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Ms. Mandy Mercer
Water Quality Control Division
Colorado Department of Public Health & Environment
4300 Cherry Creek Drive South
Denver, CO 80246-1530

November 20, 2019

RE: Conifer Metropolitan District—TDS Evaluation Report
COX-047392

Dear Ms. Mercer:

On behalf of the Conifer Metropolitan District, I am writing to respond to the Colorado Department of Public Health and Environment's Notice of Violation/Cease and Desist Order dated August 22, 2019. The NOV/CDO was issued because the district exceeded the 400 mg/L total dissolved solids limit in its groundwater discharge permit. The NOV/CDO requires the district to submit an engineering evaluation that addresses five different subject areas covering the status of the treatment facility and the potential compliance solutions. The content of this letter report addresses those items.

Summary of Recommended Compliance Improvements

For all the reasons discussed in the following pages, the district proposes to remedy the high levels of TDS in the wastewater effluent by taking the following actions.

- 1) Because all additional wastewater treatment possibilities are infeasible, the district will commence an effort to modify its water rights and augmentation plan to allow for the surface discharge of its effluent. Surface discharge could occur at the Conifer Sanitation Association discharge point, which is approved for up to 19,000 GPD, and at a new surface water discharge point which would need to be approved by the CDPHE. The new surface water discharge point would be in close proximity to the facility.
- 2) In addition, the district will explore the feasibility of acquiring additional water rights and well sites from neighboring property owners that would provide the district with additional water sources that contain lower TDS levels. If lower TDS water is obtained having TDS concentrations of less than 400 mg/L once blended with the existing wells, then CMD would recommence groundwater discharge activities in the District's recharge galleries.

Problem Statement

The Colorado Department of Public Health and Environment is applying a 400 mg/L TDS limit to all domestic wastewater groundwater discharge permits as they are renewed. The district was issued this limit when its permit,

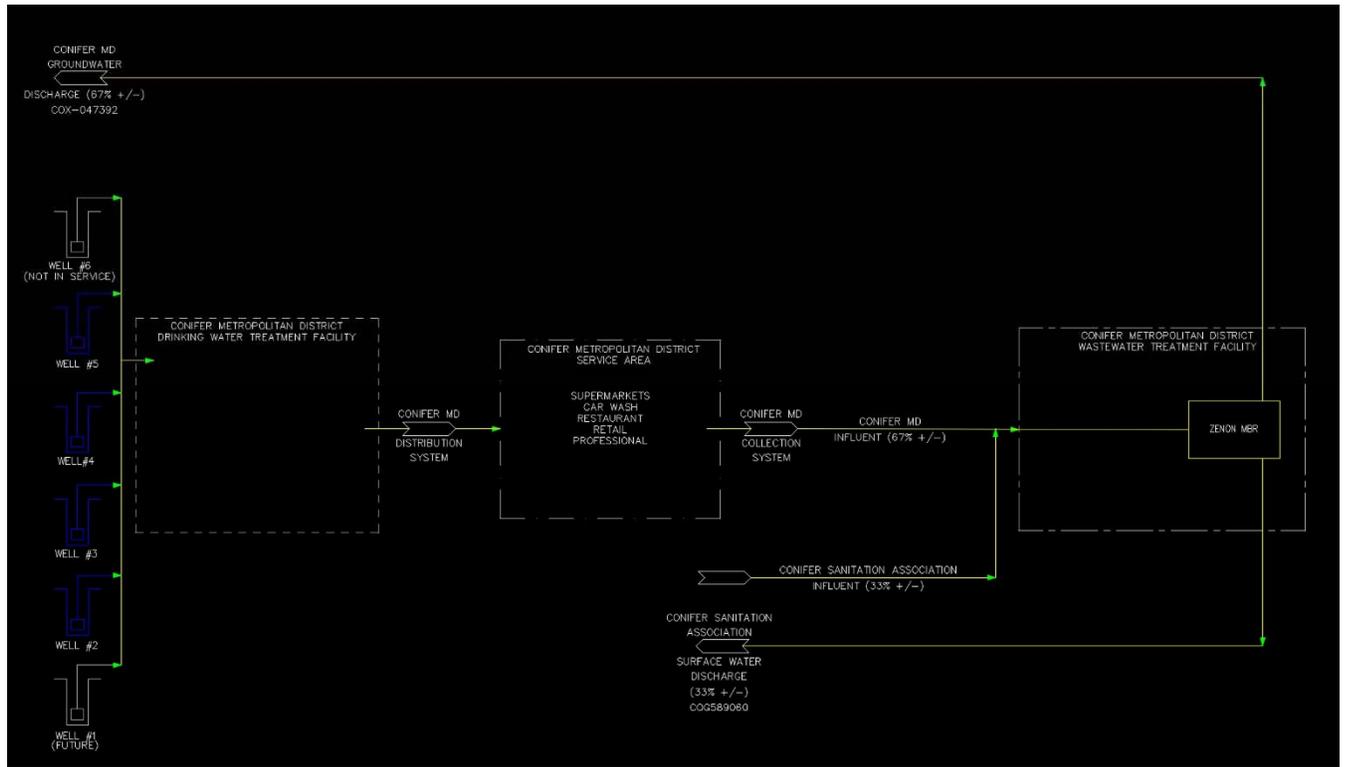
COX-047392, was renewed, which was effective February 1, 2014. The district began exceeding the TDS limit immediately after the effective date and it has never been able to meet the TDS effluent limit. The district received a Compliance Advisory on May 13, 2014, for exceeding the TDS limit in February 2014. Since the Compliance Advisory was issued, the district has been seeking remedies to the violations.

Maintaining compliance with the 400 mg/L TDS limit is a challenge for many domestic wastewater treatment facilities in Colorado. TDS levels are high in the water coming from the wells and removal cannot be achieved with current wastewater treatment technologies. The district's wastewater treatment facility features a membrane bioreactor process, which is regarded as an advanced form of wastewater treatment because of the ultrafilter barrier at the end of the treatment process. TDS enters in the influent, travels through the treatment process, and exits in the effluent without any reduction in concentration. Facilities, including Conifer MD, find it challenging to meet the TDS limit because the only treatment processes that can treat TDS, reverse osmosis and electrocoagulation, are expensive and challenging to implement.

The Conifer MD has extraordinary contributing factors that make meeting the TDS limit difficult:

- The drinking water/wastewater system was designed so wastewater effluent infiltrates into the ground and is pumped by the groundwater wells to the drinking water treatment system. TDS cycles in loop from the wastewater effluent, into the groundwater, to the drinking water treatment facility, to the service area, and back to the wastewater treatment facility.
 - Complex water rights agreements and limitations.
 - Limited availability of additional drinking water sources.
 - The district is positioned at the top of the hill and ambient groundwater is not diluted by lower TDS groundwater coming from offsite.
 - An agreement between the district and the Conifer Sanitation Association (CSA) to receive CSA's wastewater, treat the water, and return it to the association.
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Figure 1. Process Flow Diagram



An evaluation of the status of Conifer Metro District’s receivership.

Edward B. Cordes, Managing Director of Cordes & Company, was appointed by the Jefferson County District Court on June 6, 2016, (Case Number 2015CV32176) as the operating receiver for the Conifer Metropolitan District. Michael L. Staheli, also of Cordes & Company, was substituted in to replace Edward on August 22, 2019. The receiver is charged with taking physical possession, managing, operating, and protecting the district’s assets under the direction of the court. Mike Staheli acts both as the district’s manager by providing day-to-day administration of the district and as the district’s board of directors.

The receivership order remains active, with no plans to terminate it or transfer the district’s assets.

An evaluation of the facility’s service area, including the current and projected population and the current and projected wastewater contributors, was conducted.

The district’s wastewater treatment facility was designed and constructed as a regional facility. The facility was built and permitted for Phase I, with a treatment capacity of 43,500 gallons per day. The treatment building was

constructed to allow expansion to a total capacity of 250,000 GPD for Phase II and 350,000 GPD for Phase III by installing additional membrane bioreactor equipment into space already reserved in the building.

The growth, principally residential development that would drive expansion for Phases II and III, has not taken place. As such, only Phase I of the service area is served by the facility. Phase I includes a Safeway grocery store, Natural Grocers, retail space, dental office, fast casual restaurant, deli, full-service restaurant, performing arts theater, Starbucks, and Sonic. There are no residences currently served by the facility.

Figure 2. Aerial Image of Service Area



Quantifying the current population in terms of number of people cannot be calculated using the same method that was used to determine the population of residential communities. Estimating residential populations is accomplished by multiplying the number of homes by a factor of 2.7 people in each home. As the uses are only commercial, the number of people served by the facility varies depending upon the day of the week and the time of year. The EPA Envirofacts website says the district's drinking water treatment plant serves a population of 525. The drinking water enforcement order indicates 125 non-transients and 400 transients daily. If the Phase 1 capacity of the wastewater plant is divided by 80 gallons per day -- the typical use in a residential context--then the result is close to 525. There are differences, however, between a residential population of 525 people that spends longer at the properties and generates more wastewater than a commercial population of 525 that spends a

limited amount of time at the properties. It is likely that there are more than 525 people per day that will visit the commercial area at the Phase I buildout, but a larger number of commercial customers generates an equivalent to 525 residential customers.

The facility typically treats 10,000–20,000 GPD. There is capacity to add additional taps to the system without having to expand to Phase II. To the northwest of the District, Conifer Ridge Properties unsuccessfully attempted to rezone for 105 residential units in early 2019. Conifer Corners is south of the District and obtained approval of an official development plan for 75 townhomes. A separate development on the east side of the district, Foothills Housing, is in the conceptual planning phase for 329 residential units. The likelihood of the Foothills Housing project being built is uncertain.

Absent of any additional large residential projects coming online, future wastewater contributors would likely consist of new commercial uses within the existing service area. There is the capacity to add additional connections given the plant is loaded at less than 50% of hydraulic capacity.

An evaluation of alternative treatment technologies to address the elevated total dissolved solids concentrations in the facility's discharge was conducted.

There are a limited number of treatment technologies capable of removing TDS. Distillers work by heating small amounts of water to produce steam. Steam is then condensed back into water. Dissolved materials are left behind in the heating chamber. Distillers require frequent and rigorous cleaning, produce a “flat” water taste, and are expensive to operate. Distillers are not a practical solution. Deionization systems can remove TDS but are installed downstream of reverse osmosis treatment. Electrocoagulation is capable of removing TDS; however, its drawbacks are more substantial than reverse osmosis. The most workable treatment technology is reverse osmosis to meet the 400 mg/L effluent limit, however new effluents that would apply for an industrial discharge for the reverse osmosis concentrate make this solution not practical.

Reverse osmosis removes TDS by forcing water under pressure through a synthetic membrane. The membrane contains microscopic pores that only allow molecules smaller than 0.0001 microns to pass through. As the molecules of dissolved metals and salts are large compared to water molecules, water (permeate) squeezes through, leaving the metals and salts behind (concentrate). The permeate will have low levels of TDS, and the liquid stream can be directed to the district's groundwater discharge and remain in compliance with the effluent limit. The concentrate, with high levels of TDS, would be directed to the CSA's surface water discharge, which does not have a TDS limit.

The district has an agreement with the CSA to accept the CSA wastewater, treat it in the Conifer MD facility, and return the effluent to the CSA discharge. The district must return the same quantity of treated wastewater to CSA as the amount of sewage it receives, per the agreement and water rights.

Flow records from the district and the CSA were reviewed as part of this analysis. About 68% of the wastewater treated at the facility comes from the district. The remaining 32% comes from the CSA.

Table 1. Flow Calculations

			<u>YTD Proportion</u>
2019 YTD Conifer MD Effluent	2,064,820	Gallons Per Year	68%
2019 YTD CSA Effluent	969,700	Gallons Per Year	32%
Total Effluent Year to Date	3,034,520	Gallons Per Year	100%

254 days into 365 = 70% through the year

			<u>Project Annual Proportion</u>
Total Year 2019 Projected MD Effluent	2,684,266	Gallons Per Year	68%
Total Year 2019 Projected CSA Effluent	1,260,610	Gallons Per Year	32%
Total Year 2019 Projected Effluent	3,944,876	Gallons Per Year	100%

			<u>Daily Proportion</u>
2019 Conifer MD Effluent (Daily Average)	7,354	Gallons Per Day	68%
2019 CSA Effluent (Daily Average)	3,454	Gallons Per Day	32%
	10,808	Gallons Per Day	100%

The ratio of the amount of permeate to concentrate depends upon site-specific water quality parameters and the design of the reverse osmosis treatment equipment. A reverse osmosis equipment manufacturer looked at the composition of the wastewater effluent and determined the manufacturer could provide equipment that produces 87% permeate and 13% concentrate. This ratio would not be in compliance with the district's requirement to return 32% of the effluent back to CSA. The equipment supplier can provide reverse osmosis equipment with a lower recovery ratio of 67% permeate to 33% concentrate, which would be in compliance with the CSA agreement. In addition, per the district's augmentation plan, it has to send 95% of what it pumps from the groundwater wells to the recharge gallery discharge.

Reverse osmosis performance was projected for this application. The projections were based on a flow rate of 43,500 gallons per day, the permitted capacity of the WWTP. The instantaneous flow rate entering the reverse osmosis equipment would be 30 GPM. Flow leaving the equipment would consist of permeate at 20 GPM and concentrate at 10 GPM. The TDS concentration is projected to be 6 mg/L in the permeate and 2,800 mg/L in the concentrate. These concentrations would be in compliance with the groundwater discharge 400 mg/L limit and the surface water discharge, which does not have a TDS limit.

If the district were to install a reverse osmosis system, it would need to apply for a CDPHE site application amendment and design review approval. The engineer's opinion of probable costs to install reverse osmosis treatment is as follows:

Table 2. Engineer's Conceptual Opinion of Probable Costs

<u>Item</u>	<u>Cost</u>
Reverse Osmosis Treatment Equipment	\$100,000
Pump Station	\$50,000
Concrete/Piping/Building Modifications	\$20,000
Instrumentation & Controls	\$15,000
Installation	\$25,000
Electrical	\$10,000
Engineering (Design & Construction)	\$30,000
Contingency	\$25,000
Grand Total:	\$275,000

The CDPHE Permits Unit has informed the district that an industrial discharge permit will be required for the concentrate disposal at CSA's surface water discharge. An industrial discharge permit will have additional permit limits, specifically radionuclides and metals. Radionuclides, naturally occurring radioactive materials, are high in the Conifer area. The district tested Well #5 in 2017 and the sample had 62 pCi/L of adjusted gross alpha activity, 11.2 pCi/L of radium 226+228, and uranium of 22 ug/L. Because of the industrial permit limits, reverse osmosis treatment is not the preferred compliance solution.

An evaluation of all potential compliance solutions, including but not limited to consolidation with another treatment facility:

The district has looked at various compliance situations since the violations began accruing:

Discharge Permit Modification. The district submitted a discharge permit modification application on February 12, 2016. This application was denied because the CDPHE Permits Unit determined the district's wells are down-gradient from the WWTP. The down-gradient wells did not meet Regulation 41.5.B.5, which requires the wells contain background and/or up-gradient TDS concentrations.

Alternative Limit. The district inquired about submitting a request for an alternative discharge permit limit. CDPHE staff informed the district that the process is a civil one that is reviewed and approved by the Water Quality Control Commission. CDPHE staff expected vocal opposition for seeking relief through this process and, therefore, did not recommend submitting for relief through this process.

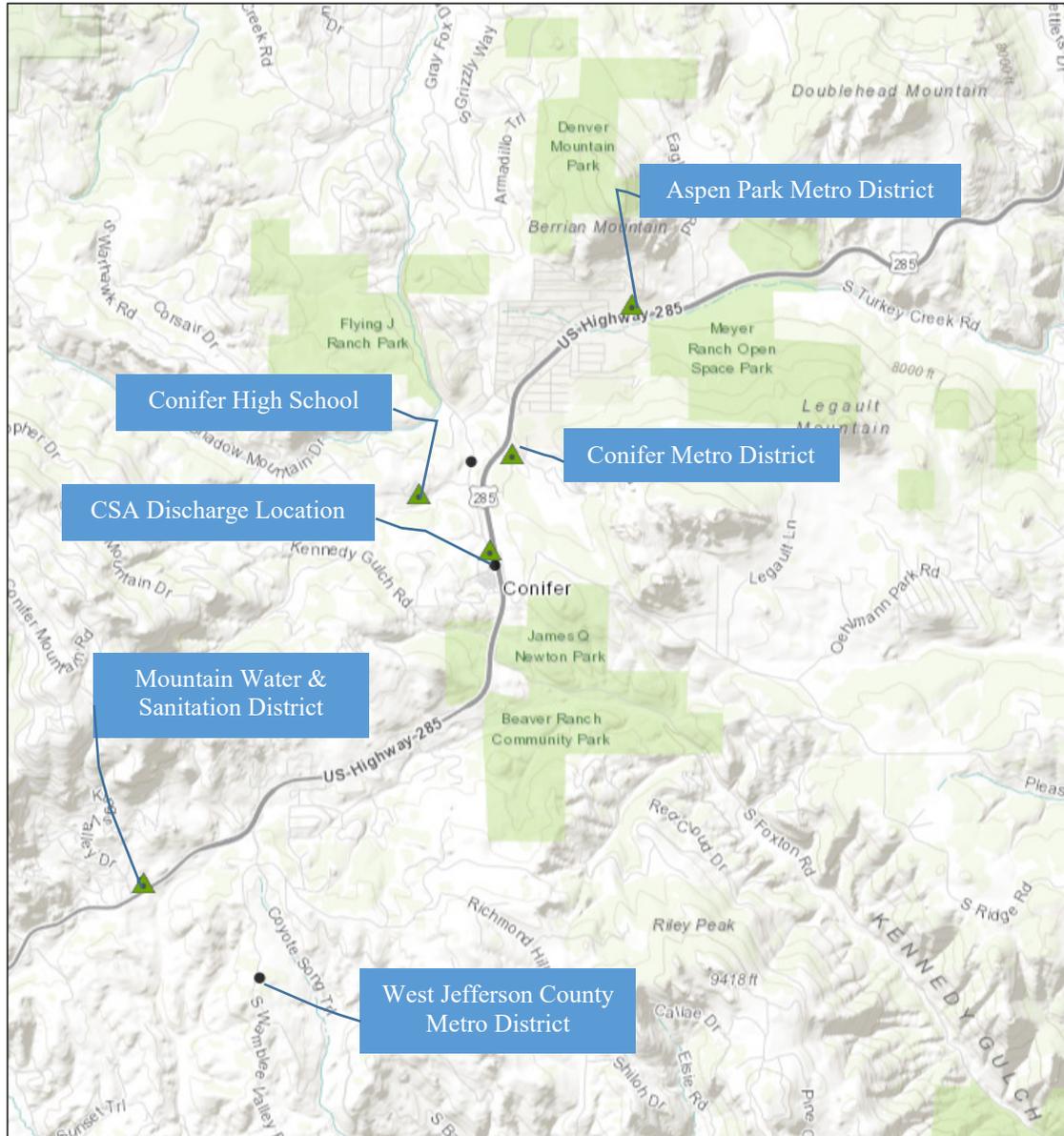
Switch Existing Groundwater Discharge Permit to a Surface Water Discharge Permit. Surface water discharge permits do not have TDS limits. Switching the type of discharge permit from groundwater to surface water is feasible and identified as one of the possible compliance solutions. Updates will be required to the district's water rights agreements for this option.

Increase Amount of Water Sent to CSA's Surface Water Discharge. The volume of effluent sent to CSA's surface water discharge is less than allowed in its permit. Increasing the amount of water the facility discharges to the CSA outfall is feasible and identified as one of the possible compliance solutions.

Consolidation with another System. The district looked at consolidating with other nearby districts. It is not feasible to connect to these systems because of the districts' water rights agreements; loss of the source of potable water, if the effluent drain field is relocated; cost to build the wastewater force main to the other facility; not returning water to locations required in water rights agreements; and the significant amount of upgrades that would be required at the other facility to accommodate the planned 350,000 gallons generated by the Conifer MD facility. The nearby locations include:

- Mountain Water & Sanitation District—this facility is 17,000 feet away and would require installing a force main parallel to Highway 285. The capacity of this facility is 100,000 GPD.
 - West Jefferson County Metro District—the capacity of this facility is 700,000 gallons and can receive flow exceeding more than 600,000 gallons. It is 18,000 feet away from the Conifer MD treatment facility.
 - Conifer High School—the capacity of this facility is 52,000 GPD. This facility is 7,000 feet away and would require a force main parallel to Highway 285 with crossings underneath the highway.
 - Aspen Park Metro District—the capacity of this facility is 25,000 GPD. It is about 2,000 feet away.
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Figure 3. Nearby Wastewater Treatment Facilities

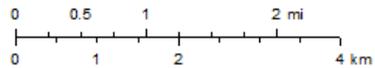


November 15, 2019

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-  Publicly Owned Treatment Works
-  Major WWTW
-  Minor WWTW



Sources: Esri, HERE, Garmin, Intermap, InCREMENT P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Obtain potable water with lower TDS. The TDS concentrations in the district's wells are high. There are several possible reasons for the elevated TDS, including a lack of household water (showers and sinks) to dilute the high TDS in urea, effluent being cycled from the WWTP to the WTP, and road salts coming from Highway 285 and the internal service roads.

Developing additional water sources that may have lower TDS is feasible and identified as one of the possible compliance solutions.

An evaluation of the facility's water rights, how the water rights might affect each treatment technology or compliance solution, and how any issues with water rights might be resolved to enable the facility to effectively and economically meet all effluent limitations are indicated below.

The water rights and availability of water will guide and limit the approach the district will take to maintain compliance. The report has discussed why some of the potential solutions cannot be implemented because of the associated water rights. The recommended compliance improvements consider water rights limitations and propose how they can be amended to achieve the compliance objectives.

Recommended Compliance Improvements

The district proposes a multistep process to return to and maintain compliance with the TDS effluent limit.

CSA's discharge permit (COG589060) does not have a TDS limit. The facility is permitted to discharge up to 19,000 GPD (30-day average) of effluent to the surface water outfall. The facility's 30-day average of wastewater effluent is less than 19,000 GPD. The district will amend its water rights to send all of its wastewater discharge to the CSA outfall, not to exceed the discharge permit's limit of 19,000 GPD. Amending the district's water rights is expected to take 1-2 years according to the district's water consultant. Discharging exclusively to the surface water location does not require any physical modifications to the facility or CDPHE approval and can begin immediately after the water rights are revised to allow this change.

The district will need additional sources of water as the population served grows and potentially from removing the groundwater well recharge achieved by discharging effluent to the infiltration gallery. The district will immediately work with neighboring property owners to seek new sources of water. The TDS concentrations in the neighboring properties will not be known until the wells are drilled. Most of these nearby properties are not in the geographic area where the facility's effluent cycles from the WWTP to the WTP; therefore it is possible that the TDS in those wells will be less than in the district's existing wells. If the TDS in the blended raw water from the new wells and existing wells is less than 400 mg/L, the district can discharge effluent according to the facility's groundwater discharge permit. Acquiring the water rights for the district to install wells in offsite locations will take a period of years and is being proposed as a longer term compliance solution.

In parallel to the efforts to send all the effluent to CSA's outfall and seeking additional raw water sources, the district will apply to switch its existing groundwater discharge permit (COX-047392) to a surface water discharge which would be installed near the facility, which will not have a TDS limit. Converting the type of discharge permit will require modifications to the district's water rights as well as the CDPHE's discharge permits. It is expected that it will take 1-2 years to modify the water rights and discharge permit.

The district's management and consultants would be pleased to review the proposed compliance solutions, either in person or on the phone, with the CDPHE to further develop the plan to return to and maintain compliance with the TDS effluent limit. The district is aware of the quarterly reporting submittals called for in Paragraph 24 of the NOC/C&D and will begin submitting those reports in December.

Please feel free to call me with any questions at (303) 477-5915.

Sincerely,

AQUAWORKS DBO, INC.



Adam Sommers, P.E.

cc. Michael Staheli, Cordes & Company
