the tributary outfalls and confluences of the Purgatoire River indicates that compliance with acute levels at the outfalls will result in meeting WET chronic objectives for the Purgatoire River. To assure that toxicity in the Purgatoire River does not increase, chronic WET tests will be conducted at the confluences of tributaries and the River.

These permitted discharge outfalls are all located in tributaries to the Purgatoire River- the flow in the tributaries is intermittent or effluent dominated. In many locations, if not for the discharge of produced water, no flow or aquatic life would exist. There is a robust dataset of acute whole effluent toxicity ("WET") testing results, as this has been required of all outfalls since initiation of CBM discharges in the mid-1990s. Outfalls consistently pass this test as shown by DMR data.

However, WET tests using *Ceriodaphnia dubia* (*C. dubia*) cannot consistently pass the chronic survival and reproduction threshold limits at discharge outfalls identified in XTO permit Nos. CO- 0048054 and - 0048062, and Pioneer Permit Nos., CO-0047776 and -0048003 (all permits issued in 2010). These permits contain compliance schedules to evaluate WET testing compliance and determine sources of toxicity and discharge effects on aquatic life.

Sustainable communities of fish and other aquatic species are not present at the points of discharge themselves, because the outfalls are located in the ephemeral, tributary canyons. Chronic WET is not attained at the outfalls, so XTO and Pioneer undertook further studies downstream in waters proximate to the locations of aquatic species. Downstream near the mouths of the canyons, at the confluence with the Purgatoire River, there are surface water flows and more robust aquatic life communities. US EPA has indicated that Colorado Department of Public Health and Environment (CDPHE) has the discretion to set the point of compliance for its aquatic life/toxicity testing policy.

Surface water toxicity studies were performed at different locations in the Lorencito Canyon and South Fork tributaries to the Purgatoire River (Figure 2) to determine if the CBM effluent could be resulting in adverse effects to aquatic life. The evaluations, conducted with effluent and surface water, confirmed that the chronic toxicity, specifically observed in Lorencito Canyon, is related to total dissolved solids (TDS). The toxicity studies, along with habitat, benthic macroinvertebrate, and fish assessments provide evidence about the relative risks associated from the CBM produced water discharge. Testing at these sites using *C. Dubia*, *Daphnia magna*, and *Pimephales promelas* demonstrate sublethal toxicity to only *C. dubia* at multiple locations near the outfalls and within the Lorencito tributary due to TDS. According to the AECOM Report, *C. dubia* is recognized as being sensitive to elevated TDS and is not indigenous to these streams.

The TDS concentrations in Lorencito Canyon only appear to be of concern based on WET studies with *C. dubia*. The fact that there are sensitive benthic macroinvertebrate (individuals representing four multi-metric Plains Intolerant families) and fish (flathead chub) species found in portions of the tributary where flow levels allow for a connection to the Purgatoire River indicates that the tolerance ranges of these organisms are within the current water conditions. Therefore, the tributaries near the confluence with Purgatoire River could serve as suitable auxiliary monitoring locations for chronic WET testing in the respective permits.

On the behalf of Pioneer Natural Resources and XTO Energy, Inc., we request to amend XTO Permit Nos. CO-0048054 and CO-0048062 and Pioneer Permit Nos., CO0-0047776 and CO-0048003, to modify the WET test (chronic) requirements. During discussions with the Water Quality Control Division (WQCD), Permitting Section, we initially proposed that chronic WET attainment occur where the aquatic uses and water exist, namely downstream near the mouth of tributary canyons.

The WQCD has recommended incorporating a permitting model for WET testing similar to that in the London Mine Permit (CO0-0038334). Application of this permitting model in the Purgatoire watershed results in acute testing of *Daphnia magna* (*D. magna*) at the outfalls and biennial chronic testing of *C. dubia* at the confluences of the tributaries and Purgatoire River to confirm no toxicity occurs other than related to TDS.

Our data and analysis supports this approach because acute testing with *D. magna* would occur at the outfalls as it has been conducted since the initiation of CBM discharges in the basin. While chronic WET testing with *C. dubia* often results in WET testing failures due to TDS (even at the mouth of Lorencito canyon in proximity to the Purgatoire River), tests with *D. magna*, a species less susceptible to TDS toxicity and more representative of the aquatic species found in the area, indicates attainment of WET (Table 1). However, because *D. magna* and *C. Dubia* have similar sensitivity to a variety of toxicants, chronic WET testing with *C. dubia* near the mouth of the tributaries and Purgatoire River would provide assurance that no toxicities, other than TDS could be affecting the aquatic species.

Therefore, the permit would require quarterly acute WET testing at the outfalls with *D. magna*, and biennial chronic WET testing with *C. dubia* at the confluences of the tributaries and Purgatoire River. If the chronic testing indicates toxicity, the permittee will conduct a PTI study to demonstrate that chronic toxicity of *C. dubia* where it occurs is due to TDS. If chronic WET test failures can be attributed to continued, and historic, TDS levels, no further TIE analyses shall be necessary. If chronic WET tests with *C. dubia* fail and the PTI study finds that the source of the toxicity is not TDS, then quarterly monitoring for WET testing (chronic) will be initiated and the WQCD will issue a correction and place this requirement in the permit.

Dr. Naddy's data collection and evaluations support the identification of TDS in Lorencito Canyon as the cause of sublethal toxicity to *C. dubia*. Aquatic life data support the WET being met at the mouth of the canyon, where biological, chemical and physical habitat remain in compliance. Acute WET testing will continue at the discharge outfalls for *D. magna*. No discharge permit violation will be deemed to have occurred if acute WET at the discharge outfall for *D. magna* is met.

Discussion of Request

This discussion will focus on the Lorencito Canyon and tributaries, as the outfalls within this permit (CO-0048054) discharge into this watershed. The discussion of WET for those outfalls from other facilities will be discussed in those permit Fact Sheets.

Regulatory Basis for WET Effluent Limits

Limitations for WET have been developed to implement the narrative standards for toxicity. The narrative standards are contained at Regulation 31.11(1), which provides that: “state water shall be free from substances attributable to human-caused point source or nonpoint source discharge in amounts, concentrations or combinations which are harmful to the beneficial uses or toxic to humans, animals, plants or aquatic life.”

Applicable regulatory provisions regarding the derivation of effluent limits to implement this narrative standard include the following:

Regulation 61.8(2)(b)(i)(A)

Limitations must control all pollutants or pollutant parameters which the Division determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or measurably contribute to an excursion above any water quality standard, including narrative standards for water quality.

Regulation 61.8(2)(b)(i)(B)

When determining whether a discharge causes, has the reasonable potential to cause, or measurably contributes to an in-stream excursion above a narrative or numeric water quality standard, the Division shall use procedures, including appropriate water quality modeling, which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant or pollutant parameter in the effluent, the sensitivity of the species to toxicity testing (when evaluating whole effluent toxicity), and where appropriate, the dilution of the effluent in the receiving water.

Regulation 61.8(2)(b)(i)(E)

Except as provided in this subparagraph, when the Division determines, using the procedures in subsection (b)(i)(B) of this section, toxicity testing data, or other information, that a discharge causes, has the reasonable potential to cause, or measurably contributes to an in-stream excursion above a narrative water quality standard, the permit must contain limitations, which include effluent limits, for whole effluent toxicity. Such limitations to be derived by the Division are based upon the Division's determination of what constitutes an acceptable level of whole effluent toxicity. Limits on whole effluent toxicity are not necessary where the Division demonstrates in the rationale of the permit, using the procedures in subsection (b)(i)(B) of this section, that chemical-specific limits for the effluent are sufficient to attain and maintain applicable numeric and narrative water quality standards.

Toxicity Studies- Sodium Bicarbonate, NaHCO_3 , and Bicarbonate, HCO_3^- .

In accordance with the current CBM permits, and the WET Policy, upon failure of a chronic WET test for *C. dubia*, some Preliminary Toxicity Investigations (PTI) and Toxicity Identification Evaluations (TIE) were conducted. The function of a PTI/TIE study is to identify the cause of toxicity in the effluent. The PTI/TIE studies, concluded that TDS ions are the cause of toxicity in the effluent. The PTI and TIE use a series of tests to identify the cause of the toxicant. As stated in the reports:

The cation/anion ion exchange test is designed to determine if effluent toxicity is due to an imbalance of essential ions (either in excess or deficiency) and to determine if TDS was the cause of toxicity. If toxicity is removed following the ion exchange, the results from this characterization test can be used in conjunction with other procedures to document ionic imbalance and/or TDS as the cause of toxicity.

NaHCO_3 is an ion captured in the TDS analysis, and is a major consistent of CBM produced waters, including those in the Purgatoire River watershed. The PTI and TIE studies concluded that sodium bicarbonate, NaHCO_3 , is the primary ion causing toxicity in the discharge. On occasion, chloride was reported as a possible additional toxicant, however this was not further studied and substantiated through additional ion exchange and ion addition tests. Therefore, chloride is not discussed further in this analysis as no detailed information regarding chloride toxicity in these effluents is currently available. It may be appropriate in the future to generate additional information regarding chloride toxicity in these effluents.

A more extensive ecological evaluation was conducted to evaluate the toxicity instream and aquatic life (*Ecological Evaluation of the Effects from XTO and Pioneer NPDES Discharges to Aquatic Life in Lorencito Canyon and South Fork Purgatoire River*, AECOM Technical Services, Inc, February 2013). The AECOM report was submitted to evaluate instream aquatic communities and to verify that instream WET tests exhibit failures for similar ions as 'mock' effluent. The AECOM report was also attached as Appendix A to the WET permit modification request for revision of the chronic WET effluent limit for *C. dubia*.

The AECOM report also concludes that NaHCO_3 is the dominant TDS ion present in the CBM effluent, and concludes that NaHCO_3 is also the primary toxicant instream, downstream of the CBM influence. The AECOM report does not present study results in terms of NaHCO_3 and instead presents results of the study in terms of alkalinity, mg/L as CaCO_3 and bicarbonate, HCO_3^- .

Based on the aquatic toxicity/PTI/TIE studies submitted in response to WET failures, the Division concurs that TDS ions, specifically sodium bicarbonate, NaHCO_3 , and bicarbonate, HCO_3^- , are pollutants causing chronic toxicity for *C. dubia*. The conclusion is well substantiated through the cation/anion ion exchange tests conducted. However, the Division maintains that limitations at the outfalls to implement the narrative standard for chronic toxicity remain applicable.

The USGS also concluded that NaHCO_3 is a primary toxicant in CBM produced waters (*The Potential Effects of Sodium Bicarbonate, a Major Constituent of Produced Waters from Coalbed Natural Gas Production, on Aquatic Life*, USGS, 2012). The USGS studied the potential effects of the levels of NaHCO_3 present in CBM produced waters, on aquatic life, and this report was also referenced in the AECOM report. The USGS study was conducted to expand the limited knowledge base related to the potential effects of NaHCO_3 , and focused on NaHCO_3 because it is a major constituent of CBM waters in the Tongue and Powder River Basins, which was the study area.

While USGS focused on formulating sample water quality criteria in terms of NaHCO_3 , they noted the following in regard to the use of HCO_3^- , as an indicator of toxic effects:

Criteria often are established for single elements or ions, in this case most likely HCO_3^- as the toxic fraction of the compound NaHCO_3 (Mount and others, 1997). Therefore, HCO_3^- information has been provided for use if derivations with this single element are preferred. The sample criteria could also be calculated as alkalinity because it is an easily measured water chemistry property that is expressed as mg CaCO_3/L , but defines the amount of HCO_3^- in a sample with a pH less than 8.3 (American Public Health Association, 1975).

Mount and others (1997) demonstrated that the toxicity of sodium and calcium salts was caused by the co-occurring anions (specifically Cl^- , sulfate, and HCO_3^-). In the Tongue and Powder River waters that were simulated in the present experiments, HCO_3^- was the predominant co-occurring anion. Therefore, it is likely that the primary source of toxicity of NaHCO_3 can be attributed to HCO_3^- .

The Division agrees with the conclusion that TDS ions are causing toxicity in this case, and that effluent limits for sodium bicarbonate, NaHCO_3 and/or bicarbonate, HCO_3^- and potentially other ions could be established to control the level of toxicity. The form of the expression of the effluent limit could be based on available information on the toxicity of that parameter to aquatic life. Further, chloride may also be considered due to its prevalence in CBM waters, and its potential implications in aquatic toxicity.

Effluent Limits for the Pollutant(s) Causing the Toxicity.

An alternative to the establishment of a chronic effluent limit for WET would be to establish chemical specific effluent limits for the pollutants causing the toxicity. This is discussed in the WET policy as follows:

If the pollutant(s) causing toxicity is/are identified, and is/are not controlled by a permit effluent limitation(s), the Division may develop and add limitations to the permit for these parameters. If there is not a water quality standard for a parameter, the Division will develop a limitation based on available information on the toxicity of that parameter to aquatic life, particularly that present in the receiving stream. The permit may be modified as noted in the above paragraph.

Water quality standards have not been developed for sodium bicarbonate, NaHCO_3 and/or bicarbonate, HCO_3^- . If the Division developed limits for these parameters, the limits would need to be consistent with the following regulatory provisions.

Regulation 61.8(2)(b)(i)(G)

Where a water quality standard has not been established for a specific chemical pollutant that is present in an effluent at a concentration that causes, has the reasonable potential to cause, or measurably contributes to an excursion above a narrative water quality standard, the Division must establish effluent limits using one or more of the following options:

(I) Establish effluent limits consistent with the requirements set forth in section 14(4) of the Basic Standards, Regulation No. 31;

Regulation 31.14(4)

Where no statewide or site-specific numeric standard exists for a constituent of concern, the Division may establish effluent limitations or other permit conditions for such constituent if necessary to comply with the narrative standards in section 31.11(1). Such effluent limitations shall be developed in a manner consistent with the Commission's methodology for establishing numeric water quality standards and, if applicable, shall be consistent with the criteria contained in table I, II and III of this regulation. In such circumstances, upon the request of any interested person, the Commission may hold a rulemaking hearing to consider the adoption of a numerical standard, which would then be binding.

Establishing the Appropriate Level of Aquatic Life Protection.

Laboratory WET tests use aquatic species as detectors of toxicity. Consequently, it is critical for a sensitive species to be used as a detector and for that species to be widely available so that WET tests can be successfully conducted. The appropriate selection is based on the species best used as a surrogate for the range of biological community expected to be present at the site. The Division determines the appropriate species to be used based on the aquatic life expectation for the segment that is established by the WQCC through the process of classifying the receiving water and assigning water quality standards to the waterbody.

WET testing is not required where there is not an aquatic life designated use on the stream segment, unless such testing is determined to be necessary to protect downstream aquatic life designated uses. Normally the Division protects for both acute effects (usually death) on group of test organisms during a short-term exposure (e.g., 24, 48 or 96 hours) and chronic effects (growth and reproduction) during a longer-term exposure (96 hours or longer).

For acute testing, the Division may allow use of the 6 organisms identified in the 40 CFR 136 approved method: Invertebrates: *Ceriodaphnia dubia* (*C. dubia*), *Daphnia pulex*, *Daphnia magna* (*D. magna*); Vertebrates: *Pimephales promelas* (fathead minnow), rainbow trout, brook trout. Consistent with the WET policy, the Division normally specifies *C. dubia* and fathead minnow. The Division does approve requests for a change in species for acute testing, such as when a less sensitive species is demonstrated to be an appropriate surrogate for the range of biological community expected to be present at the site.

For chronic testing, normally chronic effluent limits apply and the effluent limits specify use of *C. dubia* and fathead minnow. Exceptions are made in the following circumstances:

- where discharges are intermittent, on the basis that there would not be chronic exposure of aquatic life to the effluent,
- where the dilution effect in the receiving water is significant, as such the most significant chronic effect is expected to be within the mixing zone, or
- the Commission has applied an aquatic life use the use classification, but most of the aquatic life standards (e.g. chlorine, and the TVS equations such as ammonia and metals standards) are not in the

site-specific segment standards, (unless it is determined that chronic WET testing is necessary to protect downstream aquatic life designated uses, or other evidence exists that would make chronic WET requirements appropriate.)

In this case the discharge is continuous, there is no significant dilution effect, and the level of aquatic life protection assigned by the WQCC is not limited.

However the permittee argues that the use of *C. dubia* is overly protective, and that *D. magna* would be a more appropriate surrogate for the range of biological community expected to be present at the site. The permittee phrases the question in the AECOM report as follows:

But the question becomes what WET species would be appropriately protective of the indigenous aquatic biotic community without being overly protective?

EPA has not approved the use of *D. magna* for chronic WET testing in 40 CFR 136. If its use were to be an appropriate surrogate for the range of biological community expected to be present at the site, the permittee would need to submit, and EPA would need to approve, the limited use of this method for these permits under the ATP process specified in 40 CFR 136. As the permittee states, this path has been considered, but to date no such ATP request has been developed and submitted to the Division and EPA.

Even if an ATP request is approved by EPA, the permitting authority must still determine whether the ATP is appropriate for use in the permitting action. In other words, the permitting authority must still determine if an alternate species such as *D. magna* in this case, would be an appropriate surrogate for chronic toxic effects to aquatic life in lieu of *C. dubia*.

The same question applies in consideration of the establishment of effluent limits for other parameters including sodium bicarbonate, NaHCO_3 , bicarbonate, HCO_3^- and chloride. Consistent with the Commission's methodology for establishing numeric water quality standards the Division defines species that are “expected to be present” at the site. In 2006, the phrase was included in Policy 06-1 (the Temperature Criteria Policy) at Section XII. The discussion of the phrase is essentially the same as in the EPA’s 1994 guidance which is included in the “Recalculation Procedures”, which is an Appendix to EPA’s Water Quality Standards Handbook chapter on Water Effects Ratio, and re-confirmed in its 2013 “Revised Deletion Process for the Site-Specific Recalculation Procedure for Aquatic Life Criteria”. The description from Policy 06-1 states:

The phrase “expected to be present” includes the species, genera, families, orders, classes, and phyla that:

- 1) are usually present at the site.
- 2) are present at the site only seasonally due to migration.
- 3) are present intermittently because they periodically return to or extend their ranges into the site.
- 4) were present at the site in the past, are not currently present at the site due to degraded conditions, and are expected to return to the site when conditions improve.
- 5) are present in nearby bodies of water, are not currently present at the site due to degraded conditions, and are expected to be present at the site when conditions improve.

The study area included in the AECOM report includes the South Fork of the Purgatoire River and the Lorencito. Both of these waterbodies have had the documented occurrence of white sucker (fish taxa). While other taxa were mentioned, including Mayflies, the full taxa results were not included in the report. As such, the Division reviewed the information regarding the toxic effects on white sucker, but notes that prior to assigning or determining effluent limits, a review of other taxonomic data, or additional studies may be required to verify, present and past species. Thus, it is likely that effluent limitations would need to be based on other, more sensitive species.

Chronic Toxicity of Sodium Bicarbonate, NaHCO₃, and Bicarbonate, HCO₃⁻ to Aquatic Life

The Division reviewed the information provided in the ACEOM report, and that provided in the USGS report to determine if adequate chronic toxicity information exists to establish effluent limitations for sodium bicarbonate, NaHCO₃, and bicarbonate, HCO₃⁻. The Division concluded that the establishment of effluent limits for these pollutants for control of the toxicity, in lieu of an effluent limit for WET, is not appropriate at this time as discussed below.

The Division found that continued use of a chronic WET limit using *C. dubia* as a surrogate species for the range of biological community expected to be present at the site remains appropriate. The information presented by the permittee to support its argument that the Division should not use the *C. dubia* as a surrogate species for the range of biological community expected to be present at the site was not compelling. The AECOM report did not include a reference site and the observed toxicity to *C. dubia* is likely attributable to the CBM influence. A reduction in the level of aquatic life protection would be inconsistent with the level of protection applied by the Commission through the adoption of the aquatic life classification and standards. As documented in the AECOM report and rulemaking hearings for the adoption of water quality classifications and standards for these segments,

- The South Fork Purgatoire River has supported multiple fish species, including white sucker with a demonstrated sensitivity to sodium bicarbonate, NaHCO₃, based on the USGS study. The South Fork Purgatoire River supports a healthy and diverse macro invertebrate assemblage, including more sensitive macro invertebrate species.
- The Lorencito Canyon is capable of supporting a wide variety of biota, including sensitive fish and sensitive macroinvertebrate species. Colorado Parks and Wildlife records indicate multiple fish and macroinvertebrate species present in Lorencito Canyon including white sucker with a demonstrated sensitivity to sodium bicarbonate, NaHCO₃, based on the USGS study. Some macroinvertebrate samples collected by GEI in the Lorencito Canyon downstream of CBM influence have indicated impairment based on the MMI score, for which the influence of the CBM discharges is possible cause. The AECOM report documents chronic effects instream to *C. dubia*, for which the influence of the CBM discharges is possible cause.

The most appropriate value to use as an effluent limit would be the USGS calculated chronic criteria of 381 mg NaHCO₃/L for protection of aquatic life. This is a published value derived using methodology consistent with how water quality criteria are established by EPA and the Commission for protection of aquatic life. The value is supported by a series of scientific investigations conducted on the same toxicant, sodium bicarbonate, NaHCO₃, present in produced waters from similar CBM operations. If applied as an effluent limit, the level of toxicity that would need to be reduced in the discharge would be in a similar range to the level of toxicity that would need to be reduced in the discharge to comply with the chronic WET limits currently in place. The permittee currently reports values for bicarbonate, HCO₃⁻. The values reported from March 2010 through March 2015 for all 5 CBM are summarized below:

Permit No and Name	Range Reported of HCO ₃ ⁻ Values (mg/L)	Average Reported HCO ₃ ⁻ Value (mg/L)
CO0047767 Pioneer East Spanish Peaks	883 - 1290	1284
CO0047776 Pioneer Lorencito	873 - 1464	1189
CO0048054 XTO Lorencito	600 - 2782	1034
CO0048062 XTO Alamocito	332 - 2020	901
CO0048003 Pioneer West	597 - 930	755

Spanish Peaks		
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Discharge data are not available for sodium bicarbonate, NaHCO_3 . However, sodium bicarbonate, NaHCO_3 , values would be higher than bicarbonate, HCO_3^- . The in depth analysis of the toxicity of sodium bicarbonate, NaHCO_3 , and bicarbonate, HCO_3^- , conducted for this permit was in response to the permittees request for relief from control of whole effluent toxicity in the discharge. However, a site-specific effluent limit for sodium bicarbonate, NaHCO_3 , and bicarbonate, HCO_3^- , to address toxicity would not result in relief.

The Division did not have adequate information in the AECOM report to derive effluent limitations using similar methodology used by USGS to calculate the overall value for protection of aquatic life. The permittees conducted the study for the purpose of suggesting that the chronic level of toxicity observed in stream is acceptable, and that to argue that no level of control in the permit should be included for chronic toxicity (i.e., no effluent limits). Therefore the study design was not intended to provide the level of information needed to derive chronic criteria, which could be used to establish effluent limits in the permit. However, the study results were reviewed to evaluate the relative magnitude of toxicity observed for the species for which the study was conducted. In general, the chronic toxicity values were higher in the AECOM study than in USGS study, and the number of organisms studied was more significantly more limited in the AECOM study.

WET Effluent Limitations Established in This Permit.

After reviewing the information provided by the permittee, and additional information provided in the USGS report, the Division concluded that it remains appropriate to apply chronic WET effluent limits in this permit in accordance with the WET policy. The Division found that continued use of a chronic WET limit using *C. dubia* as a surrogate species for the range of biological community expected to be present at the site remains appropriate. The Division has concluded that the discharge causes, has the reasonable potential to cause, or measurably contributes to an in-stream chronic toxic aquatic life effect and as such effluent limits must be established to control the toxicity. The Division considered the establishment of effluent limits for sodium bicarbonate, NaHCO_3 , and bicarbonate, HCO_3^- , and concluded that the establishment of effluent limits for these pollutants for control of the toxicity, in lieu of an effluent limit for WET, is not appropriate at this time.

The permittee may request the Commission hold a rulemaking hearing to consider the adoption of a numerical standard for sodium bicarbonate, NaHCO_3 , bicarbonate, HCO_3^- , and potentially other ions (e.g. chloride) which would then be binding in the permitting process for the appropriate level of control of the pollutants causing toxicity. This would be analogous to the London Mine permit example. In that case the Commission had adopted a site specific numeric quality standard for the pollutant causing toxicity, zinc. In doing so the Commission understood that the magnitude of the pollutant concentration established as a site-specific numeric standard would cause toxicity to some aquatic life, for example more sensitive species of trout, and that the lesser level of aquatic life protection embedded into the site specific standards decision reflected the biological community expected to be present at the site.

However, given that the Division has determined that there is reasonable potential, and has derived effluent limits based on the best information available at the time of permit development, the Division must require compliance with those effluent limits “as soon as possible”. Any further work to inform appropriate levels of control of toxicity related to the ions in the effluent, would be a possible cause for a permit modification, but are not cause for delay in the reduction of toxicity based on the establishment of a chronic WET limit in this permit renewal.

IV. RECEIVING STREAM

A. Waterbody Identification: COARLA05a, Guajatoyah Creek and
COARLA05b, Parras Canyon, North Fork of the Purgatoire River
(downstream segment), and the Purgatoire River (downstream segment)

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 the receiving waters for potential pollutants of concern. This information, which is contained in the Water Quality Assessment (WQA) for this receiving stream(s), 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 fact sheet can be found in Part I.A of the permit.

Permitted Features listed in Table I-1 will be the authorized discharge points to the receiving streams as they are prior to discharge into state waters.

V. FACILITY DESCRIPTION

A. Industry Description

This is a coalbed methane (CBM) operation north of the Purgatoire River, on tributaries of the North Fork of the Purgatoire River. A CBM operation involves the drilling of numerous wells and periodic fracing to pump groundwater out of coal seams in order 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.

The discharges covered under this permit are to Parras canyon and Guatajoyah Creek, which all drain to the North Fork of the Purgatoire, which is tributary to the Purgatoire River.

B. Sources to the Treatment Plant

The sources to the treatment include produced water from the CBM operations, and does not include frac flowback. The water does not come into contact with any of the drilling fluids and is exclusively ground water from dewatering the wells. The seams from which the ground water originates is from the Raton and the Vermejo seams.

C. Chemical Usage

The permittee did not specify any chemicals for use in waters that may be discharged. On this basis, no chemicals are approved under this permit. Prior to use of any applicable chemical, the permittee must submit a request for approval that includes the most current Material Safety Data Sheet (MSDS) for that chemical. Until approved, use of any chemical in waters that may be discharged could result in a discharge of pollutants not authorized under the permit. Also see Part II.A.1. of the permit.

D. Wastewater Treatment Description

No treatment is provided of this discharge.

VI. PERFORMANCE HISTORY

A. Monitoring Data

1. Discharge Monitoring Reports – The following tables summarize the effluent data reported on the Discharge Monitoring Reports (DMRs) for the previous permit term, from March 2010 through September 2014.

Tables VI-1a through VI-1c – Summary of DMR Data for Permitted Features

<i>Table VI-1a: Outfall 005a</i>					
<i>Parameter</i>	<i># Samples or Reporting Periods</i>	<i>Reported Average Concentrations Avg/Min/Max</i>	<i>Reported Maximum Concentrations Avg/Min/Max</i>	<i>AD 2-Year Average Avg/Min/Max</i>	<i>Previous Avg/Max/AD Permit Limit</i>
<i>Effluent Flow (MGD)</i>	10	0.17/0.1/0.25	0.18/0.1/0.25		0.254/Report
<i>pH (su)</i>	10	8.6/8.5/9	8.6/8.5/9		6.5 - 9
<i>TSS, effluent (mg/l)</i>	10	0/<4/0	0/<4/0		30/45/
<i>Oil and Grease (mg/l)</i>	10	NA/NA/NA	0/0/0		NA/10/
<i>TDS (mg/l)</i>	10	840/770/941	840/770/941		Report/3500/
<i>Fe, TR (µg/l)</i>	10	654/2400	654/2400	560/609	Report/5000/Report
<i>B, Tot (mg/l)</i>	10	0.12/0.26	NA/NA/NA	0.11/0.14	Report/Report
<i>Chloride (mg/l)</i>	10	47/79	NA/NA/NA	46/49	370/56
<i>Calcium (mg/l)</i>	10	2.3/2.8	2.3/2.8		Report/Report/
<i>Magnesium (mg/l)</i>	10	0.34/0.44	0.34/0.44		Report/Report/
<i>Sodium (mg/l)</i>	10	372/410	372/410		Report/Report/
<i>SAR</i>	9	46/51	NA/NA/NA		50.6/Report/
<i>EC (dS/m)</i>	10	1.4/1.6	1.4/1.6		1.6/Report/
<i>WET, chronic</i>					
<i>pimephales lethality, Stat Diff</i>	3	//	100/100/100	//	NA
<i>pimephales lethality, IC25</i>	3	//	100/100/100	//	
<i>ceriodaphnia lethality, Stat Diff</i>	3	//	100/100/100	//	NA
<i>ceriodaphnia lethality, IC25</i>	3	//	81/79/82	//	
<i>pimephales toxicity, Stat Diff</i>	3	//	100/100/100	//	Report
<i>pimephales toxicity, IC25</i>	3	//	100/100/100	//	
<i>ceriodaphnia toxicity, Stat Diff</i>	3	//	83/75/100	//	Report
<i>ceriodaphnia toxicity, IC25</i>	3	//	68/57/77	//	

Table VI-1b: Outfall 241-A

<i>Parameter</i>	<i># Samples or Reporting Periods</i>	<i>Reported Average Concentrations Avg/Min/Max</i>	<i>Reported Maximum Concentrations Avg/Min/Max</i>	<i>AD 2-Year Average Avg/Min/Max</i>	<i>Previous Avg/Max/AD Permit Limit</i>
<i>Effluent Flow (MGD)</i>	21	0.022/0.01/0.026	0.022/0.012/0.026		0.026/Report
<i>pH (su)</i>	19	8.7/8.5/8.9	8.7/8.5/8.9		6.5 - 9
<i>TSS, effluent (mg/l)</i>	19	0/<4/0	0/<4/0		30/45/
<i>Oil and Grease (mg/l)</i>	3	NA/NA/NA	0/<4.7/0		NA/10/
<i>TDS (mg/l)</i>	19	699/660/750	702/660/800		Report/3500/
<i>Fe, TR (µg/l)</i>	19	251//830	238//600	227//270	Report/5000/Report
<i>B, Tot (mg/l)</i>	19	0.13//0.15	NA/NA/NA	0.13//0.14	Report/NA/Report
<i>Chloride (mg/l)</i>	19	15//18	15//18	14//16	370/NA/56
<i>Calcium (mg/l)</i>	21	1.8//2.1	1.8//2.5		Report/Report/
<i>Magnesium (mg/l)</i>	21	0.13/<0.1/0.19	0.13/<0.1/0.19		Report/Report/
<i>Sodium (mg/l)</i>	21	313//340	314//360		Report/Report/
<i>SAR</i>	21	41//44	42//45		44.3/Report/
<i>EC (dS/m)</i>	21	1.2//1.7	1.2//1.7		1.7/Report/
<i>WET, chronic</i>					
<i>pimephales lethality, Stat Diff</i>	4	//	100/100/100	//	NA
<i>pimephales lethality, IC25</i>	4	//	100/100/100	//	
<i>ceriodaphnia lethality, Stat Diff</i>	4	//	100/100/100	//	NA
<i>ceriodaphnia lethality, IC25</i>	4	//	83/79/88	//	
<i>pimephales toxicity, Stat Diff</i>	4	//	100/100/100	//	Report
<i>pimephales toxicity, IC25</i>	4	//	100/100/100	//	
<i>ceriodaphnia toxicity, Stat Diff</i>	4	//	81/50/100	//	Report
<i>ceriodaphnia toxicity, IC25</i>	4	//	59/36/81	//	

Table VI-1c: Outfall 245-A

Parameter	# Samples or Reporting Periods	Reported Average Concentrations Avg/Min/Max	Reported Maximum Concentrations Avg/Min/Max	AD 2-Year Average Avg/Min/Max	Previous Avg/Permit Limit
Effluent Flow (MGD)	21	0.11/0.04/0.18	0.11/0.04/0.18		0.181/Rep
pH (su)	19	8.5/8.4/8.8	8.6/8.4/8.8		6.5 - 9
TSS, effluent (mg/l)	19	0/<4/0	0/<4/0		30/45
Oil and Grease (mg/l)	3	NA/NA/NA	0/0/0		NA/10
TDS (mg/l)	19	845/800/981	845/800/981		Report/35
Fe, TR (µg/l)	17	547//1300	547//1300	534//690	Report/5000
B, Tot (mg/l)	17	0.15//0.23	NA/NA/NA	0.15//0.18	Report/NA/E
Chloride (mg/l)	18	47//94	NA/NA/NA	43//46	370/NA/
Calcium (mg/l)	21	2.3/2/2.8	2.2/0.24/2.8		Report/Rep
Magnesium (mg/l)	18	0.31//0.37	0.31//0.37		Report/Rep
Sodium (mg/l)	21	376//477	374//432		Report/Rep
SAR	25	47//59	NA/NA/NA		53.1/Repo
EC (dS/m)	21	1.4//1.7	1.4//1.7		1.7/Repo
WET, chronic					
pimephales lethality, Stat Diff	4	//	100/100/100	//	NA
pimephales lethality, IC25	4	//	100/100/100	//	NA
ceriodaphnia lethality, Stat Diff	4	//	100/100/100	//	NA
ceriodaphnia lethality, IC25	4	//	81/78/84	//	Report
pimephales toxicity, Stat Diff	4	//	100/100/100	//	Report
pimephales toxicity, IC25	4	//	100/100/100	//	Report
ceriodaphnia toxicity, Stat Diff	4	//	81/75/100	//	Report
ceriodaphnia toxicity, IC25	4	//	63/48/77	//	Report

2. Additional Data – The following table summarizes data submitted by the permittee as Special Sampling during the previous permit term. These data were to be used in conducting a reasonable potential analysis. Data was collected in August 2010.

Table VI-2a – Summary of Additional Data

Discharge Points	Total Recoverable Beryllium (mg/L) PQL = 0.01	Mercury (ng/L) PQL = 0.5 MDL = 0.2	Radium 226 (pCi/L)	Radium 228 (pCi/L)	Strontium 90 Results ± 2s /TPU	Thorium 230 (pCi/L)	Thorium 232 (pCi/L)
Guajatoyah Creek							
241A	<0.01	<0.2	0.16 U	1.3 U	3.2 U	0.2 U	0.1 U
Parras Canyon							
005A	<0.01	2.6	0.16 U	1.3 U	0.7 U	0.2 U	0.1 U
		field blank 0.2B					duplicate 0.1 U

Hg - Practical Quantifiable Limit (PQL) = 0.5, Method Detection Limit (MDL) = 0.2

"<" indicates analytical measurement was below the MDL

"B" values indicate analytical measurements that are not quantifiable but between the MDL and PQL

Be - Reporting Limit (RL or PQL) = 0.01

B. Compliance With Terms and Conditions of Previous Permit

1. Effluent Limitations –The data shown in the table indicate apparent compliance with the permit.

In accordance with 40 CFR Part 122.41(a), any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

VII. DISCUSSION OF EFFLUENT LIMITATIONS

A. Regulatory Basis for Limitations

1. Technology Based Limitations

- a. Federal Effluent Limitation Guidelines – The federal guidelines that apply to this type of facility are found under 40 CFR 435, titled *Oil and Gas Extraction Point Source Category*. The applicable ELGs are found in Section VIII of the WQA. These limitations will typically apply, unless a more stringent limitation, or an alternate limitation that would be protective of the limits shown below is applied.
- b. Regulation 62: Regulations for Effluent Limitations – These Regulations include effluent limitations that apply to all discharges of wastewater to State waters and are shown in Section VIII of the WQA. These regulations are applicable to the discharges.

2. Numeric Water Quality Standards - The WQA contains the evaluation of pollutants limited by water quality standards. The mass balance equation shown in Section VI of the WQA 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 the relevant parameters of concern is provided in Section VI of the Water Quality Assessment developed for this permitting action.

The maximum allowable pollutant concentrations determined as part of these calculations represent the calculated effluent limits that would be protective of water quality. These are also known as the water quality-based effluent limits (WQBELs). 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.

3. Narrative Water Quality 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.
 - a. Agricultural Use Protection –The WQA contains the evaluation of pollutants limited by narrative standards, and specifically sodium absorption ratio (SAR) and electrical conductivity (EC), as outlined by the Division’s Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops policy.

- b. Whole Effluent Toxicity - 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. The requirements for WET testing are being implemented in accordance with Division policy, Implementation of the Narrative Standard for Toxicity in Discharge Permits Using Whole Effluent Toxicity (Sept 30, 2010). Note that this policy has recently been updated and the permittee should refer to this document for additional information regarding WET.

4. Water Quality Regulations, Policies, and Guidance Documents

a. Antidegradation

For the Lorencito watershed (COARLA04b): Since the receiving water is Use Protected an antidegradation review is not required pursuant to Section 31.8(2)(b) of The Basic Standards and Methodologies for Surface Water.

For the Purgatoire River (COARLA05b): Since the receiving water is Undesignated an antidegradation review is required pursuant to Section 31.8(2)(b) of The Basic Standards and Methodologies for Surface Water. As set forth in Section VII of the WQA, 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 below, 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 VII of the WQA); (2) When applicable, the facility may select permit limits based on their non-impact limit (NIL); 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 ADBAC limits are imposed as two-year average limits.

- b. Antibacksliding – As the Lorencito Canyon and tributaries are designated Use-Protected, the antibacksliding requirements in Regulation 61.10 have been met.

As the Purgatoire River is designated Reviewable or Outstanding, and the Division has performed an antidegradation evaluation, in accordance with the Antidegradation Guidance, the antibacksliding requirements in Regulation 61.10 have been met.

- c. Determination of Total Maximum Daily Loads (TMDLs) – This stream segment is not on the State's 303(d) list, and therefore TMDLs do not apply.
- 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 facility design flow to the chronic low flow (30E3) is greater than 2:1 or if the ratio of the chronic low flow to the design flow is greater than 20:1.

Outfalls 005,241, 245

As Parras Canyon and the unnamed tributary to Guajatoyah Cree, are zero flow streams, no mixing study is required.

- 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. Because it may be anticipated that the limits for a parameter could not be met without treatment, and the treatment is not coincidental to the movement of water through the facility, limits may be included to assure that treatment is maintained.

A qualitative RP determination may also be made where a federal ELG exists for a parameter, and where the results of a quantitative analysis results in no RP. As the federal ELG is typically less stringent than a limitation based on the WQBELs, if the discharge was to contain concentrations at the ELG (above the WQBEL), the discharge may cause or contribute to an exceedance of a water quality standard.

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 an 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. A compliance schedule may be added to the permit to require the request of an RP analysis once the appropriate data have been collected.

For other parameters, effluent data may be available to conduct a quantitative analysis, and therefore an 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-1 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.

Table VII-1 – Quantitative Reasonable Potential Analysis

Outfall 005

Parameter	30-Day Average			Antideg (2 Year Roll. Ave)		
	MEPC	QBEL (MAPC)	Reasonable Potential	MEPC	ADBAC (MAPC)	Reasonable Potential
Fe, TR (µg/l)	4080	1000	Yes	609	363	Qualitative*
B, Tot (mg/l)	0.42	4	No	0.14	0.62	Qualitative*
Chloride (mg/l)	103	250	No	49	56	Qualitative*

* Not enough data points for Quantitative RP

Outfall 241

Parameter	30-Day Average			Antideg (2 Year Roll. Ave)		
	MEPC	QBEL (MAPC)	Reasonable Potential	MEPC	ADBAC (MAPC)	Reasonable Potential
Fe, TR (µg/l)	1079	1000	Yes	296	363	Monitor
B, Tot (mg/l)	0.17	4	No	0.15	0.62	No
Chloride (mg/l)	20	250	No	18	56	No

Outfall 245

Parameter	30-Day Average			Antideg (2 Year Roll. Ave)		
	MEPC	QBEL (MAPC)	Reasonable Potential	MEPC	ADBAC (MAPC)	Reasonable Potential
Fe, TR (µg/l)	1690	1000	Yes	828	363	Yes
B, Tot (mg/l)	0.28	4	No	0.22	0.62	No
Chloride (mg/l)	113	250	No	51	56	Monitor

B. Parameter Evaluation

*****PLEASE SEE THE RESPONSE TO COMMENTS FOR FURTHER DISCUSSION OF THE REASONABLE POTENTIAL EVALUATION SUBSEQUENT TO PUBLIC NOTICE**

Total Suspended Solids - The TSS concentrations in Reg 62 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 upon the effective date of this permit.

Total Dissolved Solids – The Division’s practice has been to include a TDS limitation of 3,500 mg/l where discharges are to surface waters that could be used for livestock (range cattle) watering. This TDS limit will be applied to all outfalls.

Oil and Grease –The oil and grease limitations from the Regulations for Effluent Limitations are applied as they are the most stringent limitations.

pH - This parameter is limited by the water quality standards of 6.5-9.0 s.u., as this range is more stringent than other applicable standards.

Table A- 15d Final Potential Limitations for West Spanish Peaks Outfalls for Parras Canyon/North Fork of the Purgatoire River¹ (COARLA05b): 005, 245 (From the Water Quality Assessment for reference for the reasonable potential analysis)			
<u>Effluent Parameter</u>	<u>Effluent Limitations Maximum Concentrations</u>		
	<u>30-Day Average</u>	<u>Daily Maximum</u>	<u>2-Year Average</u>
As, TR (µg/l) Until 12/31/2022	100	NA	NA
As, PD (µg/l)	NA	340	51
Cd, PD (µg/l)	0.58	2.4	
Cr+3, TR (µg/l)	NA	50	7.5
Cr+3, PD (µg/l)	104	NA	16
Cr+6, Dis (µg/l)	11	16	1.7
Cu, PD (µg/l)	13	20	2
Fe, TR (µg/l)	1000	NA	363
Pb, PD (µg/l)	3.9	101	0.59
Mn, PD (µg/l)	1892	3425	297
Mo, TR (µg/l)	160	NA	24
Hg, Tot (µg/l)	0.01	NA	0.0015
Ni, PD (µg/l)	74	664	11
Se, PD (µg/l)	4.6	18	0.88
Ag, PD (µg/l)	0.15	4.1	0.023
Zn, PD (µg/l)	176	242	35
B, Tot (mg/l)	4	NA	0.62
Chloride (mg/l)	250	NA	56 ²
Sulfide as H2S (mg/l)	0.002	NA	0.0003
Radium 226+228 (pCi/L)	5	NA	0.75
Strontium 90 (pCi/L)	8	NA	1.2
Thorium 230+232	60	NA	9

¹Downstream segment (COARLA05b) more restrictive, substituted that value

²Downstream segment (COARLA05b) has this parameter, not the immediate receiving stream

Table A- 15e			
Final Potential Limitations for West Spanish Peaks Outfalls for Unnamed Tributary to Guajatoyah Creek¹			
(COARLA05a): Outfall 241			
(From the Water Quality Assessment for reference for the reasonable potential analysis)			
<u>Effluent Parameter</u>	<u>Effluent Limitations Maximum Concentrations</u>		
	<u>30-Day Average</u>	<u>Daily Maximum</u>	<u>2-Year Average</u>
As, TR (µg/l) Until 12/31/2021	100	NA	NA
As, PD (µg/l)		340	51
Cd, PD (µg/l)	0.58	2.4	
Cr+3, TR (µg/l)		50	7.5
Cr+3, PD (µg/l)	104		16
Cr+6, Dis (µg/l)	11	16	1.7
Cu, PD (µg/l)	13	20	2
Fe, TR (µg/l)	1000		363
Pb, PD (µg/l)	3.9	101	0.59
Mn, PD (µg/l)	1892	3425	297
Mo, TR (µg/l)	160		24
Hg, Tot (µg/l)	0.01		0.0015
Ni, PD (µg/l)	74	664	11
Se, PD (µg/l)	4.6	18	0.88
Ag, PD (µg/l)	0.15	4.1	0.023
Zn, PD (µg/l)	176	242	35
B, Tot (mg/l)	4		0.62
Chloride (mg/l)	250		56 ¹
Sulfide as H ₂ S (mg/l)	0.002		0.0003
Radium 226+228 (pCi/L)	5		0.75
Strontium 90 (pCi/L)	8		1.2
Thorium 230+232	60		9

¹ADBEL based on the Alternatives Analysis

Total Arsenic – There is no current data available regarding the presence/absence or quantification of total arsenic in the discharge. In the previous permitting action, a one-time sampling event from March 2008 for dissolved arsenic was described (the outfalls discharging at that time). Results were either non-detect at a reporting limit of 1 ug/l, or were less than 2 ug/l . However, since the potential exists for this parameter to be present, and because no data in the proper form (total) is available, semi-annual monitoring has been added to the permit to gather data from these outfalls for a future RP analysis.

Dissolved Arsenic- There is no current data available regarding the presence/absence or quantification of this parameter in the discharge from the previous (current) permit term. In the previous permitting action, a one-time sampling event from March 2008 for dissolved arsenic was described (the outfalls discharging at that time). Results were either non-detect at a reporting limit of 1 ug/l, or were less than 2 ug/l . Because dissolved is a portion of ‘total’, and monitoring for total arsenic is included in the permit renewal, monitoring will be limited to the total recoverable form at this time.

Potentially Dissolved Cadmium – There is no current data available regarding the presence/absence or quantification of this parameter in the discharge from the previous (current) permit term. In the previous

permitting action, a one-time sampling event from March 2008 for total cadmium was described (the outfalls discharging at that time). Results were non-detect at a reporting limit of 1 ug/l. However, since the potential exists for this parameter to be present, and because no recent data is available, semi-annual monitoring has been added to the permit to gather data from these outfalls for a future RP analysis.

Total Recoverable and Potentially Dissolved Trivalent Chromium – There is no current data available regarding the presence/absence or quantification of this parameter in the discharge from the previous (current) permit term. In the previous permitting action, a one-time sampling event from March 2008 for total Cr+3 was described (the outfalls discharging at that time). Results were non-detect at a reporting limit of 20 ug/l and 10 ug/l. However, since the potential exists for this parameter to be present, and because no recent data is available, semi-annual monitoring has been added to the permit to gather data from these outfalls for a future RP analysis. Because dissolved is a portion of ‘total’, monitoring will be limited to the total recoverable form.

Dissolved Hexavalent Chromium – According to the Agency for Toxic Substances and Disease Registry, hexavalent chromium is produced by industrial processes. Activities authorized under this permit (subsurface gas extraction with no frac water) would not generate hexavalent chromium. A qualitative determination of no RP has been made and the evaluation for chromium is limited to the trivalent form.

Potentially Dissolved Copper – There is no current data available regarding the presence/absence or quantification of this parameter in the discharge from the previous (current) permit term. In the previous permitting action, a one-time sampling event from March 2008 for total copper was described (the outfalls discharging at that time). Results were non-detect at a reporting limit of 1 ug/l. However, since the potential exists for this parameter to be present, and because no recent data is available, semi-annual monitoring has been added to the permit to gather data from these outfalls for a future RP analysis.

Total Recoverable Iron : Note that an Alternatives Analysis was included as a part of the Response to Comments, which changed the reasonable potential for the antidegradation limitations. Please see Appendix C for a complete review of the Alternatives Analysis for this permit. This Alternatives Analysis does not impact the 30-day Average WQBEL reasonable potential analysis.

Permit No. CO-0048003	
Outfall	ADOPTED ADBEL
241	Report
005	920
245	690

The RP analysis for was based upon the WQBEL of 1,000 ug/l and the ADBAC of 363 ug/l as described in the WQA. This outfall reported on a quarterly basis and returned 10 DMR values. Two year average reporting was required for the previous permit. This reporting was required until the conclusion of the compliance schedule in the previous permit, which is July 1, 2015.

Outfall 005

With the available effluent data, the log-normal program was used to determine the appropriate statistics to determine the MEPC. The MEPC of 4080 was greater than the MAPC of 1000 and

therefore limitations are required. Therefore a 30-day average requirement has been added to the permit. Only one data point from several years ago in quarterly effluent exceeded 1,000 ug/l as follows;

09/30/2010	2400.
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However, this suggests that the permittee may not be able to consistently meet the WQBEL and **therefore a compliance schedule has been added to the permit. Interim limits are set to report for the 30 day average and 5000 ug/l for the daily maximum.**

For the ADBAC, a qualitative RP analysis was conducted as there was not enough data to conduct a quantitative RP analysis (3 calculations were available, 10 are needed), as this outfall did not discharge in 2013 and 2014. Nevertheless, a quantitative analysis is not needed as the 2- year rolling averages ranged from 471 ug/l to 609 ug/l, compared to the ADBAC of 363 ug/l. Therefore a qualitative determination of RP has been made and limitations will be added to the permit.

The 2 year rolling average maximum effluent concentrations for these outfalls is less than the WQBEL. Therefore, the WQBEL will not be protective of the necessary level of degradation and the ADBELs will be revised from 495 ug/l to the highest effluent value.

Outfall 245

With the available effluent data, the log-normal program was used to determine the appropriate statistics to determine the MEPC. The MEPC of 1690 was greater than the MAPC of 1000 and therefore limitations are required. Therefore a 30-day average requirement has been added to the permit. Considering the facility had one DMR results at 1300 ug/l, **the permittee may not be able to consistently meet the new limitation and therefore a compliance schedule has been added to the permit. Interim limits are set to report for the 30 day average and 5000 ug/l for the daily maximum.**

For the ADBAC, with the available effluent data, the normal program was used to determine the appropriate statistics to determine the MEPC. The MEPC of 828 was greater than the MAPC of 363 and therefore limitations are required. The 2 year rolling average maximum effluent concentrations for these outfalls is less than the WQBEL. Therefore, the WQBEL will not be protective of the necessary level of degradation and the ADBELs will be revised from 495 ug/l to the highest effluent value.

Outfall 241

With the available effluent data, the log-normal program was used to determine the appropriate statistics to determine the MEPC. The MEPC of 1079 was greater than the MAPC of 1000 and therefore limitations are required. Therefore a 30-day average requirement has been added to the permit. Effluent data indicates that the limitation can be met.

For the ADBAC, with the available effluent data, the log-normal program was used to determine the appropriate statistics to determine the MEPC. The MEPC of 297 was greater than the MAPC of 363 and therefore no limitations are required. However, the MEPC was greater than 50% of the MAPC and therefore monitoring is required.. Therefore a qualitative determination of RP has been made and monitoring will be added to the permit.

A 2 year rolling average requirement (quarterly) has been added to the permit as an interim requirement. Reporting for the 2 year rolling average will be based on the 23 months prior to the

effective date of the permit and the 30-day average effluent for the first month of the effective date of the permit (to equal 24 months), and so on. Please see the permit for additional details.

Boron

The RP analysis for was based upon the WQBEL of 4 mg/l and the ADBAC of 0.62 mg/l as described in the WQA.

WQBEL Outfalls 005, 241, 245 (All outfalls)

With the available effluent data, the log-normal or “normal” statistical program (depending on the outfall) was used to determine the appropriate statistics to determine the MEPCs. For all outfalls, the MEPCs were less than half of the MAPC, and therefore limitations for the 30-day average are not necessary at this time.

However, to ensure that data is available for a future RP analysis, because boron is a consistent parameter of concern across the basin, monitoring has been added to the permit.

ADBAC

Outfalls 241 and 245

With the available effluent data, the log-normal or “normal” statistical program (depending on the outfall) was used to determine the appropriate statistics to determine the MEPCs. For these outfalls, the MEPCs were less than half of the MAPC, and therefore limitations for the 30-day average are not necessary at this time.

Outfall 005

A qualitative RP analysis was conducted for this outfall as only 3 values for the ADBACs are available. A qualitative “no RP” determination was made as the ADBACs were less than half of the MAPC (highest value was 0.14 vs an ADBAC of 0.62), and the highest 30 day average was 0.25 ug/l. Therefore limitations are not necessary at this time.

However, to ensure that data is available for a future RP analysis, because boron is a consistent parameter of concern across the basin monitoring remains a permit requirement.

Note that the 2-year rolling average report tshould include the effluent from the previous permitting term during the first two years. Please see the permit for additional details.

Chloride

The RP analysis for was based upon the WQBEL of 250 mg/l and the ADBAC of 56 mg/l as described in the WQA.

WQBEL Outfalls 005, 241, 245

With the available effluent data, the “normal” statistical program was used to determine the appropriate statistics to determine the MEPCs. The MEPCs were all less than half of the MAPC of 1000, and therefore limitations for the 30-day average are not necessary at this time. However, since outfall 005 is subject to 2-year rolling average, and to ensure that data is available for a future RP analysis, quarterly monitoring will be included in the renewal permit.

ADBAC

Outfall 005

A qualitative RP analysis was conducted as there was not enough data to conduct a quantitative RP analysis. The 2- year rolling averages (2 data points) reached 49 compared to the ADBAC of 56 mg/l. Because this value remains close to the ADBAC, effluent values reached 72 mg/l (6/30/2010), a qualitative determination of RP has been made and a 2 year rolling average limitation will be added to the permit.

Based on 2 year rolling average effluent DMR data, the permittee is able to meet the ADBAC. Compliance with the 2 year rolling average will be based on the 23 months prior to the effective date of the permit and the 30-day average effluent for the first month of the effective date of the permit (to equal 24 months), and so on. Please see the permit for additional details regarding compliance with the ADBAC.

Outfall 241

With the available effluent data, the log-normal statistical program was used to determine the appropriate statistics to determine the MEPC. The MEPC of 18 was less than half of the MAPC of 56, and therefore limitations are not necessary at this time.

However, to ensure that data is available for a future RP analysis, because boron is a consistent parameter of concern across the basin monitoring remains a permit requirement. Reporting the 2 year rolling average will be based on the 23 months prior to the effective date of the permit and the 30-day average effluent for the first month of the effective date of the permit (to equal 24 months), and so on. Please see the permit for additional details.

Outfall 245

With the available effluent data, the log-normal statistical program was used to determine the appropriate statistics to determine the MEPC. The MEPC of 51 was greater than 50% of the MAPC of 56 and therefore monitoring is required. Therefore a 2 year rolling average report requirement (quarterly) has been added to the permit. Reporting for the 2 year rolling average will be based on the 23 months prior to the effective date of the permit and the 30-day average effluent for the first month of the effective date of the permit (to equal 24 months), and so on. Please see the permit for additional details.

Potentially Dissolved Lead- There is no current data available regarding the presence/absence or quantification of this parameter in the discharge from the previous (current) permit term. In the previous permitting action, a one-time sampling event from March 2008 for total lead was described (the outfalls discharging at that time). Results were non-detect at a reporting limit of 1 ug/l. However, since the potential exists for this parameter to be present, and because no recent data is available, semi-annual monitoring has been added to the permit to gather data from these outfalls for a future RP analysis.

Potentially Dissolved Manganese- There is no current data available regarding the presence/absence or quantification of this parameter in the discharge from the previous (current) permit term. In the previous permitting action, a one-time sampling event from March 2008 for dissolved manganese was described (the outfalls discharging at that time). Results for manganese were split between non-detect and detect, at a reporting limit of 10 ug/l (dissolved). However, since the potential exists for this parameter to be present, and because no recent data is available, semi-annual monitoring has been added to the permit to gather data from these outfalls for a future RP analysis.

Total Molybdenum -There is no data available regarding the presence/absence or quantification of this parameter in the discharge, and this parameter was added to the segment standards for this watershed in 2013. Molybdenum is a naturally occurring element and can be found in elevated concentrations in

groundwater. Coal bed methane activities have the potential to bring raw groundwater to the surface and therefore the character of the water discharge is unknown. Therefore, the potential exists for this parameter to be present and monitoring has been added to the permit.

Total Mercury- A qualitative RP analysis was conducted as there was not enough data to conduct a quantitative RP analysis. A total of 2 low-level samples were taken from outfalls 241 and 005 (August 2010). The sample from 241 was non-detect at a PQL of 0.2 ng/l. No limitations are required at this time. Outfall 005 had data at 2.6 ng/L (0.0026 ug/l) compared to a WQBEL of 0.01 ug/l. However, for the purposes of future reasonable potential determinations, and to ensure that water quality is appropriately characterized for each outfall, annual monitoring for total mercury (low-level) will remain in permit.

Potentially Dissolved Nickel- There is no current data available regarding the presence/absence or quantification of this parameter in the discharge from the previous (current) permit term. In the previous permitting action, a one-time sampling event from March 2008 for total nickel was described (the outfalls discharging at that time). Results for nickel were non-detect, at a reporting limit of 2 ug/l (total recoverable). However, since the potential exists for this parameter to be present, and because no recent data is available, semi-annual monitoring has been added to the permit to gather data from these outfalls for a future RP analysis.

Potentially Dissolved Selenium- There is no current data available regarding the presence/absence or quantification of this parameter in the discharge from the previous (current) permit term. In the previous permitting action, a one-time sampling event from March 2008 for total selenium was described (the outfalls discharging at that time). Results were non-detect, at a reporting limit of 1 ug/l (total recoverable). However, since the potential exists for this parameter to be present, and because no recent data is available, semi-annual monitoring has been added to the permit to gather data from these outfalls for a future RP analysis.

Potentially Dissolved Silver- There is no current data available regarding the presence/absence or quantification of this parameter in the discharge from the previous (current) permit term. In the previous permitting action, a one-time sampling event from March 2008 was described (the outfalls discharging at that time). Results were non-detect, at a reporting limit of 1 ug/l (total recoverable). Even though no recent data is available, results for potentially dissolved silver across the CBM fields (600 effluent data points), have no detected values. Thus, the division will no longer consider potentially dissolved silver as a parameter of concern and limitations and monitoring are not required.

Potentially Dissolved Zinc - There is no current data available regarding the presence/absence or quantification of this parameter in the discharge from the previous (current) permit term. In the previous permitting action, a one-time sampling event from March 2008 for total zinc was described (the outfalls discharging at that time). Results were non-detect, at a reporting limit of 10 ug/l (total recoverable). However, since the potential exists for this parameter to be present, and because no recent data is available, semi-annual monitoring has been added to the permit to gather data from these outfalls for a future RP analysis.

Sulfide as H₂S (mg/l) - There is no data available regarding the presence/absence or quantification of this parameter in the discharge. Since the potential exists for this parameter to be present, monitoring has been added to the permit.

Radium 226+228 (pCi/L) - A qualitative RP analysis was conducted as there was not enough data to conduct a quantitative RP analysis. 2 samples from 241 and 005 were analyzed for radium 266 and

radium 228 in August 2010 (see Table VI-2a for reference.) Both results were non-detect at 1.46 pCi/l, compared to the chronic WQBEL of 5 pCi/l and the ADBAC of 1.4 pCi/l. Therefore, no limitations are warranted at this time. However, monitoring will be required in order to obtain a more robust sample set for a quantitative reasonable potential analysis.

Strontium 90 (pCi/L) - A qualitative RP analysis was conducted as there was not enough data to conduct a quantitative RP analysis. 2 samples from 241 and 005 were analyzed in August 2010 (see Table VI-2a for reference.) Both results were non-detect The sample result was ‘non-detect’ at a PQL of 3 pCi/l, compared to the WQBEL of 8 pCi/l and the ADBAC of 2.3 pCi/l. Thus, because this sample is non-detect all samples through out the CBM field do not demonstrate RP, a qualitative determination of no RP has been made. No limitations or monitoring are required at this time.

Thorium 230+232- A qualitative RP analysis was conducted as there was not enough data to conduct a quantitative RP analysis. 2 samples from 241 and 005 were analyzed in August 2010 (see Table VI-2a for reference.) Both results were non-detect The sample result was ‘non-detect’ PQL of 0.2 pCi/l compared to the WQBEL of 60 pCi/l and the ADBAC of 17 pCi/l. Thus, because this sample is non-detect all samples through out the CBM field do not demonstrate RP, a qualitative determination of no RP has been made. No limitations or monitoring are required at this time.

Temperature: Based on the information presented in the WQA, these outfalls are exempt from the temperature requirements on Parras Canyon due to its ephemeral characteristics.

Electrical Conductivity (EC) – As discussed in the WQA and this fact sheet, the approach to assigning limitations for the outfalls of this facility was different than the typical process of calculating EC limitations. Instead, the EC limitations are set at the maximum recorded value for each individual outfall (note that outliers were removed from consideration.) The EC limitations will be the same as the previous permit.

Sodium Absorption Ratio (SAR), Adjusted SAR – As discussed in the WQA and this fact sheet, the approach to assigning limitations for the outfalls of this facility was different than the typical process of calculating SAR limitations. Instead, the SAR limitations are set at the 85th percentile with the LCL method used for compliance determinations.

Flow – In addition to limitations at each outfall for SAR and EC, flow limits for each outfall are necessary to ensure that the initial effluent discharge concentrations would be maintained. The flow limitations will be the same as the previous permit.

Whole Effluent Toxicity (WET) Testing – For all outfalls, chronic WET testing at 100% IWC has been determined to be applicable based on the instream waste concentrations calculated in the WQA. A zero flow stream has a 100% IWC, and Parras Canyon and the unnamed tributary to Guajatomah Creek is considered zero flow streams. Therefore, due to the facility type, expected pollutants, and previous WET test results, a determination of reasonable potential has been made and chronic WET testing is required.

The permittee should read the WET testing section of Part I of the permit carefully, as this information has been updated in accordance with the Division’s updated policy, Implementation of the Narrative Standard for Toxicity in Discharge Permits Using Whole Effluent Toxicity (Sept 30, 2010) . The permit outlines the test requirements and the required follow-up actions the permittee must take to resolve a toxicity incident. The permittee should also read the above mentioned policy which is available on the

Permit Section website. 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.

C. Parameter 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 total recoverable arsenic, the analysis may be performed using a graphite furnace, however, this method may produce erroneous results and may not be available to the permittee. Therefore, the total method of analysis will be specified instead of the total recoverable method.

Until recently there has not been an effective method for monitoring low-level total mercury concentrations in either the receiving stream or the facility effluent. To ensure that adequate data are gathered for future reasonable potential determinations and that data are consistent with Division initiatives for mercury, semi-annual effluent monitoring for total mercury at low-level detection methods will be required by the permit.

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 for these metals will be prescribed as the “potentially dissolved” form.

For total recoverable trivalent chromium, the regulations indicate that standard applies to the total of both the trivalent and hexavalent forms. Therefore, monitoring for total recoverable chromium will be required.

VIII. ADDITIONAL TERMS AND CONDITIONS

A. **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. For this facility, the frequencies in the permit are already extended to the maximum allowed frequency.

B. **Reporting**

1. Discharge Monitoring Report – The 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.A.2 of the permit. See the permit, Part I.D 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.

C. Signatory and Certification Requirements

Signatory and certification requirements for reports and submittals are discussed in Part I.D.6. of the permit.

D. Compliance Schedules

The following compliance schedules are included in the permit. See Part I.B of the permit for more information.

Total Recoverable Iron (Outfall 005A, 245A)

As discussed in Section VII, the above outfalls cannot consistently meet the new 2 year rolling average limitation of 363 ug/l. During the previous permit term, as discussed in Section III (Modification Request Iron Trading) the permittee was given until July 1, 2015 to meet the limitations of 1,805 ug/l and a 2 year rolling average of 150 ug/l. As also detailed in that section, the permittee identified strategies to meet the iron limitations, and selected an Iron Trading Offset approach. As discussed therein, an iron trading approach is not appropriate for this watershed and is not incorporated into this permit renewal. Thus, the Division has allocated the facility additional time to complete evaluations and implement strategies to meet the ADBAC.

As discussed in the Colorado WQCD Compliance Schedule Policy 2, the Division evaluates the appropriateness of compliance schedules for discharges that are not new on the basis of necessity. “Necessity” is determined on the basis of whether associated effluent limits can be met. In this case, as discussed above, limitations cannot be met for the majority of outfalls covered by this permitting action.

Once necessity has been determined, the Division evaluates the “appropriateness” of a compliance schedule. This evaluation includes whether the effluent limit is the same, more stringent, or less stringent than the previous effluent limit. The Division’s policy is that compliance schedules may be allowed for pollutants that were previously limited, but for which revised more stringent effluent limits are included in a renewal permit. Note that there is no specific regulatory prohibition against providing a compliance schedule for an effluent limit that is the same as, or even less stringent from the effluent limit in the previous permit. The appropriateness determination, in those circumstances, is based on a consideration of how much time has already been given to meet effluent limits under previous permitting actions, and a good faith effort to comply.

The facility has had since February 2010 to come into compliance with the previous final permit 2 year rolling average of 150 µg/l. The permittee has secured a consultant and has submitted numerous compliance schedule items that include research into options for obtaining compliance with the final limitations. Noting this, a compliance schedule which allows the permittee to select and install an alternate strategy to meet the TR iron limitations from alternatives identified in the 2010, 2011, and 2013 compliance schedule reports is appropriate.

Therefore, a compliance schedule of 24 months, **until July 1, 2017**, has been added to the permit for total recoverable iron. Note that interim milestones associated with this compliance schedule may be

more detailed and more frequent (scheduled at least every six months) to ensure that progress towards compliance is attained.

Whole Effluent Toxicity (Chronic)

The effluent limits for WET in the renewal permit are the same as the effluent limits in the current permit, and those limits have not yet gone into effect. Therefore, the consideration for WET in this renewal is whether an extension of the duration of the existing compliance schedule is appropriate, and if so how milestones should be specified.

The regulatory requirement is that compliance must result “as soon as possible”. In determining the specific milestones and duration of the compliance schedule, the Division intends to provide adequate time to conduct the sequence of actions needed thereby leading to compliance, while not providing more time than reasonably needed thus ensuring that the requirement of “as soon as possible” is met.

The WET monitoring frequency requirement in the current permit is annual, and in this case the milestones for the compliance schedule were specified through standard permit language that requires the permittee upon failure of a test to conduct a PTI/TIE or accelerated testing. The first annual WET monitoring results were due by March 28, 2011, and annually thereafter, and the submittal of those results each year triggered the response requirement. During this time, the permittee has conducted several preliminary toxicity investigations (PTI’s) to identify causes of chronic toxicity, but has not yet identified or implemented strategies to eliminate whole effluent toxicity in the effluent.

The results of these toxicity investigations identify Total Dissolved Solids (TDS) as the cause, and specifically sodium bicarbonate and bicarbonate.

Therefore, a compliance schedule of 18 months, **until July 1, 2017**, has been added to the permit for chronic WET limitations. Given that this extension of the duration makes the compliance period seven years, the Division determined that more detailed milestone and more frequent reporting on progress was appropriate for this renewal. Those have been specified in the permit.

Subsequent to Public Notice (Total Reoverable Iron and Chronic WET Testing)

The Division determined that an appropriate compliance schedule duration in this case is 24 months. This timeline provides time to design, install, and operate treatment for WET and iron. The treatment would not only need to remove the sodium bicarbonate (an identified toxicant) but also be removing iron for some outfalls where reductions are needed to comply with effluent limitations. The 24 month timeline was developed based on treatment options applicable in this case, including oxidation to remove iron, followed by settling and then membrane filtration to remove sodium bicarbonate for the portion of the discharge necessary to meet the WET limit. The permittee may also elect to implement underground injection in that timeline which they have indicated is their preferred option. Assuming that the permit will be effective July 1, 2015, the following compliance schedule is included in their permit:

1. By December 31, 2015, hire a professional engineering consultant to design the wastewater treatment processes or indicate that underground injection or other method will be implemented.
2. By July 1, 2016, initiate construction of the wastewater treatment processes or provide a progress update on actions taken to complete underground injection or other method selected by the permittee to comply with the effluent limitation.
3. By July 1, 2017, complete construction of wastewater treatment facility and have all waste streams treated by the wastewater treatment facility or complete underground injection or other method selected by the permittee to comply with the effluent limitation.

This will effectively extend the compliance dates in the current administratively extended permits by 24 months, and extends the compliance dates by six months over the timeline included in the draft of this renewal permit. This compliance schedule is considered “as soon as possible.”

The Division has modified this date from the public notice version of January 1, 2017.

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

F. 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, Regulation 32, 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.

IX. REFERENCES

- A. Colorado Department of Public Health and Environment, Water Quality Control Division Files, for Permit Number CO0048003.
- B. Basic Standards and Methodologies for Surface Water, Regulation No. 31, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective January 31, 2013.

- C. Classifications and Numeric Standards for Arkansas River Basin, Regulation No. 32, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective, June 30, 2015.
- D. Colorado Discharge Permit System Regulations, Regulation No. 61, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective effective January 30, 2015.
- E. Regulations for Effluent Limitations, Regulation No. 62, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective July 30, 2012.
- F. Colorado’s Section 303(d) List of Impaired Waters and Monitoring and Evaluation List, Regulation No 93, Colorado Department of Public Health and Environment, Water Quality Control Commission, effective March 30, 2012.
- G. 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.
- H. 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.
- I. Determination of the Requirement to Include Water Quality Standards-Based Limits in CDPS Permits Based on Reasonable Potential Procedural Guidance, Policy Number CW-1, Colorado Department of Public Health and Environment, Water Quality Control Division, effective November 18, 2013.
- J. The Colorado Mixing Zone Implementation Guidance, Colorado Department of Public Health and Environment, Water Quality Control Division, effective April 2002.
- K. 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.
- L. Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops, Water Quality Control Division Policy WQP-24, March 10, 2008.
- M. Implementing Narrative Standard for Toxicity in Discharge Permits Using Whole Effluent Toxicity (WET) Testing. Colorado Department of Public Health and Environment, Water Quality Control Division Policy Permits-1, September 30, 2010.
- N. Policy for Conducting Assessments for Implementation of Temperature Standards in Discharge Permits, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-23, effective July 3, 2008.
- O. Permit Compliance Schedules, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number CW-3, effective December 2, 2010.

X. PUBLIC NOTICE

The public notice period was from February 6, 2015 to April 6, 2015. Comments were received from a number of stakeholders, including, but not limited to; several citizens of Las Animas County, the U.S. Environmental Protection Agency, XTO, and Pioneer.

These comments and the associated Division responses are in Appendix C and are incorporated herein.

Lori Mulsoff
5/29/2015