

APPENDIX F

Concept Paper for Emergency Reuse of Wastewater Effluent

TCEQ February 8, 2013 Response Letter

**Concept Paper
for the
Emergency Reuse of Wastewater Effluent
as a
Source for Direct Potable Reuse in Wichita Falls**



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Executive Summary

The City of Wichita Falls is currently in the second year of an extended drought, which has depleted its source water reservoirs to approximately 40% of their storage capacity. The City of Wichita Falls anticipates that if significant rainfall is not forthcoming, that its source water reservoirs will continue to drop, triggering more advanced stages of its Drought Plan. The City of Wichita Falls' current drought plan has an established goal of 10 MGD maximum daily production when its source water lakes drop below 30% of their combined storage capacity.

In an effort to extend the use of these source water lakes to a point that they receive enough rainfall runoff to raise their levels, the City of Wichita Falls is seeking approval from the Texas Commission on Environmental Quality to utilize a portion of the City's Wastewater Effluent to augment its source waters for drinking water.

The City of Wichita Falls proposes to initially divert 7.5 MGD of its Wastewater Effluent to its Microfiltration/Reverse Osmosis Plant located within its Cypress Water Treatment Facility, and then blend the produced 5.0 MGD of RO Permeate with 5.0 MGD of raw lake water and treat that blend through one of the conventional plants at Cypress.

The City of Wichita Falls has performed extensive monitoring of its wastewater effluent and has calculated that it will be able to comply with all

existing Federal regulations governing surface water treatment, as well as additional requirements that the TCEQ has proposed. The primary focus will be those constituents that would cause problems with short-term (4 to 6 months) consumption of water, such as waterborne pathogens.

The City recognizes the importance of the Wastewater Effluent as a valuable resource that can be utilized in a variety of ways. To that end, the City is also developing a long-term strategy for the permanent reuse of its Wastewater Effluent.

In conclusion, the City of Wichita Falls believes that it has demonstrated through monitoring, calculation, and the development of operational plans that the Wastewater Effluent can be safely and effectively utilized as a source of water for the direct potable reuse for drinking water.

I. Statement of Problem

The Current Drought

The City of Wichita Falls utilizes 3 lakes (Lake Kickapoo, Lake Arrowhead, and Lake Kemp) as its primary sources of water. All 3 of these lakes have been adversely impacted by the drought that began in 2011 and persisted through 2012. (Figure 1 & Figure 2).

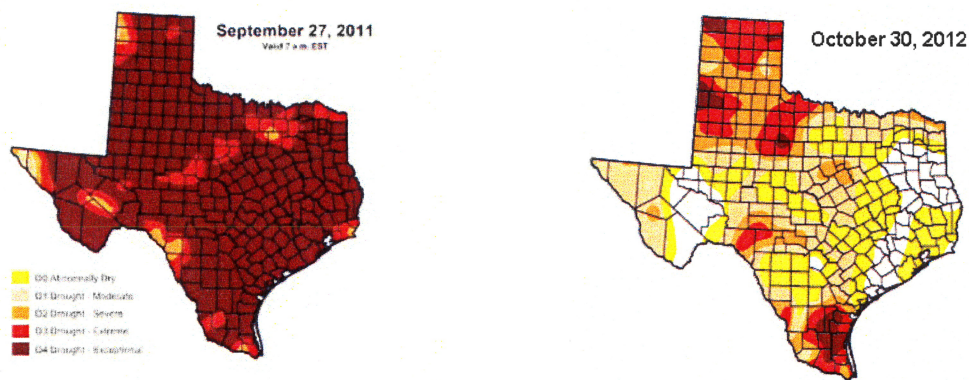


Figure 1: Overall Impact of Drought Throughout Texas

It can be seen that while the whole State of Texas was adversely impacted by the drought of 2011, recent rains have brought the vast majority of the State into a better condition by October 2012. Unfortunately, the Wichita Falls watersheds are still within the areas that are indicating Severe to Extreme Drought conditions as of October 30, 2012.

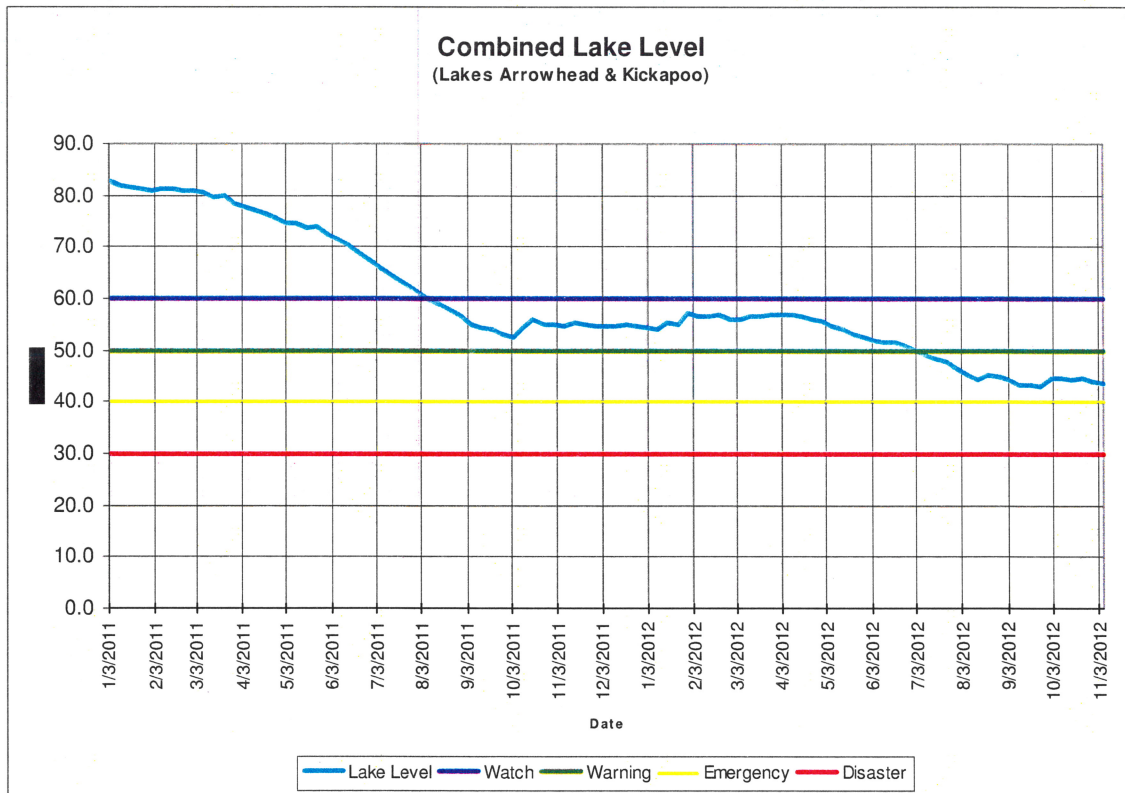


Figure 3: Wichita Falls Lake Combined Lake Levels (January 2011 to Present)

When Wichita Falls started the calendar year 2011, it had a combined lake level of 83.0 %. During the summer of 2011, Wichita Falls experienced over 100 days of temperatures over 100° F and high winds, all of which served to drop the combined lake levels to 55% by the end of the summer.

Wichita Falls started 2012 with a combined lake level of 54%. It did have what is considered an average summer as far as temperatures and rainfall but the combined lake level continued to decline and as of October 30, 2012 is at 43%.

As Wichita Falls attempts to predict the future of its water supplies for the next 6 – 12 months, it takes into account several sources of information. Of those, the two most important are presented below.

The U.S Seasonal Drought Outlook, provided by the National Oceanic & Atmospheric Administration (NOAA) is predicting that the drought throughout the North Central Texas region to persist or intensify through January 31, 2013 (Figure 3)

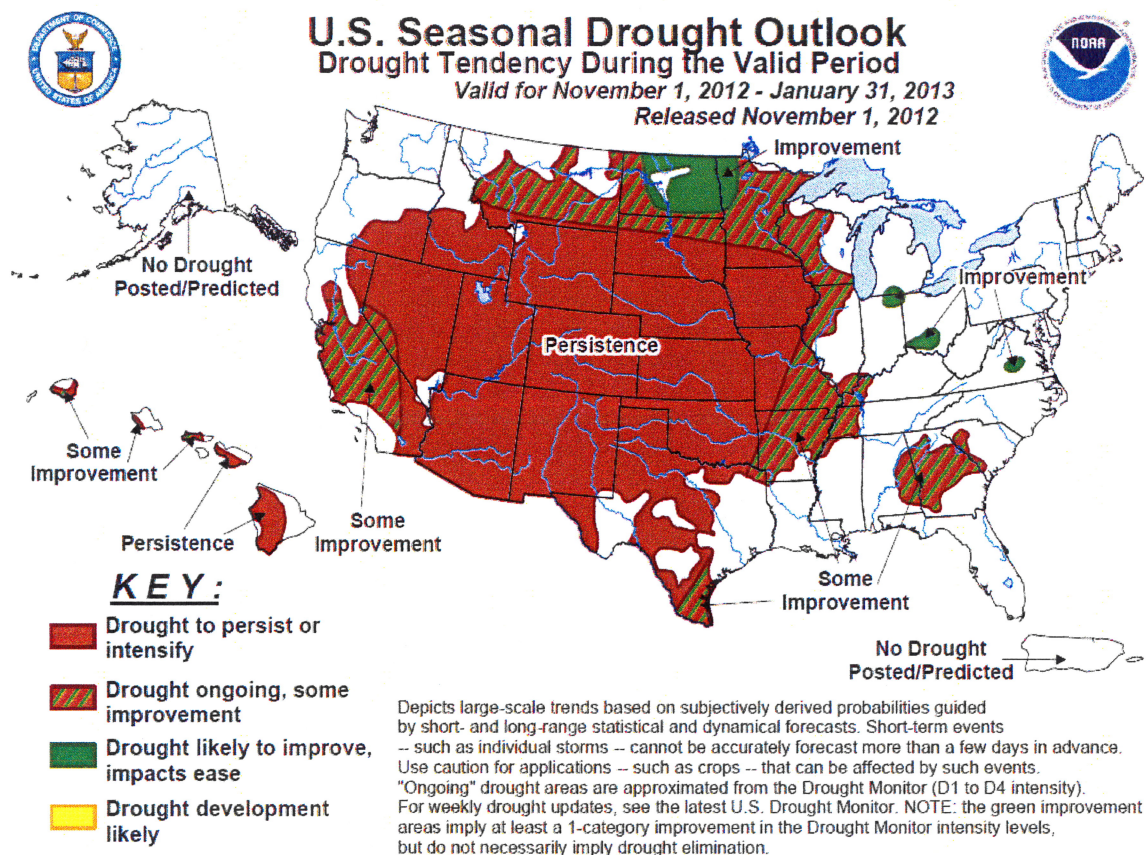


Figure 3: NOAA Drought Outlook through January 31, 2013.

The City of Wichita Falls is also projecting the lake level decline using data that provides for a worst case scenario for lake level decline (2011 Summer Data). This projection indicates that the City of Wichita Falls could trigger its Stage 3 Drought Emergency restrictions as soon as March 2013, followed by the declaration of a Stage 4 Drought Disaster as early as 3 months later, in June 2013. (Figure 4)

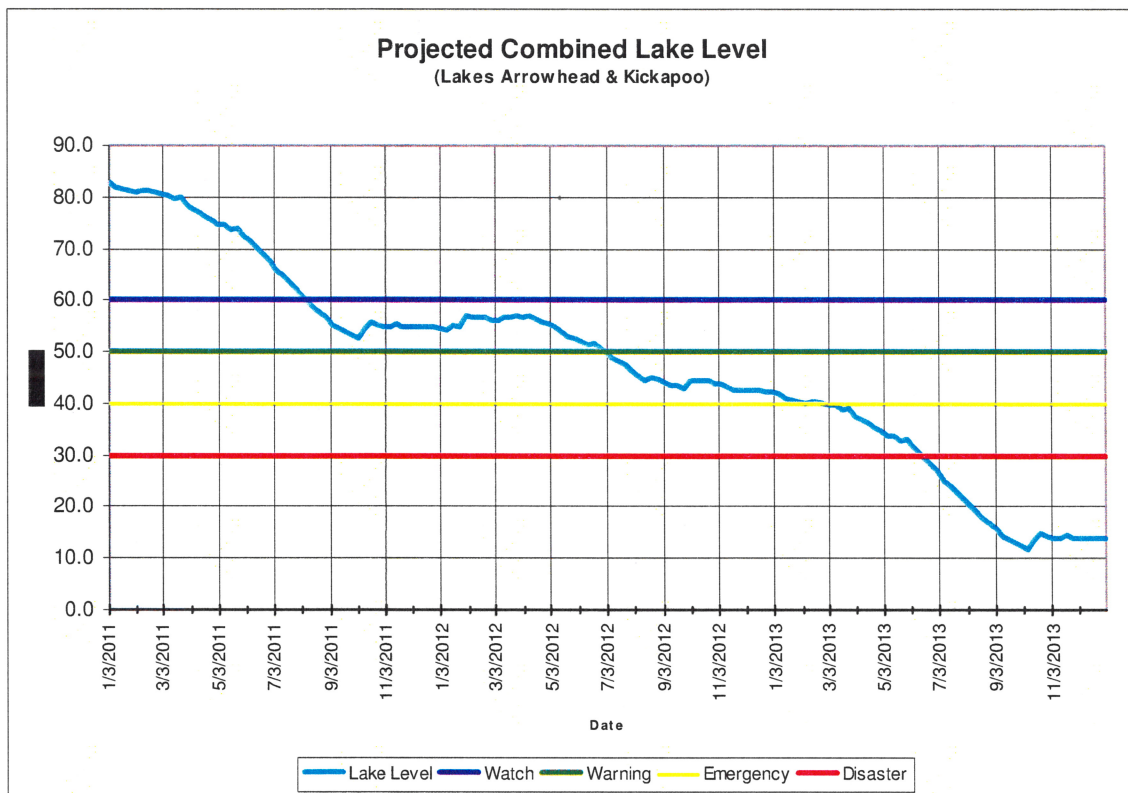


Figure 4: Wichita Falls Projected Lake Level Reduction

As Figure 4 demonstrates, without significant rainfall/runoff within the watershed boundaries of Lake Kickapoo and Lake Arrowhead the City of Wichita

Falls runs the risk of starting its 2013 Summer demand with a combined lake level of 30 % and rapidly declining into the teens before the end of the summer.

This situation not only poses a problem for the citizens of Wichita Falls and its wholesale potable water customers but also those communities that purchase raw water from the City of Wichita Falls. Several of them rely on the sources from Lake Kickapoo and Lake Arrowhead as a backup supply for their smaller sources of water. If these two lakes are not reinforced against a steep decline in their levels, then the City's of Archer City, Olney, Henrietta, and Windthorst run the very real risk of not having any drinking water at all.

Water Conservation / Drought Contingency

The City of Wichita Falls conducted a major revision of its Water Conservation / Drought Contingency Plan in 2008. It raised the trigger levels of the first 3 drought triggers by 10% (triggering them earlier than in the past) and created a new 4th trigger, Stage 4 Drought Disaster.

Wichita Falls triggered its Stage 1 Drought Watch during the summer of 2011. An aggressive conservation Public Education Program was launched, bringing to bear all resources that the City had at its disposal to get the word out to the public.

Within a year, the City triggered its Stage 2 Drought Warning (June 2011). During this stage, the City started issuing water violation citations that had substantial fines associated with them. To date, the City has issued just under

1300 water violation citations. In addition to the citations, the City implemented its surcharging program.

In anticipation of triggering its Stage 3 Drought Emergency, the City of Wichita Falls has coordinated with its Water Resources Committee on the further development of the Stage 3 restrictions, which encompass further restrictions of outside irrigation, increased surcharges, and the restriction of certain industries.

The Stage 4 Drought Disaster is the most restrictive of all the Drought stages in the City's Drought Plan. The stated production goal in the Stage 4 Drought Disaster is a maximum of 10 MGD. This value was derived from the demand flows that are exhibited in the months of January and February, i.e. the flows that are necessary to maintain health, sanitation, and safety of the citizens. The City anticipates that the Public Education message at this stage will be, "If you don't do it in January, Don't do it in July."

The Proposal

If the City's lake levels decline to predicted levels, then the City of Wichita Falls would enter the high demand / evaporation summer months of 2013 with dwindling raw water sources. The City, in an effort to continue to supply drinking water and by extension protect the public health, the City of Wichita Falls is seeking to augment its supply of source water to help see it through the high demand / evaporation summer of 2013.

After considering several options and the timing to achieve them, the City of Wichita Falls proposes to begin utilizing its Wastewater Effluent to augment its

supply of raw source water when it reaches a combined lake level of 30% or less (Stage 4 Drought Disaster declaration). The City is requesting that of the 10 MGD production goal established in its Stage 4 Drought Disaster, that 5 MGD (50%) of that total be Wastewater Effluent.

The City of Wichita Falls proposes to lay a temporary pipeline from its River Road Wastewater Treatment Plant (RRWWTP) to the Cypress Water Treatment Facility. There, it would treat the Wastewater Effluent through the existing Microfiltration/ Reverse Osmosis Plant. The RO Permeate would then be blended with raw lake water, at a 1:1 ratio, and treated through one of its conventional plants at Cypress.

The City anticipates that once the combined lake levels increased to a level that was over 40%, it would cease the use of its Wastewater Effluent under this Emergency configuration.

II. Conceptual Design

Introduction

As stated previously, the City of Wichita Falls proposes to bring the wastewater effluent from the River Road Wastewater Treatment Plant (RRWWTP) to the Cypress Water Treatment Facility. The water would be disinfected using Chloramines down the entire length of the pipeline.

Once at Cypress, the Wastewater Effluent would be treated first through the existing Microfiltration/ Reverse Osmosis Plant. This preliminary processing would entail:

- ◆ Treatment through the Microfiltration / Reverse Osmosis Clarifier with Chloramines and Ferric Sulfate
- ◆ Clarifier Supernatant passed through MF
- ◆ MF Permeate dechlorinated with Sodium Bisulfite and Stored in a Break Tank
- ◆ From the Break Tank the water is pumped through the Reverse Osmosis process.

The RO Permeate would then be placed in an existing Backwash Water Lagoon, where it can be blended with filter backwash water from the conventional plants at Cypress.

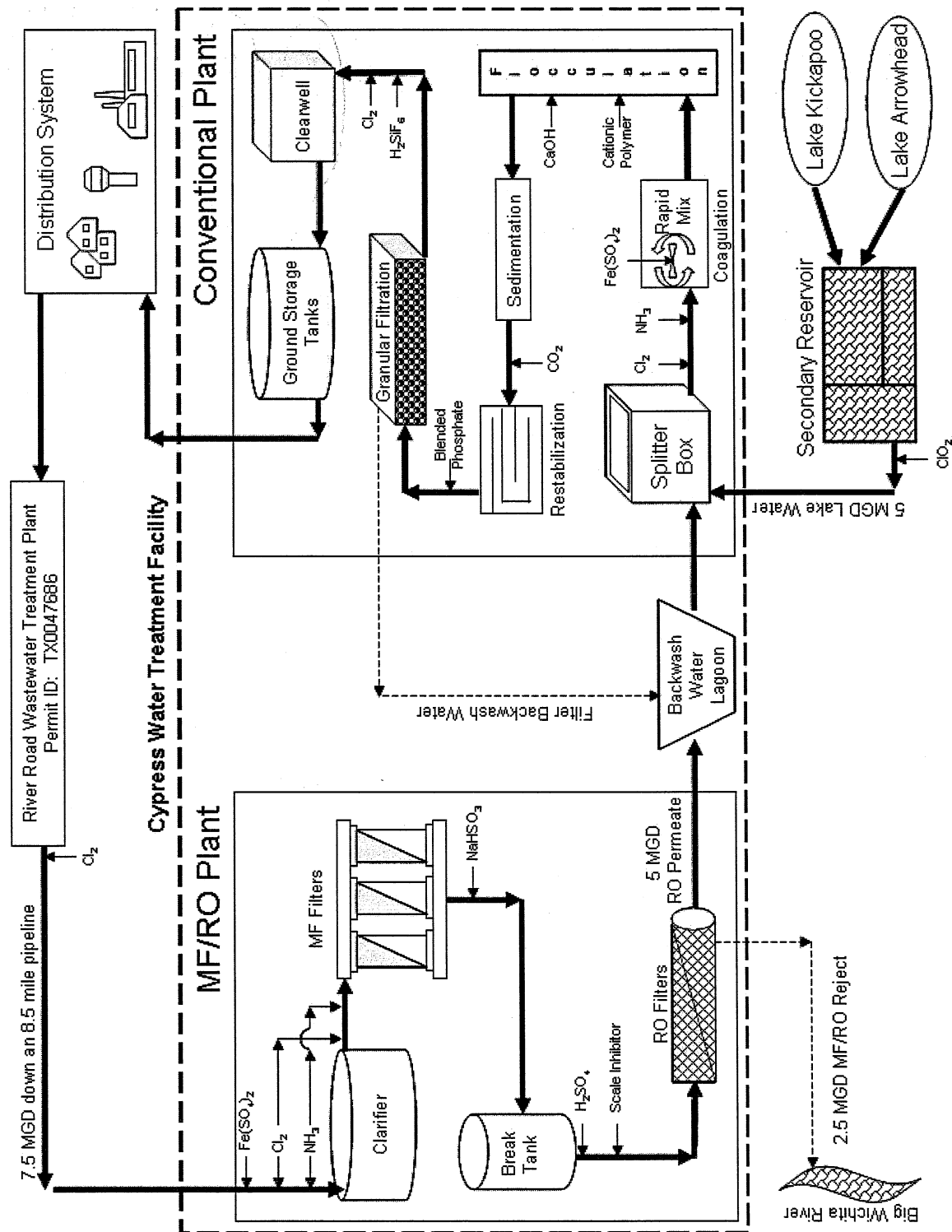
The water from the Backwash Water Lagoon would then be pumped to the Raw Water Splitter Box and blended with raw lake water before it is sent to the Conventional Plants for treatment. The City anticipates a 1:1 blending ratio.

The Conventional Treatment at Cypress consists of the following process:

- ◆ Disinfection with Chloramines starting at the Splitter Box
- ◆ Coagulation with Ferric Sulfate and Mechanical Rapid Mixing
- ◆ Flocculation with the addition of Cationic Polymer for Bridging and Calcium Hydroxide for Lime Softening.
- ◆ Sedimentation
- ◆ Restablization with Carbon Dioxide and the addition of a Blended Phosphate
- ◆ Filtration through Granular Media
- ◆ Storage in a Clearwell with the addition of Chloramines for Post-Disinfection and Hydrofluosilicic Acid for Fluoridation.

At this point, the water is stored in Ground Storage Tanks totaling 18 MG in capacity before it is pumped into the Distribution System.

A Flow Diagram of this conceptual design is provided below.



Issues

The use of Wastewater Effluent as a source of drinking water comes with some inherent risk, associated with the fact that the water has come into intimate contact with human fecal waste. Those risks can either be microbial, chemical, or radiological; and they can either cause problems with an acute exposure or require long-term, chronic exposure.

Since the City of Wichita Falls is only seeking to utilize this source on an Emergency basis, thereby requiring only a short duration of use (potentially 4 to 6 months), the City of Wichita Falls is particularly interested in eliminating those contaminants that would pose a threat upon an acute exposure in the drinking water. Examples of those contaminants would include:

- Microbials, such as Giardia, Cryptosporidium, and Viruses that would cause acute waterborne diseases
- Inorganics, such as Nitrate that would cause acute Methemoglobinemia,
- Organic Disinfection By-Products that would cause acute Neural Tube Defects in fetuses

The City has been analyzing the Wastewater Effluent for nearly a year for a parallel project (Permanent Wastewater Reuse) and feels that it has a very good understanding of the contaminants and their concentrations that would be present in the wastewater effluent stream (see Appendix A). The City of Wichita Falls is taking all of this data into consideration in this project, as it relates to the

degree of treatment that would be necessary to bring the Wastewater Effluent to drinking water standards.

Microbial

During preliminary discussions with the TCEQ, it has been stated that the TCEQ would seek the following levels of treatment to ensure that the public health was protected from certain microbial contaminants:

- ◆ 8 – log removal of Viruses
- ◆ 6 – log removal of Giardia cysts
- ◆ 5.5 – log removal of Cryptosporidium oocysts

The City of Wichita Falls has calculated the removal credits that could be expected through the existing treatment processes. In making these calculations, the City used the credits for removal that are allowed through existing Surface Water Treatment Rules, as well as Disinfection credit (CT) spreadsheets and other documentation that states approved removal credits from the TCEQ. The City of Wichita Falls has compiled all of this information into tables and requests the TCEQ approval of the cumulative credits.

Viruses (Need 8 – log Total)

Process	Agent		Log Removal
Pipeline from RRWWTP	Total Chlorine	30° C	4.27 ¹
		7° C	0.85 ¹
MF/RO Clarifier	Total Chlorine	30° C	7.76 ¹
		7° C	1.54 ¹
Microfilters	Total Chlorine	30° C	0.06 ¹
		7° C	0.01 ¹
Microfiltration	Physical Removal		2.0 ²
Reverse Osmosis	Physical Removal		0.0
Conventional Plant	Total Chlorine	30° C	27.5 ¹
		7° C	5.3 ¹
Conventional Plant	Physical Removal		2.0 ³
	Total	30° C	43.59
	Total	7° C	11.7

1 Calculated using the TCEQ software for CT calculations.

2 Applied based on TCEQ Letter dated April 30, 2012 from Ada Lichaa

3 Applied based on demonstration of Turbidity levels in accordance with Surface Water Treatment Rule

Giardia (Need 6 – log Total)

Process	Agent		Log Removal
Pipeline from RRWWTP	Total Chlorine	30° C	1.24 ¹
		7° C	0.47 ¹
MF/RO Clarifier	Total Chlorine	30° C	2.26 ¹
		7° C	0.86 ¹
Microfilters	Total Chlorine	30° C	0.02 ¹
		7° C	0.01 ¹
Microfiltration	Physical Removal		3.0 ²
Reverse Osmosis	Physical Removal		0.0
Conventional Plant	Total Chlorine	30° C	8.0 ¹
		7° C	3.0 ¹
Conventional Plant	Physical Removal		2.5 ³
	Total	30° C	17.02
	Total	7° C	9.84

1 Calculated using the TCEQ software for CT calculations.

2 Applied based on TCEQ Letter dated April 30, 2012 from Ada Lichaa

3 Applied based on demonstration of Turbidity levels in accordance with Surface Water Treatment Rule

Cryptosporidium (Need 5.5 – log Total)

Process	Agent		Log Removal
Pipeline from RRWWTP	Total Chlorine	30° C	0
		7° C	0
MF/RO Clarifier	Total Chlorine	30° C	0
		7° C	0
Microfilters	Total Chlorine	30° C	0
		7° C	0
Microfiltration	Physical Removal		2.0 ¹
Reverse Osmosis	Physical Removal		0.0
Conventional Plant	Total Chlorine	30° C	0
		7° C	0
Conventional Plant	Physical Removal		4.0 ²
	Total	30° C	6.0
	Total	7° C	6.0

1 Applied based on TCEQ Letter dated April 30, 2012 from Ada Lichaa

2 Applied based on demonstration of Turbidity levels in accordance with LT2 Enhanced Surface Water Treatment Rule (3-log plus additional 1.0 log for IFE and CFE credits for turbidities below 0.15 NTU 95% of the month)

Chemical

The City's analysis of the Wastewater Effluent (Appendix A) has indicated that several constituents will need to be addressed to bring this source into drinking water standards. Those constituents are pH, Chlorides, Nitrates and the Disinfection By-Products (Total Trihalomethanes and Haloacetic Acid 5's). Below is a synopsis of how the City of Wichita Falls plans on dealing with each of these constituents.

pH

The Wastewater Effluent has exhibited a pH of below 7.0. The City of Wichita Falls utilizes a Lime Softening process within its Conventional Treatment

Plant. This process will enable the City to bring the pH back to an acceptable level before it is used as drinking water.

Chloride

The Wastewater Effluent has an average Chloride (388 ppm) that is slightly over the Secondary Limit of 300 ppm for drinking water. The City's Reverse Osmosis plant is expected to reduce this amount by 90%, which would lower the RO Permeate to approximately 39 ppm. Blending the RO Permeate with the existing source water would help reduce the Chloride concentrations in the lake water which are expected to be elevated due to the continued drought.

Nitrate

It is anticipated that the City will accomplish approximately 70% to 90% reduction in Nitrate through its Reverse Osmosis process, with additional reduction being accomplished through blending with the raw lake water prior to conventional treatment. If the average amount of Nitrate that can be expected is 80 ppm, and an average reduction of 80% through the RO process, that would yield a Nitrate concentration of 16 ppm in the RO Permeate. If the RO permeate is blended with the existing Source water at a 1:1 ratio, then it can be expected that the 16 ppm will be further reduced to 8.0 ppm, which is below the regulatory MCL of 10.0 ppm. The City will continue to evaluate the current RO's performance in removing this constituent and apply that removal efficiency to future reports.

Disinfection By-Products

With an average Total Trihalomethane concentration of 106 ppb and an average Haloacetic Acid concentration of 68 ppb in the Wastewater Effluent, these concentrations will have to be reduced to comply with the Drinking Water regulations of 80 ppb and 60 ppb, respectively for TTHM and HAA5.

The City of Wichita Falls anticipates a low removal rate of TTHM & HAA5 through the Reverse Osmosis plant, on the order of 30% - 60%. Using an average removal rate of 50%, this would yield 53 ppb for TTHM and 34 ppb for HAA5 in the RO Permeate. Further blending with the existing Source Water in a 1:1 ratio would further reduce the TTHM value to 27 ppb and the HAA5 to 17 ppb. It is expected that the conventional disinfection process using Chloramines will add back to those concentrations an additional 20 ppb and 28 ppb, for TTHM and HAA5, respectively. That would yield a final TTHM concentration in the drinking water of 47.0 ppb, which is below the regulatory MCL of 80 ppb; and, 45 ppb for the HAA5's, which is below the regulatory MCL of 60ppb. The City will continue to evaluate the current RO's performance in removing these constituents and apply that removal efficiency to future reports.

Unregulated / Emerging Contaminants

Because the Unregulated / Emerging contaminants were an unknown, the City has submitted samples to laboratories to shed light on these constituents. Please refer to Appendix B for the average concentrations of those unregulated /

emerging contaminants that the City has detected, to date. As more data becomes available, the City will update this Table.

The City plans on evaluating these constituents using methodologies established by the Water Industry, the EPA and the State of California in an attempt to determine if there are any concerns with these levels of constituents in the source water, as well as their removal through the Reverse Osmosis plant.

The City would like to note that concomitant sampling of the City's source water lakes and its Tap water have found many of the same constituents already existing in these waters (see footnotes in Appendix B).

Operations and Monitoring

The City recognizes that the Wastewater Effluent is derived from a source that has had direct contact with human waste, and therefore has already begun to develop the Operational & Monitoring procedures that it feels would be necessary to implement a successful program and ensure the public's health.

The City currently has an established Water Quality Task Force that is comprised of members from the Public Works/Public Utilities staff and the Health Department. This group has established triggers that would activate a meeting and investigation by the Task Force.

On the Public Utilities side, triggers include but are not limited to;

- ◆ Failure of the Disinfection Process or Bacteriological Testing
- ◆ Failure of the Turbidity MCL

On the Health Department side, triggers include but are not limited to;

- ◆ Epidemiological increase of waterborne disease

Additionally, the Utilities Divisions of Water Purification and Wastewater Treatment have developed protocols for the monitoring of the entire treatment system. Those protocols include triggers that would shutdown the use of the wastewater effluent in the event that there was something of operational concern.

On the Wastewater side, shutdown triggers include:

- ◆ Failure in the Aeration Basins or Finals.
 - a) A low Dissolved Oxygen level for more than two hours in two or more Basins.
 - b) Rake failures in the Finals causing an increase in solids going over the weirs.
- ◆ A high dissolved oxygen demand in two or more of the Aeration Basins causing an increase in air consumption for more than four hours to maintain the DO set point under normal flow conditions.
- ◆ Any sign of soap or suds in the treatment process. Do not wait for it to appear at the out fall.
- ◆ Any abnormalities in the quality of the water whether raw or effluent.
- ◆ Elevated TSS / Turbidity levels (above average).
- ◆ Elevated CBOD levels (above average).
- ◆ Elevated E-Coli levels (above average).
- ◆ Elevated Phosphorus levels (above average).
- ◆ When any parameter as defined in the discharge permit exceeds maximum limits.
- ◆ Any indication that there is toxicity in the daily microscopic exam.
 - a) A microscopic exam will be done every eight hours while water is being sent to purification and before the start up of sending

water to purification.

- ◆ The CCB effluent Chlorine residual is below defined limits.
- ◆ Failure of the Chlorination system.
- ◆ The indicator fish at the outfall die.

On the Water Treatment side, shutdown triggers include:

- ◆ Blended Nitrate/Nitrite concentrations that will not meet MCL's.
- ◆ Blended TTHM or HAA5 concentrations that will not meet MCL's.
- ◆ Failure of the MF/RO to meet defined criteria on turbidity or removal percentages.
- ◆ TOC removal is being adversely affected and Alternative Compliance Criteria will not be sufficient to meet TOC removal regulations

III. Conclusion

The City has performed preliminary research into the viability of utilizing its existing Water Treatment Facilities to treat Wastewater Effluent for a source of drinking water. It has further performed analysis to characterize this source of water and has identified those constituents that would be of an immediate health concern if not removed in the treatment process.

Taking these considerations into account, the City believes that the existing quality of the Wastewater Effluent lends itself to be effectively treated to drinking water standards, by utilizing the existing treatment processes within the City and the application of existing Rules and Regulations that govern Drinking Water Treatment.

The City eagerly awaits the TCEQ's response to this Concept Paper and anticipates that, based off of the data presented here within; the TCEQ will request a Formal Engineering Report to advance the project.

The City of Wichita Falls looks forward to working with the TCEQ in an effort to protect the citizens of Wichita Falls from running out of drinking water, which would ultimately lower the sanitary conditions and reduce the City's abilities to protect the public's health.

Appendix A

Wastewater Effluent Monitoring

Appendix A Wastewater Effluent Monitoring

Inorganic Constituent	Unit of Measure	Regulatory Limit	Wastewater Effluent (avg)
pH		>7.0 ²	6.62
Temperature	C	N/A	27.0
Total Hardness	ppm	N/A	130.0
Total Alkalinity	ppm	N/A	44.0
Turbidity	NTU	0.5 ¹	2.49
TSS	ppm	N/A	4.43
TDS	ppm	1000 ²	760.0
Conductivity	us/cm	N/A	1232.0
Fluoride	ppm	4.0 ¹	1.96
Chloride	ppm	300 ²	388.0
Bromide	ppm	N/A	0.6
Nitrite	ppm	1.0 ¹	0.09
Nitrate	ppm	10.0 ¹	78.0
Sulfate	ppm	300 ²	75.0
Aluminum	ppm	0.05 ²	0.022
Antimony	ppm	0.006 ¹	0.002
Arsenic	ppm	0.01 ¹	0.001
Barium	ppm	2.0 ¹	0.005
Beryllium	ppm	0.004 ¹	0.00002
Cadmium	ppm	0.005 ¹	0.003
Calcium	ppm	N/A	34.0
Chromium (total)	ppm	0.1 ¹	0.0006
Copper	ppm	1.3 ³	0.004
Iron	ppm	0.3	0.09
Lead	ppm	0.015 ³	0.0004
Magnesium	ppm	N/A	9.0
Manganese	ppm	0.05 ²	0.024
Mercury	ppm	0.002 ¹	<0.0001
Potassium	ppm	N/A	28.19
Selenium	ppm	0.05 ¹	0.0005
Silver	ppm	0.1 ²	0.002
Sodium	ppm	N/A	180.0
Thallium	ppm	0.002 ¹	0.0003
Zinc	ppm	5.0 ²	0.07
TOC	ppm	N/A	9.74

1 Primary Drinking Water Standard

2 Secondary Standard

3 Action Level

Organic Constituent	Unit of Measure	Regulatory Limit	Wastewater Effluent (avg)
Alachlor	ppm	0.002	ND
Atrazine	ppm	0.003	ND
Benzopyrene	ppm	0.0002	ND
Carbofuran	ppm	0.04	ND
Chlordane	ppm	0.002	ND
Dalapon	ppm	0.2	ND
Dibromochloropropane	ppm	0.0002	ND
Di(2-ethylhexy 1)adipate	ppm	0.4	ND
Di(2-ethylhexy 1)phthalate	ppm	0.006	0.004
Dinoseb	ppm	0.007	ND
Diquat	ppm	0.02	ND
Endothall	ppm	0.1	ND
Endrin	ppm	0.002	ND
Ethylene Dibromide	ppm	0.00005	ND
Glyphosate	ppm	0.7	ND
Heptachlor	ppm	0.0004	ND
Heptachlor epoxide	ppm	0.0002	ND
Hexachlobenzene	ppm	0.001	ND
Hexachlorocyclopentadiene	ppm	0.05	ND
Lindane	ppm	0.0002	ND
Methoxychlor	ppm	0.04	ND
Oxamyl (Vydate)	ppm	0.2	ND
Pentachlorophenol	ppm	0.001	ND
Picloram	ppm	0.5	ND
Polychlorinated Biphenyls	ppm	0.0005	ND
Simazine	ppm	0.004	0.0011
Toxaphene	ppm	0.003	ND
2,3,7,8 -TCDD (Dioxin)	ppm	3×10^{-8}	ND
2,4,5-TP	ppm	0.05	ND
2,4-D	ppm	0.07	ND
1,1-Dichloroethylene	ppm	0.007	ND
1,1,1-Trichloroethane	ppm	0.2	ND
1,1,2-Trichloroethane	ppm	0.005	ND
1,2-Dichloroethane	ppm	0.005	ND
1,2-Dichloropropane	ppm	0.005	ND
1,2,4-Trichlorobenzene	ppm	0.07	ND
Benzene	ppm	0.005	ND
Carbon Tetrachloride	ppm	0.005	ND
cis- 1,2-Dichloroethylene	ppm	0.07	ND
Dichloromethane	ppm	0.005	ND
Ethylbenzene	ppm	0.7	ND

Monochlorobenzene	ppm	0.1	ND
o-Dichlorobenzene	ppm	0.6	ND
para-Dichlorobenzene	ppm	0.075	ND
Styrene	ppm	0.1	ND
Tetrachloroethylene	ppm	0.005	ND
Toluene	ppm	1.0	ND
trans- 1,2-Dichloroethylene	ppm	0.1	ND
Trichloroethylene	ppm	0.005	ND
Vinyl Chloride	ppm	0.002	ND
Xylenes	ppm	10.0	ND
Total Trihalomethanes	ppm	0.08	0.106
Chloroform	ppm	0.07 ¹	0.0077
Dibromochloromethane	ppm	0.06 ¹	0.051
Dichlorobromomethane	ppm	0 ¹	0.029
Bromoform	ppm	0 ¹	0.025
Haloacetic Acid 5	ppm	0.06	0.064
Dichloroacetic Acid	ppm	0 ¹	0.015
Trichloroacetic Acid	ppm	0.02 ¹	0.011
Monochloroacetic Acid	ppm	0.07 ¹	0.0032
Bromoacetic Acid	ppm	N/A	0.021
Dibromoacetic Acid	ppm	N/A	0.026

1 Maximum Contaminant Level Goal

Radiological Constituent	Unit of Measure	Regulatory Limit	Wastewater Effluent (avg)
Gross Alpha	pCi/L	15.0	-0.93 (± 0.90)
Gross Beta	pCi/L	N/A	20.6 (± 1.2)

Microbiological Constituent	Unit of Measure	Regulatory Limit	Wastewater Effluent (avg)
Cryptosporidium	oocysts/L	N/A	0.566
Giardia	cysts/L	N/A	8.56
Total Coliform	MPN/100mL	N/A	179.3
E. Coli	MPN/100mL	N/A	10.48
Total Culturable Virus	MPN/100mL	N/A	<0.387

Appendix B

Wastewater Effluent Monitoring

for

Unregulated / Emerging Constituents of Concern

Appendix B Wastewater Effluent Monitoring for Unregulated / Emerging Constituents of Concern

Constituent	Unit of Measure	Regulatory Limit	Wastewater Effluent (avg)
Perchlorate	ug/L	N/A	0.17
Sucralose	ug/L	N/A	43.0
Perfluorooctanoic Acid (PFOA)	ng/L	N/A	28.0
Acetaminophen	ug/L	N/A	0.008
Antipyrine	ug/L	N/A	0.004 ²
Atenolol	ug/L	N/A	0.128
Carbamazepine	ug/L	N/A	0.059
Cotinine	ug/L	N/A	0.025 ¹
DEET	ug/L	N/A	0.116 ^{1, 2}
Fluoxetine	ug/L	N/A	0.009
Meprobamate	ug/L	N/A	0.505
Nicotine	ug/L	N/A	0.019 ¹
Paraxanthine	ug/L	N/A	0.029
Primidone	ug/L	N/A	0.391
Sulfamethoxazole	ug/L	N/A	0.004
Theobromine	ug/L	N/A	0.465 ^{1, 2}
Dilantin	ug/L	N/A	0.279
Salicylic Acid	ug/L	N/A	0.18 ²
Theophylline	ug/L	N/A	0.040
Triclocarbon	ug/L	N/A	0.076 ¹
Galaxolide	ng/L	N/A	490.0
Tonalid	ng/L	N/A	71.0
Progesterone	ng/L	N/A	0.2 ²

¹ Detected in Current Lake Water also.

² Detected in Current Tap Water also.

Bryan W. Shaw, Ph.D., *Chairman*
Carlos Rubinstein, *Commissioner*
Toby Baker, *Commissioner*
Zak Covar, *Executive Director*



File PWS 2430001/CO

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

February 8, 2013

Mr. Russell Schreiber, P.E., Director of Public Works
City of Wichita Falls
P.O. Box 1431
Wichita Falls, TX 76307-1431

Subject: City of Wichita Falls – PWS ID No. 2430001
Review: Concept Paper for the Emergency Reuse of Wastewater Effluent as a
Source for Direct Potable Reuse in Wichita Falls
Wichita County, Texas
CN 600129316 RN 101611275

Dear Mr. Schreiber:

On November 13, 2012, the Texas Commission on Environmental Quality (TCEQ) received the City of Wichita Falls' (City's) Concept Paper for the Emergency Reuse of Wastewater Effluent as a Source for Direct Potable Reuse in Wichita Falls (Concept Paper) for review. The City is in an extended drought with source water reservoirs currently at approximately 43 percent capacity. Without any projected rainfall in the future to produce a significant quantity of runoff, the City is proposing to temporarily convert part of the Cypress Surface Water Treatment Plant (SWTP) to a direct potable reuse (DPR) water treatment plant (WTP) for four to six months to extend the existing capacities of the surface water reservoirs. The City proposes to augment its potable water supply with effluent from the temporary DPR WTP once the combined lake levels are 30 percent or less. Once the combined lake levels return to a level over 40 percent, the City would cease use of the temporary Cypress DPR WTP. In addition, the City is working on a proposal for a long-term, permanent DPR WTP. **The comments in this letter are based on the City's proposed temporary project requesting a one-time emergency operation with a duration not to exceed six months.**

The following table lists the City's existing potable water treatment facilities, with their TCEQ-assigned identification numbers and activity status.

Existing Wichita Falls Facilities with TCEQ-Assigned Identification Numbers (IDs)

ID	Plant Name (in TCEQ data)	Type	Status	Availability
TP15131	CYPRESS 1961	Treatment Plant (TP)	Active (A)	Permanent (P)
TP15132	CYPRESS 1987	TP	A	P
TP21567	CYPRESS 2008 RO MEMBRANE PLANT	TP	A	P
TP410071	CYPRESS 2010	TP	A	P
TP15134	JASPER 1951	TP	A	P

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ID	Plant Name (in TCEQ data)	Type	Status	Availability
TP20695	JASPER 2005	TP	A	P
TP15133	JASPER 1941	TP	Inactive	P

Proposed DPR WTP

The Cypress Surface Water Treatment Plant (SWTP) currently consists of four parallel treatment trains. Three of the parallel trains are referred to as the 1961 (Plant ID 15131), 1987 (Plant ID 15132) and 2010 (Plant ID 410071) Plants and treat Lake Arrowhead and Lake Kickapoo source water from the City's Secondary Reservoir. These three treatment trains provide conventional surface water treatment using coagulation, flocculation, clarification/sedimentation, filtration, disinfection, and lime softening. The fourth train is referred to as the Cypress 2008 RO Membrane Plant (Plant ID 21567) and currently treats Lake Kemp source water from the Headquarters Road Reservoir. This fourth train consists of coagulation, flocculation, clarification, microfiltration (MF) membranes, reverse osmosis (RO) membranes and disinfection with a 10.0 million gallons per day (MGD) RO permeate capacity. In addition to the Cypress SWTP, the City also operates a second plant, the Jasper SWTP (Plant ID Nos. 15133, 15134, and 20695), on the opposite side of the City. The Jasper SWTP consists of conventional surface water treatment with a total capacity of 42 MGD.

The City's Concept Paper included the following proposed Cypress SWTP modifications for the temporary Cypress DPR WTP treatment train:

- Initially divert 7.5 MGD of River Road Wastewater Treatment Plant (RR WWTP) effluent approximately 8.5 miles away to the Cypress SWTP location;
- Provide total chlorine (chloramines) disinfection of the RR WWTP's effluent in the 8.5 miles of pipeline;
- Disconnect the Cypress 2008 RO Membrane Plant's influent piping from the existing raw surface water source (Lake Kemp) and effluent piping to the 1961 and 2010 Plant's individual clearwell piping;
- Connect the treated wastewater pipe from the RR WWTP to the influent of the Cypress 2008 RO Membrane Plant's train;
- Boost the total chlorine residual before the Cypress 2008 RO Membrane Plant's clarifier;
- Discharge 5.0-MGD of the Cypress 2008 RO Membrane Plant's treated effluent into the existing backwash waste lagoon;
- Transfer the decant water from the backwash waste lagoon to the 1961, 1987, and 2010 Plant's existing raw water splitter box and convert the splitter box to a blending chamber for the temporary Cypress DPR WTP;
- Blend the Cypress 2008 RO Membrane Plant's effluent with 5.0-MGD of raw surface water from the Secondary Reservoir in the converted blending chamber;
- Send 10.0 MGD of blended backwash lagoon and Secondary Reservoir water to one of the three existing conventional surface water treatment trains (which one was not identified);
- Boost the total chlorine residual before discharging the filtered water to the Cypress SWTP's clearwells;
- Discharge to distribution; and

- Return to normal operations of treating only raw surface water after no more than six months of operation.

TCEQ Comments on Concept Paper

The City submitted a Concept Paper for TCEQ review and response. The City will use TCEQ's response to develop and submit an Engineering Report for the proposed temporary DPR WTP. The City's Concept Paper has been reviewed and discussed by technical staff and TCEQ management. Based on our review and discussions of the one-time temporary potable reuse project, we have the following comments:

- The direct use of treated wastewater as a raw water source for a public water supply is not addressed in federal or state regulations; therefore an exception to Title 30 of the Texas Administrative Code (30 TAC) §290.41 is required. Similarly, 30 TAC §290.42 does not address the design requirements for DPR treatment plants. Since the TCEQ does not have rules that contain minimum design, treatment, operating, maintenance, monitoring, and reporting requirements for direct reuse sources or DPR WTPs, the City's proposed temporary DPR WTP will require the submittal of written requests for temporary exceptions to the TCEQ for review under 30 TAC §290.39(l). The requests for exceptions will be reviewed on a site-specific basis. Please note:
 - Any exception granted is subject to revision or revocation if the granting of the exception results in an increase in public health risk or degradation in water service as described in 30 TAC §290.39(l)(2).
 - Please be aware that all exceptions are subject to revision or revocation if the U.S. Environmental Protection Agency (EPA) revises the allowable maximum contaminant levels for existing regulated contaminants or establishes drinking water standards for chemical or microbiological contaminants that are currently unregulated. Exceptions related to the temporary Cypress DPR WTP may also be revised or revoked if substantiated data becomes available establishing public health risk levels for any unregulated contaminants in drinking water.
 - Based on the absence of rules for DPR WTPs, the TCEQ will review each public water system's proposed site-specific minimum design, operation, maintenance, monitoring, and reporting requirements as exceptions as required by 30 TAC §290.39(l). The proposed site-specific design, operation, maintenance, monitoring, and reporting ideas must provide the same or greater levels of public health protection than those provided by the TCEQ design rules for conventional source waters. The TCEQ will review the proposal and the alternative provided by the PWS to ensure public health will be protected to the same level or greater as the minimum requirements for conventional water sources. If the proposed design, operation, maintenance, monitoring, and reporting criteria do not demonstrate adequate protection of public health, the TCEQ can establish more stringent requirements or ask the public water system for another alternative(s).
 - The City will be required to submit an Engineering Report and detailed engineering plans and specification for TCEQ review. The City must receive the TCEQ's approval-to-construct in writing prior to beginning construction.

- Since the City does not plan to conduct a pilot test prior to constructing the proposed DPR WTP, the City will need to request temporary exceptions to allow the TCEQ to review the necessary engineering plans for modification of the Cypress SWTP facility.
- The City must submit a Full-Scale Verification Testing Protocol with the temporary exception requests. Pursuant to the Texas Health & Safety Code (THSC) §341.031 and §341.0351, the TCEQ staff will review the Protocol to determine if sufficient information will be collected during the full-scale verification testing to demonstrate that:
 - The proposed DPR WTP will be able to continuously provide public drinking water that will be free of deleterious matter;
 - The proposed DPR WTP's effluent will comply with the drinking water standards and treatment techniques established by the commission and the United States Environmental Protection Agency (EPA); and
 - The City will continue to provide an adequate and safe drinking water supply.

The City will be required to conduct the full-scale verification testing in accordance with the conditions in a TCEQ's written response after reviewing the City's verification testing protocol. The full-scale verification test must include at least one continuous test period of **no less than 30 days** with at least one of each of the treatment processes in operation at the City's selected maximum flow rates and operating parameters. After performing a chemical clean-in-place (CIP) procedure on the test microfiltration (MF) and reverse osmosis (RO) membrane units, the full-scale verification testing must continue at the same selected maximum flow rates and operating parameters for at least ten (10) more days to verify the CIP procedures were effective in flux recovery. A CIP procedure is to be performed on the selected RO membrane skid at the same time as the MF membrane unit(s) CIP procedure is performed. Please note, if there are equipment failures or failures to produce a water quality that continuously meets the requirements of 30 TAC Chapter 290, Subchapter F and the City makes a modification to one or more treatment processes to achieve an acceptable water quality, the verification test **must be restarted**.

- During the required full-scale verification testing, the effluent from the proposed temporary Cypress DPR WTP cannot be discharged to the City's potable water system and must be disposed of in accordance with a TCEQ discharge or reclaim permit.
- After completion of the full-scale verification testing, the City must submit an acceptable Full-Scale Verification Testing Report for the TCEQ's review. The TCEQ will review the Full-Scale Verification Report and respond in writing to document whether the City may begin producing water through the temporary Cypress DPR WTP. The City cannot begin discharging the effluent from the temporary DPR WTP to the City's distribution system until written TCEQ approval is received that documents the Cypress DPR WTP can produce finished water that meets all Federal Safe Drinking Water Standards. Please note that if the City fails to meet all TCEQ requirements and limitations contained in the letter approving the discharge the TCEQ can revoke the temporary approval or impose additional requirements.

- At this time the City has not determined how the finished water generated from the DPR WTP will be managed prior to approval for distribution as potable water. The City will need to identify management options prior to beginning construction on any phase of the Emergency DPR Project. If management options require TCEQ approval, the City will need to submit the necessary information for those approvals. Per discussion at the project meeting on January 18, 2013, the de-chlorinated finished water may be discharged via WQ0004419-000 permitted Outfall 001 as long as the total permitted flow of 6 MGD is not exceeded.
- Under normal circumstances, the TCEQ requires that exception requests be submitted before engineering plans and specifications. However, due to the reported shortage of surface water supplies, the TCEQ will expedite reviews of the above-required submittals.
- The Concept Paper indicated that the City's primary focus will be the removal of contaminants from the RR WWTP's effluent that have short-term (acute) health effects only. Please note that there is no leeway in the federal requirements for primary drinking water standards with long-term health effects for Texas public water systems because of the drought. Therefore, the following provisions apply:
 - The City will not receive any reduced requirements for primary drinking water standards of 30 TAC 290 Subchapter F whether they have long-term or short-term health effects.
 - All treated water compliance sampling must be conducted as specified in the standards of 30 TAC 290 Subchapter F. If the Cypress SWTP has been on reduced chemical monitoring, the City may be required to return to routine chemical monitoring schedules for the Cypress SWTP due to the addition of source water from the RR WWTP.
- In the City's consulting engineer's letter dated February 22, 2012, the City requested approval to use chloramines as a biocide to control corrosion of the microfiltration (MF) membrane unit's piping being caused by iron-related bacteria and sulfur-reducing bacteria. TCEQ approved this treatment change. Please provide information on the effectiveness of this treatment process and if dechlorination is being provided prior to the RO membranes.
- The Concept Paper indicates disinfection byproducts will have to be reduced to comply with the maximum contaminant level (MCL). Although projected levels of these contaminants appear to be acceptable, please note the City should plan to achieve levels lower than the MCL so that the City's wholesale water purchasers receive water of an acceptable quality at the wholesale meters.
- If the City believes that during the operation of the temporary Cypress DPR WTP, it will exceed a secondary drinking water standard and wishes to temporarily produce water that does not meet that secondary drinking water standard, a written request for a conditional approval must be submitted to the TCEQ's Public Drinking Water Section at the following address:

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TCEQ Public Drinking Water Section -- MC 155
Attn: Bob Patton, Manager
P.O. Box 13087
Austin, TX 78711-3087

- All pipe connections and common walls between basins containing waters in different stages must be examined for cross-connections. The engineering plans and specifications must contain the necessary modifications to eliminate any cross-connection. This includes, but is not limited to, the following:
 - The effluent piping from the Cypress 2008 RO Membrane Plant must be physically disconnected from the 1961 and 2010 Plants' clearwells and any other existing effluent piping from the conventional surface water treatment trains.
 - The effluent piping from the Cypress 2008 RO Membrane Plant's train must be provided with an air gap at the discharge into the existing backwash lagoon.
 - No cross-connection can exist between waters in two different stages of treatment. This includes the MF and RO membrane units during chemical clean-in-place (CIP) procedures.
 - The Concept Paper did not indicate which of the Cypress SWTP's conventional treatment trains will be taken offline during the use of the RR WWTP effluent or whether those trains will continue to treat raw surface water to be blended with the proposed temporary Cypress DPR WTP effluent. If the City plans to operate a conventional treatment train to treat raw surface water, TCEQ acceptable cross-connection protection must be provided.
- The City's planned sanitary procedures and disinfection methods must provide for:
 - Returning all four Cypress SWTP's treatment trains to raw surface water source (current) operation status and physically disconnecting the Cypress 2008 RO Membrane Plant's train from the RR WWTP's piping; and
 - Physically removing the temporary effluent discharge pipe from the Cypress 2008 RO Membrane Plant to the existing backwash waste lagoon and reconnecting it to one or more of the clearwells.
- The City must provide a description, drawings, and specifications describing how the City will control the blend of RO membranes' permeate (delivered from the existing backwash lagoon) with the raw surface water **so that there is always a blending ratio of one-to-one or a ratio that provides more raw surface water than RO membrane permeate.** This should include any rate-of-flow controllers, engineered orifice plates, and flow-indicating devices. Note that the TCEQ will require monitoring, record keeping, and reporting of the daily blending ratios.
- If any of the Cypress SWTP's other conventional treatment trains will remain in service treating raw surface water, the planned blending ratio and what modifications will be necessary for ensuring control and monitoring of the blending ratio must be addressed.

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- If either of the other two Cypress SWTP conventional treatment trains will remain in service treating raw surface water, the connections between the clearwells must be piped so that the temporary Cypress DPR WTP's clearwell is completely separated from the conventional SWTP clearwells
- The Concept Paper stated that the City intends to maintain a disinfectant residual using chloramines in the entire 8.5 miles of pipe from the RR WWTP to the temporary Cypress DPR WTP. Since the RR WWTP's effluent will be high in free ammonia, injection of chlorine would form chloramines without injecting additional ammonia. However, viral inactivation credit is not allowed by rule for a total chlorine residual when ammonia is provided prior to chlorine. To receive inactivation credit, the City may pursue one of the following methods:
 - Modify the City's proposal to inject sufficient chlorine to achieve break-point chlorination and maintain a continuous measurable free chlorine residual prior to ammonia injection. If this option is selected, the City will need to provide at least 8.0-log of total viral removal or inactivation through the temporary Cypress DPR WTP. Please note this option has the potential to form very high levels of disinfection byproducts, so the City must include information on how those levels will be controlled to comply with 30 TAC §290.115.
 - Inject another disinfectant such as chlorine dioxide or ozone and maintain a measurable residual before converting to chloramines. To clarify, since the question has been asked in conference calls, the use of chlorine dioxide or ozone alone is not considered an advanced oxidation process, nor does it provide the same benefits as recognized advanced oxidation processes. If chlorine dioxide or ozone is used, the City must meet the standards of 30 TAC §290.114 and will need to provide at least 8.0-log of total viral removal or inactivation through the temporary Cypress DPR WTP.
 - Use the free ammonia present in the WWTP effluent to produce a chloramine residual. If this option is used:
 - The City will need to provide at least 9.0-log of total viral removal or inactivation through the temporary Cypress DPR WTP. Based on consultations with EPA Region 6 staff, the TCEQ has concluded that 1.0 log of additional viral log inactivation, for a total of 9.0-log, will provide an equivalent safety factor to that provided when chlorination precedes ammonia addition.
 - The City must comply with the monitoring and maximum contaminant levels of 30 TAC §290.106 for cyanide at the Cypress SWTP entry point.
- Interferences in the analytical method for determining total chlorine residual in treated wastewater can result in the inclusion of constituents that do not provide quantifiable disinfection. In these cases, the measured total chlorine residual could incorrectly indicate a higher inactivation of viruses and *Giardia* than actually occurred. One method of determining the actual inactivation provided by chloramines is to measure the monochloramine residual and use it to calculate the inactivation for a disinfection zone. The TCEQ routinely requires plants that use chloramines to measure monochloramine, which is the desired disinfectant species.

ClO₂
@ 2nd day

- The TCEQ is applying the following requirements to DPR WTPs:
 - Effective April 1, 2012, the maximum *Cryptosporidium* removal credit a public water system treating surface water can receive is the lesser of the acceptable Challenge Test log removal credit (LRC_{C-test}) granted by the TCEQ after review of the Challenge Test Report or the removal that can be demonstrated during a direct integrity test (LRC_{DIT}) using a TCEQ-approved test pressure. TCEQ staff are currently reviewing the Challenge Test Report for the US Filter (now owned by Siemens) CMF-S7, Module Part No. 119023, S10V MF membrane modules. This Challenge Test Report for the City's MF membranes was posted on the National Sanitation Foundation's website on December 4, 2012. The TCEQ will notify the City when we have completed the review of the Challenge Test Report and approved an LRC_{C-test} value for the City's MF membranes.
 - In TCEQ's April 30, 2012 letter, the TCEQ approved direct integrity test (DIT) values for the S10V MF membranes at 3.0-log removal. Because the source of the water has changed, key parameters like temperature, flow, volumetric concentration factor, and the log removal required may change. Please be prepared to resubmit the DIT values with the requests for temporary exceptions for the proposed temporary Cypress DPR WTP. Please note that these DIT values are under review and may be revised.

Please note that the above information is also necessary for the City to continue to receive removal credit for the Cypress 2008 RO Membrane Plant when treating surface water.

- It was not indicated what waste disposal methods will be used at the Cypress SWTP for all waste streams generated during the temporary Cypress DPR WTP's operation. Specifically, the methods of disposing of the clarifiers' blow-down waste, MF membrane backwash waste, MF and RO membrane clean-in-place waste, and any other liquid or solid waste were not indicated. Consideration must be given to the potential increase of pathogens by any recycling of these wastes. Because of the potential for an increase in pathogen concentrations in the RR WWTP effluent, the City will need to address the following:
 - All clarifier blow-down, MF membrane backwash waste, media filter backwash waste, and other generated waste cannot be sent to the existing backwash waste lagoon receiving effluent from the RO Membrane Plant during operation of the temporary Cypress DPR WTP. Consideration should be given to returning the decant to a point in front of the temporary Cypress DPR WTP, head of the RRWTP, or discharging to a stream. The City will need to identify options for the disposal of the DPR WTP waste streams prior to beginning construction on any phase of the Emergency DPR Project. Per discussion between Mr. Mark Southard, City of Wichita Falls Water Source/Purification Superintendent, and Mr. Michael Sunderlin, TCEQ Water Quality Division, the City plans to dispose of wastes from the DPR WTP via the existing outfall 001 authorized in TPDES Permit No. WQ0004419000. Per Mr. Sunderlin's initial review of data submitted by the City, which projected a worst-case concentration for parameters in the waste to be disposed of at the Cypress plant, it does not appear that the projected parameters would trigger additional requirements or limits in the current permit and no permit amendment would be necessary as long as the total permitted flow of 6 MGD is not exceeded.

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- Identifying management options for finished water and disposal options for waste streams are critical for this project. If you have any questions or need further assistance regarding the DPR WTP's finished water or waste streams management options, please contact Ms. Jaya Zyman-Ponebshek, P.E., by email at Jaya.Zyman-Ponebshek@tceq.texas.gov or by telephone at (512) 239-2012 or by correspondence at the following address:

Water Quality Division – MC 145
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

- If not currently provided or used, consideration needs to be given to filter-to-waste after backwashing the conventional gravity media filters.
- The TCEQ has continued our research on indirect potable reuse (IPR) and DPR since the City first approached the TCEQ in April 2012. Our research found that a disease outbreak in the City could result in a significant increase in the concentration of pathogens over the normal concentration. Such an increase could overload the RR WWTP's and/or temporary Cypress DPR WTP's treatment processes. The City's submittals must address how public health will be protected under those circumstances based on the continuous removal and/or inactivation, monitoring triggers and frequency, and time required to shut down one or more of the treatment plants.

Please note that 8.0-log or greater (based on the City's selected disinfection protocol), 6.0-log and 5.5-log of removal and/or inactivation of viruses, *Giardia* cysts and *Cryptosporidium* oocysts, respectively, only provide protection of public health for specific concentration levels of these pathogens in the RR WWTP effluent. To date, the City has reported the following maximum pathogen concentration for the RR WWTP effluent:

- *Giardia* concentration of 34.82 cysts per liter;
- *Cryptosporidium* concentration of 5.04 oocysts;
- *E. coli* concentration of 160 most probable number (MPN) per 100 milliliters (1,600 MPN per liter);
- Total coliform concentration of 3,200 MPN per 100 milliliters (32,000 MPN per liter); and
- No maximum data was available for total culturable virus concentrations, but a 2009 average concentration of <0.387 MPN per 100 milliliters (<3.87 MPN per liter) was provided.

Therefore, the following information must be provided to support the City's proposed site-specific total log removal and/or inactivation:

- All analytical data results for raw sewage and the RR WWTP's effluent for turbidity, total coliform, *E. coli*, culturable viruses, *Giardia* cysts, *Cryptosporidium* oocysts, and any other pathogens the City has been monitoring for the preceding five years. Include all analytical methods used and the laboratory's quality assurance and control methods and results.

- The proposed location and type of all continuous online monitoring and automatic shutdown triggers at the RR WWTP.
 - The proposed location and type of all continuous online monitoring, grab sample monitoring taps, and automatic shutdown equipment at the temporary Cypress DPR WTP.
 - The maximum time frames to receive results from grab sample analytical results.
 - The CT Study spreadsheet for the proposed temporary Cypress DPR WTP, including the dimensions of all pipelines and treatment units. The spreadsheet should include the minimum detention time in the MF and RO membrane portion of the Cypress DPR WTP, the conventional portion of the Cypress DPR WTP, and any subsequent storage before release to the distribution system.
 - The triggers that will be used for shutting down transfer of RR WWTP effluent to the Cypress DPR WTP and Cypress DPR WTP shutdown or alarms and what each of the triggers indicate.
 - A description of multi pathogen treatment barriers, an analysis of what levels of treatment will be provided if a single or multi-barriers should fail, and what safeguards will be in place to prevent failure and response actions and timelines for treatment failures.
- If the City determines that the Cypress DPR WTP will be needed on a recurring or more permanent basis, the TCEQ recommends that the City install additional barrier(s) to inactivate *Cryptosporidium* oocysts and control any organic compounds that are not removed by the RO membranes. The proposed treatment configuration for the temporary Cypress DPR WTP includes two barriers for *Cryptosporidium* removal: physical removal through microfiltration membranes and physical removal through the conventional surface water treatment plant. An additional barrier such as advanced oxidation with hydrogen peroxide and ultraviolet (UV) light, or some alternative TCEQ-approved approach, could allow Cypress DPR WTP to remain in service if one of the removal barriers fails and would provide a means of oxidizing any chemical that might not be completely removed by the RO membranes.
 - The Concept Paper indicated that the City has established a Water Quality Task Force that is composed of City staff from the Public Works, Public Utilities, and Health Departments. A list of triggers to activate the Water Quality Task Force and conduct an investigation was included. The City will be required to notify the TCEQ Water Supply Division and Abilene Regional Office by email and telephone if an established trigger is reached. TCEQ contacts for these types of notifications are Mr. Joel Klumpp at Joel.Klumpp@tceq.texas.gov or (512) 239-4453 and Mr. Cliff Moore by email at Cliff.Moore@tceq.texas.gov or (325) 698-6115. For notifications outside of normal business hours, call the 24-hour hotline number at (800) 777-3186. Based on the potential acute health risk, the TCEQ will require that the temporary Cypress DPR WTP be immediately shutdown (in addition to conducting an investigation) for:
 - Occurrence of a confirmed waterborne disease outbreak;
 - Failure to meet the TCEQ's minimum required disinfection levels for inactivation of pathogens;

- Any E. coli positive sample in the temporary Cypress DPR WTP plant, entry point, or distribution system; and
 - Exceeding the maximum TCEQ-approved turbidity level for any treatment process.
- Please submit the standard operating procedures for the Water Quality Task Force including shut-down criteria with the request for temporary exceptions.
- The Concept Paper included a list of monitoring triggers at the RR WWTP for stopping the use of the RR WWTP effluent as a public water system source water. The City will be required to notify the TCEQ Water Supply Division and Abilene Regional Office by email and telephone if an established trigger is reached. TCEQ contacts for these types of notifications are Mr. Joel Klumpp at Joel.Klumpp@tceq.texas.gov or (512) 239-4453 of the TCEQ Water Supply Division and Mr. Cliff Moore by email at Cliff.Moore@tceq.texas.gov or (325) 698-6115 of the Abilene Regional Office if notification is needed. For notifications outside of normal business hours, call the 24-hour hotline number at (800) 777-3186.
 - The TCEQ will specify minimum and maximum allowable levels to be used for monitoring triggers of the RR WWTP effluent and shutdown of the temporary Cypress DPR WTP.
 - The TCEQ will specify monitoring triggers for the RR WWTP which may include eight-hour toxicity tests using a microscopic examination of samples from the aeration basin. The TCEQ Water Supply Division will require more detailed information on what microbes will be identified through this microscopic examination, analytical method(s) to be used, and the required training and experience for the City staff who will be conducting the tests.
 - Please submit the operations and monitoring plan with the request for temporary exceptions.
- In addition, the City has proposed monitoring triggers for the proposed temporary DPR WTP to initiate shutdown of the DPR WTP. The City shall be required to notify the TCEQ Water Supply Division and Abilene Regional Office by telephone if an established trigger is reached. TCEQ contacts for these types of notifications are Mr. Joel Klumpp at Joel.Klumpp@tceq.texas.gov or (512) 239-4453 and Mr. Cliff Moore by email at Cliff.Moore@tceq.texas.gov or (325) 698-6115. For notifications outside of normal business hours, call the 24-hour hotline number at (800) 777-3186. Additional DPR WTP monitoring triggers that the City should consider include, but are not limited to, the following:
 - A MF membrane unit that fails a DIT must be removed from service until it passes a DIT;
 - An individual MF membrane unit's filtrate turbidity level exceeds 0.100 nephelometric turbidity units (NTUs) for two consecutive five-minute readings; and
 - An individual granular media filter's turbidity level exceeds 0.150 NTUs for two consecutive fifteen-minute readings.

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- The Concept Paper's Appendix A included the analytical results of the RR WWTP effluent for chemical and microbiological contaminants. In addition, the TCEQ is requesting additional information related to the City's historical finished drinking water.
 - All chemical and microbiological analytical results for the preceding five years must be provided. In addition, the average, minimum, and maximum reported levels must be included.
 - Appendix A of the Concept Paper indicated that there is not a regulatory limit for total coliform. While that may be true of the permit limits for the RR WWTP discharge permit, it is not true for finished drinking water. The federal rules establish the absence of total coliform as the regulatory limit for total coliform in finished drinking water. Please review 30 TAC §290.109(f) and 40 CFR §141.63 regarding compliance determination for microbial contaminants.
 - Please see 40 CFR §141.52 for maximum contaminant goals for *Giardia*, viruses, *Legionella*, total coliforms (including fecal coliforms and *E. coli*), and *Cryptosporidium*.
- Please note that the DPR facility must be staffed 24 hours a day, 7 days a week by licensed surface water operators unless adequate storage is provided to allow for the treatment but not release of the treated water until an operator is on-site.
- The City must provide documentation regarding coordination with all purchased water systems receiving water from the City regarding how these systems will be notified of the use of wastewater effluent as a source water. Please also address how the City's retail service customers have been informed of the City's plans to supplement the source water.
- The City must also indicate how it will inform its customers and purchased water systems of any exceedance of a drinking water standard contained in 30 TAC, Subchapter F or any failure to meet a TCEQ specified DPR WTP treatment technique requirement. These public notices must be issued in accordance with the requirements of 30 TAC 290.122. The City must also verify that it will include the information in its Consumer Confidence Report required by 30 TAC Subchapter H.
- The City must obtain all required TCEQ wastewater discharge and 210 permits from the TCEQ Water Quality Division. If you have any questions regarding the existing wastewater permits, amendments, or new permits, please contact Ms. Jaya Zyman-Ponebshek, P.E., by email at Jaya.Zyman-Ponebshek@tceq.texas.gov or by telephone at (512) 239-2012, or by correspondence at the following address:

Drinking Water Quality Division – MC 148
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087
- Copies of all wastewater permits and discharge limits will need to be provided to the TCEQ Water Supply Division.

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- The construction of the 8.5 miles of wastewater pipeline from the RR WWTP to the proposed temporary DPR WTP must be approved by the TCEQ Water Quality Division.
- The City will need to have a spill response plan for the above-ground wastewater transmission pipeline.
- Consideration must be given to security measures for the above-ground wastewater transmission pipeline to prevent accidental or intentional damage.
- At this point it does not appear that the change in the source water being treated by the RO membranes will impact the City's discharge permit No. WQ 00104419-000 to the Wichita River below Diversion Lake in segment No. 0214 of the Red River Basin. However, when the application for renewal of that permit gets submitted to the TCEQ's Water Quality Division, new influent and effluent data, along with stream water quality criteria, will be evaluated and a determination made as to whether additional parameters need to be monitored or limited.
- Our review of the Concept Paper did not find any mention of any modification to the RR WWTP to reduce the nitrate level. Please provide information on the status of this project.

Per discussion at the project meeting on January 18, 2013, the City plans to:

- Explore direct integrity testing of the Hydranautics RO membranes at the DPR WTP in order to receive pathogen removal credit; and
- Contact Hydranautics to inquire if third-party challenge testing of their RO membranes has been conducted in accordance with the 40 CFR §141.719(b)(2) and the EPA's Membrane Filtration Guidance Manual.

City staff also indicated during the January 18, 2013 meeting that the City has been using a "real-time" analytical method for monitoring *Cryptosporidium* oocysts levels in the RR WWTP. Please provide the following:

- Detailed information on the analytical method and quality assurance/quality control methods being used being used;
- Test equipment required;
- Staff training required; and
- Laboratory accreditation (such as through the EPA, National Environmental Laboratory Accreditation Conference, etc.) available for the analytical method.

The TCEQ commends the City for taking this approach to the DPR project, and requests that information regarding these initiatives be included in the City's next submittal to the TCEQ.

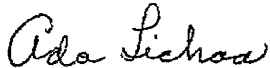
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If you have other questions concerning this letter or if we may be of further assistance, please contact Mr. Joel Klumpp by email at Joel.Klumpp@tceq.texas.gov, by telephone at (512) 239-4453, or by correspondence at the following address:

Technical Review & Oversight Team – MC 159
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Mr. Klumpp has been designated as the TCEQ point-of-contact for this project. Please route all correspondence and requests through him.

Sincerely,



Ada Lichaa, P.G. Manager
Plan and Technical Review Section
Water Supply Division
Texas Commission on Environmental Quality

AL/JSW/

cc: The Honorable Glenn Barham, Mayor, City of Wichita Falls, P.O. Box 1431, Wichita Falls, TX 76307-1431
Mr. Daniel Nix, Public Utilities Operations Manager, City of Wichita Falls, P.O. Box 1431, Wichita Falls, TX 76307-143