

FINAL ENGINEERING REPORT
FOR
TEMPORARY DIRECT POTABLE REUSE PROJECT
FOR
CITY OF WICHITA FALLS, TEXAS

VOLUME 1 OF 2

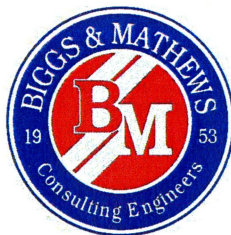
December, 2013

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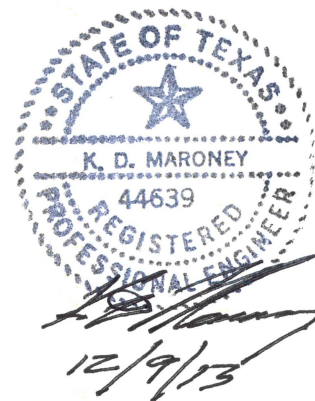


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1.0 GENERAL

The City of Wichita Falls is located in the southeastern portion of Wichita County and has a current population of approximately 104,553. It is the largest city in a radius of about 125 miles, and is a part of the Region B Water Planning Group which is comprised of eleven counties including Archer, Baylor, Clay, Cottle, Foard, Hardeman, King, Montague, Wichita, Wilbarger and a portion of Young County.

The Wichita Falls system not only provides water to its own incorporated area, but it also provides water to fifteen other cities, water districts, and water supply corporations within Wichita, Archer and Clay counties and is the only wholesale water provider in Region B. Its service area provides water to a population of approximately 140,000 and accounts for approximately 65% of the entire Region B population and municipal water demands.

With the majority of the municipal demand being dependent on the City of Wichita Falls for the next 50 years, it is imperative that the City take immediate steps to evaluate and implement water management strategies to increase its water supply reliability.

2.0 EXISTING WATER SOURCES

The City of Wichita Falls owns and operates three lakes as their primary source of water, including Lake Kickapoo in Archer County, Lake Arrowhead in Clay County, and Lake Kemp/Diversion in Baylor County.

Lake Kickapoo was constructed in 1946 and developed as a municipal water supply with an initial storage capacity of 106,000 acre-feet. It is located on the North Fork of the Little Wichita River and the City has diversion rights from the lake of 40,000 acre-feet per year or approximately 35.7 million gallons per day (MGD). The top of spillway for Lake Kickapoo is at elevation 1045.0 MSL.

Lake Arrowhead was constructed in 1966 and was developed for municipal, industrial and recreational use with an initial storage capacity of 262,100 acre-feet. It is located on the Little Wichita River and the City has diversion rights from the lake of 45,000 acre-feet per year or approximately 40.2 MGD. However, the maximum diversion from both Lake Arrowhead and Lake Kickapoo cannot exceed 65,000 acre-feet per year (58 MGD). The top of spillway for Lake Arrowhead is at elevation 926.0 MSL.

Lake Kemp/Diversion was constructed in 1922 and was developed for municipal, industrial, irrigation, mining, and recreational use with an initial storage capacity of 318,000 acre-feet. Kemp/Diversion is jointly owned, maintained and operated by the City of Wichita Falls and Wichita County Improvement District No. 2. Diversion rights total 193,000 acre-feet per year (172.3 MGD) with only 25,150 acre-feet per year (22.5 MGD) available to the City of Wichita Falls for municipal use, 40,000 acre-feet per year (35.7 MGD) for industrial use, 120,000 acre-feet per year (107 MGD) for irrigation use, 2,000 acre-feet per year (1.8 MGD) for mining use, and 5,850 acre-feet per year

(5.3 MGD) for recreational use. The top of spillway for Lake Kemp is at elevation 1144.0 MSL.

Based on the latest studies performed in the year 2000, the firm yield from the combination of Lake Kickapoo and Lake Arrowhead was determined to be 46,200 acre-feet per year (41.2 MGD) and the firm yield from Kemp/Diversion was determined to be 105,500 acre-feet per year of which only 25,150 acre-feet per year (22.5 MGD) is available for the City of Wichita Falls.

3.0 EXISTING WATER TREATMENT FACILITIES

The City owns and operates two separate water treatment plant site facilities with a total combined treatment capacity of 77.2 MGD. These facilities provide an excellent quality of finished potable water for the City of Wichita Falls and the surrounding service area.

The Jasper WTP is located generally on the east side of the city and includes two treatment trains commonly known as the 1951 treatment train and the 2005 treatment train. Raw surface water is received into the plant from the Secondary Reservoir which is fed from Lake Kickapoo and Lake Arrowhead. Settled water from the solids contact clarifier 1951 train is blended with the settled water from the solids contact clarifier 2005 train and flows through twelve multi-media filters into a weir box which feeds filtered water to two clearwells and a 5 MG ground storage tank, which all operate in parallel. The disinfection protocol includes chlorine dioxide in the raw water entering the plant and chloramines prior to the clarifiers and prior to the clearwells and ground storage tank. The rated treatment capacity of the Jasper Plant is 25.2 MGD.

The Cypress WTP is located in the southwest portion of the city and includes three conventional treatment trains operating in parallel, commonly known as the 1961 treatment train, the 1987 treatment train, and the 2010 treatment train. In addition this plant site has a microfiltration/reverse osmosis treatment train commonly known as the MF/RO Facility. Raw surface water is received into the conventional treatment trains from the Secondary Reservoir which is fed from Lake Kickapoo and Lake Arrowhead and raw surface water is received into the MF/RO Facility from Lake Kemp.

Settled water from the settling basins/solids contact clarifiers of the 1961, 1987, and 2010 trains flow through their separately designated multi-media filters into their respective clearwells and subsequently transferred into one or all of the ground storage facilities. The disinfection protocol for each train includes chlorine dioxide in the raw water entering the plant and chloramines prior to the settling basins/solids contact clarifiers prior to the clearwells and ground storage facilities. The rated treatment capacity of the 1961 train is 16 MGD, the 1987 train is rated at 16 MGD and the 2010 train is rated at 10 MGD.

Settled water from the solids contact clarifier of the MF/RO Facility is pumped through the MF/RO membrane racks and then is blended in the filtered water clearwells of the 1961 and/or 2010 treatment trains and subsequently transferred into one or all of the

ground storage facilities. The disinfection protocol includes chlorine dioxide in the raw water entering the plant from Lake Kemp and chloramines (as a biocide) prior to the MF Membranes and prior to 1961 and 2010 clearwells and ground storage facilities. The rated finished water treatment capacity of the MF/RO Facility is 10 MGD.

As required, the City of Wichita Falls monitors and test the water quality throughout the distribution system on an approved scheduled basis and included in Appendix A, are the test results of the distribution system water for the past five (5) years.

Furthermore, the City conducts scheduled distribution system monitoring and testing for trihalomethanes, haloacetic acids, asbestos, lead, and copper as described below:

- Trihalomethane/Haloacetic Acids: Wichita Falls had been on reduced monitoring according to the Stage 2 Disinfection Byproducts (DBP2) Rule 40/30 Waiver until the second quarter of 2012, when sampling for the Stage 3 Disinfection Byproducts (DBP3) Rule began. Under the reduced monitoring for the DBP2, only one distribution sample per plant (2 samples for Wichita Falls) was collected on a quarterly basis. Under the DBP3 sampling, four distribution sample sites per plant (8 samples for Wichita Falls) were collected. Samples collected on 03/26/2013 completed four quarters of DBP3 sampling the results for each site showed that the DBP3 was less than 40 ppb for trihalomethanes and 30 ppb for haloacetic acids calculated as a locational running annual average (LRAA).
- Asbestos: Wichita Falls is currently on a sample schedule of one asbestos sample every nine years. The current sampling schedule shows the sample to be collected between 01/01/2013 and 12/31/2021.
- Lead and Copper: Wichita Falls is currently on a sample schedule of fifty (50) samples every three years, with the next scheduled sample collection date being July, 2015.

4.0 EXISTING WASTEWATER TREATMENT FACILITIES

The City of Wichita Falls owns and operates the River Road Wastewater Treatment Plant (RRWWTP) which is authorized under TPDES Permit No. WQ0010509001 to treat and discharge treated effluent into the Wichita River in Segment No. 0214 of the Red River Basin. This permit was issued on December 2, 2010 and has an expiration date of midnight, December 2, 2015. In addition, the City is authorized under its Chapter 210 reclaim water Permit No. 10509-001 issued April 30, 2009, to utilize the treated effluent for Type I and Type II reclaim water uses.

The plant is located in the northeast portion of the City near the intersection of River Road and Rosewood Street, and consists of the following major treatment components:

- Bar Screens and Grit Removal
- Primary Clarifiers (3- 1,000,000 Gals. Ea.)

- Activated Sludge Basins (4- 1,150,000 Gals. Ea.)
- Secondary Clarifiers (4-1,000,000 Gals. Ea.)
- Chlorine Contact Basins (2-228,250 Gals Ea.)
- De-Chlorination Facilities

Also as required, the City of Wichita Falls, through its Pre-Treatment Program, sets certain restrictions and limitations on all dischargers of non-residential wastewater to the City treatment facilities. This program provides for a better and more uniform quality of wastewater while also preventing potential pollutant interference with the biological treatment processes at the plant. In addition, the City in cooperation with the City/County Health Department is developing a pharmaceuticals "Take Back Program" in an attempt to reduce the flushing of pharmaceuticals into the collection and treatment system.

Included in Appendix B is a schematic flow diagram of the plant, a copy of the TPDES permit, a copy of the 210 Reclaim Water Authorization Permit and a copy of the City's Pre-Treatment Program.

The plant has a rated treatment capacity of 19.91 MGD with a peak two-hour flow not to exceed 30,458 GPM or 43.85 MGD and is authorized to discharge the treated effluent in accordance with the following effluent limitations:

<u>Characteristic</u>	<u>Daily Avg.</u> <u>mg/l (lbs/day)</u>	<u>7-Day Avg.</u> <u>mg/l</u>	<u>Daily Max.</u> <u>mg/l</u>	<u>Single Grab</u> <u>mg/l</u>
CBOD (5-Day)	10 (1,661)	15	25	35
TSS	15 (2,491)	25	40	60
Ammonia Nitrogen	3 (498)	5	7	15
E. coli, CFU/100 ml	126	N/A	394	N/A

In addition, the treated effluent must contain a chlorine residual of at least 1.0 mg/l after a 20 minute detention time (based on peak flow) and then is de-chlorinated to less than 0.1 mg/l prior to discharge. The pH of the discharged effluent will not be less than 6.0 nor greater than 9.0 standard units and will contain a minimum dissolved oxygen of 4.0 mg/l.

Furthermore, the City is authorized to utilize the treated effluent as Type I or Type II reclaimed water based on the following water quality limitations:

Type I Reclaimed Water:

CBOD (5-Day)	5 mg/l (30-Day Daily Average)
Turbidity	3 NTU (30-Day Daily Average)
Fecal Coliform or E. coli Bacteria	20 CFU/100 ml (Geometric Mean)
Fecal Coliform or E. coli Bacteria	75 CFU/100 ml (Single Grab Sample)

Type II Reclaimed Water:

CBOD (5-Day)	15 mg/l (30-Day Daily Average)
Fecal Coliform or E. coli Bacteria	200 CFU/100 ml (Geometric Mean)
Fecal Coliform or E. coli Bacteria	800 CFU/100 ml (Single Grab Sample)

Based on our review the most recent historical records and reports, the City has consistently maintained and operated this facility so as to discharge and/or reuse the treated effluent well within the required effluent limitations of their permits.

5.0 IMPACT OF CURRENT DROUGHT CONDITIONS

From early March 2011 to the present, all areas within the Wichita Falls watersheds have been in Severe to Extreme Drought conditions and at times have moved into the Exceptional Drought condition category as determined and documented by the National Oceanic & Atmospheric Administration (NOAA). Furthermore based on the seasonal outlook for this area, NOAA is projecting the drought to persist or perhaps even intensify through the end of June 2013, a 40% chance that the temperatures will be above normal and even chances that the precipitation will be below normal, normal or above normal.

The Wichita Falls area normally receives rainfall of approximately 29 inches per year, however, in 2011 this area only received 12.97 inches (a historical record) and in 2012 it only received 19.81 inches. This is extremely significant when you review precipitation records for the last 114 years as shown in Appendix C and determine that there have only been ten years that the area has received less than 20 inches of annual rainfall and never in the past 114 years has there been two consecutive years, as was the case in 2011 and 2012, where the rainfall totals were less than 20 inches per year.

In June 2010 all three lakes (Lake Arrowhead, Lake Kickapoo and Lake Kemp) were near full and the City's primary water sources appeared to be in excellent condition with regards to usable capacity. However, due to the lack of rainfall, extended period of above normal temperatures and above normal wind conditions, the lake levels began to sharply decline. (See Appendix C)

By August 8, 2011 Lake Arrowhead capacity was down to 60.5%, Lake Kickapoo was at 58%, Lake Kemp was at 49.8% and in compliance with their adopted Drought Contingency Plan the City of Wichita Falls declared a Stage 1- Drought Watch.

By July 2, 2012 Lake Arrowhead capacity was down to 50.7%, Lake Kickapoo was at 47.4%, Lake Kemp was at 38.4% and in compliance with their adopted Drought Contingency Plan the City of Wichita Falls declared a Stage 2- Drought Warning.

By February 4, 2013 Lake Arrowhead capacity was down to 39.9%, Lake Kickapoo was at 40.4%, Lake Kemp was at 25.8% and in compliance with their adopted Drought Contingency Plan the City of Wichita Falls declared a Stage 3- Drought Emergency.

By November 12, 2013, Lake Arrowhead capacity was down to 28.8%, Lake Kickapoo was at 33.1%, Lake Kemp was at 25.7% and in compliance with their Drought Contingency Plan the City of Wichita Falls declared a Stage 4-Drought Disaster.

Currently, the combined lake capacities are well below 29% and continue to fall on a weekly basis. In addition, of grave concern, should the area precipitation going forward be similar to the 2011 totals it is highly likely all three lakes could be out of water by the latter part of 2015. Obviously this would pose a significant health risk for more than 140,000 people that depend on the water supply from the three lakes.

6.0 DESCRIPTION OF PROPOSED PROJECT

Having considered numerous options to extend the useful life of the current water supply from the three lakes, it is proposed that the City develop and implement an emergency reuse project and a plan of action to temporarily utilize its treated wastewater effluent to augment their supply of raw water from Lake Arrowhead and Lake Kickapoo.

Under normal conditions, the City consistently discharges approximately 11 MGD of treated wastewater into the Wichita River. However, under the current drought conditions and water use restrictions, the discharge is averaging 8 MGD which is of a quality that could be blended with the raw surface water from Lake Arrowhead and Lake Kickapoo to provide for up to 5 MGD of additional water supply for the City. This appears to be the most viable option and one that could be implemented and facilities constructed and operational by the first quarter of 2014.

It is proposed to construct temporary skid mounted pumps at the RRWWTP and pump the high quality treated effluent through a temporary transmission line to the Cypress WTP for blending on a 50/50 basis with Lake Kickapoo and Lake Arrowhead raw surface water. The effluent would be treated through the Cypress MF/RO Facility prior to being blended with the lake water and subsequently the blended water would then be treated through the 2010 10 MGD conventional treatment plant prior to entering the distribution system.

7.0 PROPOSED REUSE CONVEYANCE FACILITIES

The proposed reuse conveyance facilities include two temporary skid mounted pumps to take the treated effluent directly from the RRWWTP chlorine contact basin and pump it through a 32" High Density Polyethylene Pipe (HDPE) to the Cypress WTP MF/RO Facility.

It is proposed to install a 450 HP electric motor driven primary lead pump and also a 450 HP diesel motor driven standby pump with each rated to pump a minimum of 8 MGD (5,556 GPM) at a discharge head of approximately 75 psi. The two pumps would be designed to operate in parallel and the standby pump would only be utilized if the primary lead pump failed. Pumps will be controlled by a variable frequency drive (VFD) so that a consistent and uniform rate of flow can be maintained into the Cypress WTP.

Approximately twelve miles (65,000 LF) of 32" HDPE will be temporarily installed above ground from the RRWWTP to the Cypress WTP. The first eight miles (43,000 LF) will be installed within the banks of an existing earthen channel known as Holliday Creek. This creek is a flood control channel with minimal annual flows and very limited aquatic life. Typically, large portions of the channel bed are dry with random/sporadic areas of shallow standing water after a large rain event. The remaining four miles (22,000 LF) will be installed generally within an existing concrete lined drainage channel and a portion of railroad right-of way and a portion of irrigation channel, until finally terminating at the Cypress WTP site. The effluent will enter the treatment process through an existing flow control vault structure located just prior to the Cypress MF/RO clarifier.

On April 5, 2013 detailed plans for the temporary pipeline and pump station were provided to TCEQ and by letter dated April 8, 2013 TCEQ approved for construction the proposed conveyance facilities as submitted. (Temporary DPR Conveyance Facilities-Appendix N)

Since the 12 miles of pipeline will be constructed above ground and may be susceptible to damage, the City has developed a "Pipeline Inspection and Emergency Response Plan" to provide a systematic way to inspect and make any required repairs to the line between the RRWWTP and the Cypress WTP. This Plan is included in Appendix D.

8.0 PROPOSED REUSE TREATMENT FACILITIES

In order to minimize the likelihood that reuse effluent microorganisms will pass through the treatment system and survive in the water supplied to the public, the City proposes to utilize a multi-barrier treatment approach as conceptually agreed to by TCEQ. The existing treatment facilities to be utilized and evaluated include disinfection within the 32" diameter conveyance pipeline, the MF/RO treatment train, and the 2010 conventional treatment plant. However, since the TCEQ does not have rules that contain minimum design, treatment, operating, maintenance, monitoring and reporting requirements for direct reuse sources or Direct Potable Reuse Water Treatment Plants (DPR WTPs), the City is requesting an exception to 30 TAC 290.41 (Water Sources) and 30 TAC 290.42 (Water Treatment). These exception requests are included in Appendix E.

In addition, to comply with TAC 290.39(l) (Exceptions) the following detailed information and data is provided so as to demonstrate to the satisfaction of TCEQ that granting the requested exceptions will not compromise the public health or result in a degradation of service or water quality. Furthermore, the data is in direct response to their February 8, 2013 letter in which TCEQ provided comments and guidance to the City on their "Concept Paper for the Emergency Reuse of Wastewater Effluent as a Source for Direct Potable Reuse in Wichita Falls" (Concept Paper), which had been previously submitted to TCEQ on November 13, 2012. (See Appendix F)

Description of DPR Treatment Process and Compliance Standards: The RRWWTP effluent will be treated through the Cypress MF/RO facility in series with the Cypress WTP 2010 conventional treatment train. Chlorine will be added to the treated effluent at the RRWWTP and pumped through approximately 12.3 miles of temporary HDPE pipe to the Cypress WTP. Major membrane train treatment components to be utilized at Cypress WTP include clarification, followed by MF/RO treatment. Subsequently, the treated effluent will be mixed with the conventional source water and then treated through the 2010 treatment train which includes pre-disinfection, coagulation, flocculation, clarification and granular filtration followed by post-disinfection. (See Appendix G)

The following major components of the MF/RO treatment train and the 2010 conventional treatment train are available for use as part of the DPR treatment process:

MF Feed Pumps: 5 VFDs @ 3.6 MGD EA.
MF Backwash Pumps: 2 CS @ 7.92 MGD EA.
MF CIP Pump: 1 CS @ 2.88 MGD EA.
MF Membrane Units: 5 @ 2.788 MGD EA.
RO Feed Pumps: 5 VFDs @ 3.0 MGD EA.
RO Membrane Units: 6 @ 2.0 MGD EA.
Brine Pumps: 2 CS @ 4.32 MGD EA.
Recovery Well Pumps: 2 CS @ 4.32 MGD EA. and 2 CS @ 15 MGD EA.
2010 Gravity Filters: 5 @ 2.59 MGD EA.
2010 Transfer Pumps: 2 VFDs @ 10 MGD EA. and 2 CS @ 5.75 MGD EA.
2010 Clearwell: Full (11.3') – 216,290 Gals. and Low Level (5.7') – 109,102 Gals.
2010 Ground Storage: Full (40') – 10 MG and Low Level (20') – 4.98 MG

All chemicals to be utilized in the treatment processes comply with NSF Standards and currently include phosphate blends, membrane cleaners/antiscalant, coagulants and coagulant related chemicals, disinfection chemicals and chemicals for pH adjustments. NSF certifications are included in Appendix G for carbon dioxide, anhydrous ammonia, chlorine, sodium hypochlorite, sodium hydroxide, ferric sulfate, liquid ammonia sulfate, hydrofluosilicic acid, sulfuric acid, sodium bisulfate, chlorine dioxide, and quicklime.

In addition, the mixture ratio of reuse effluent to conventional lake source water will not exceed 50% and to further ensure that the public health is protected from certain microbial contaminants, the DPR WTP will be maintained and operated so to provide for 9-log removal of Viruses, 6-log removal of Giardia Cysts, and 5.5 log removal of Cryptosporidium Oocysts. Furthermore the DPR WTP finished water shall comply with primary and secondary public drinking water standards as set forth in TAC 290.104 and TAC 290.105 and these standards are included in Appendix G.

The existing "Reuse Flow Meter" from Lagoon No. 3 and 2010 Parshall Flume flow measurements will be utilized to maintain a 50/50 ratio of RO permeate source water to Secondary Reservoir water. The location of these two measuring devices is shown on Plan Sheet 1 of 8 (Temporary DPR Cypress WTP Piping Modifications) in Appendix N, and both devices are continuously monitored in the Cypress WTP control room. The

“Reuse Flow Meter” will be set to allow for a maximum flow rate of 5.0 MGD and the 2010 Parshall Flume will be set to allow for a maximum rate of 10.0 MGD. Subtracting the difference in the two flow instruments will be used to determine the surface water flow rate and hence to maintain the 50/50 ratio of RO permeate source water to Secondary Reservoir water.

RRWWTP Effluent Quality: The RRWWTP produces an excellent quality of water which is well in compliance with the permitted TPDES discharge limits as required by TCEQ. In addition, based on our review of the effluent lab results data shown in Appendix H, the effluent meets the majority of primary and secondary drinking water standards with the exception of the following:

<u>Primary Standards:</u>	<u>MCL's</u>	<u>Max. Measured</u>	<u>Avg. Measured</u>
➤ Arsenic	0.010 mg/l	0.0161 mg/l	0.004 mg/l
➤ Nitrate	10.0 mg/l	70.04 mg/l	27.53 mg/l
➤ THM (Total)	0.060 mg/l	0.164 mg/l	0.053 mg/l
<u>Secondary Standards:</u>	<u>MCL's</u>	<u>Max. Measured</u>	<u>Avg. Measured</u>
➤ Aluminum	0.05-0.2 mg/l	0.067 mg/l	0.039 mg/l
➤ Chloride	300 mg/l	654 mg/l	276 mg/l
➤ Color	15 Units	18 Units	7.20 Units
➤ Fluoride	2.0 mg/l	2.64 mg/l	0.98 mg/l
➤ Iron	0.3 mg/l	1.2 mg/l	0.26 mg/l
➤ pH	≥ 7.0	7.90	6.91
➤ TDS	1000 mg/l	1816 mg/l	816 mg/l

It is anticipated that all of the above constituents will be reduced well below the required MCL's following the DPR treatment process which will include the MF/RO train followed by conventional treatment through the 2010 plant.

Also, in order to increase the measures in place to protect the supply of water from the RRWWTP to the Cypress WTP, the City has agreed to modify their Pre-Treatment Program in accordance with the August 5, 2013 letter of response to TCEQ included in Appendix B. These modifications will remain in effect throughout the operation of the Temporary DPR facilities.

RRWWTP Operating Procedures: The RRWWTP is a well maintained wastewater treatment plant which is manned 24 hours a day 7 days a week by experienced and highly qualified personnel. A listing of both wastewater and water plant personnel along with their qualifications is provided in Appendix I.

However, in the event that the wastewater treatment process cannot meet the quality needed by the Cypress WTP, the water treatment plant will have to be notified and the

reuse water transfer will be immediately stopped. Though not an exhaustive list, the following are shut-down triggers for the RRWWTP:

- A high Dissolved Oxygen demand in two or more of the Aeration Basins requiring an increase of Air output greater than 40% (based on the last eight hours or flow and loading) for more than four hours to maintain the DO set point under normal flow conditions.
- Power failure in any part of the Process
- Petroleum detected in the Final Clarifiers.
- Solids Washout in the Final Clarifiers.
- Surfactant visible in the Aeration Basins or the Final Clarifiers. (This will be confirmed with a sample tested for foaming. If the foaming action cannot be replicated no action will be taken.)
- Unexplained high demand for Chlorine or loss of Demand that takes place in less than two hours.
- Chlorine failure. (This would be a failure in the Chlorine feed.)
- Artificially discolored water in the Headworks and Primaries. (This would be water that is artificially colored by something introduced to the system. Indicators would be Orange, Green, Blue, or sparkles in the water. Black water is acceptable because septic condition in the collection system does bring in black water.)
- Planned Maintenance
- Fish Kill (Two or more “indicator” goldfish suddenly die at the outfall.)
- Detection in the EPA Method 1623 of Giardia cysts in excess of 7,000 cysts per 100 Liters (70 cysts per Liter) in the Wastewater Effluent water.
- Detection in the EPA Method 1623 of Cryptosporidium oocysts in excess of 948 oocysts per 100 Liters (9.48 cysts per Liter) in the Wastewater Effluent water.
- Detection of Total Culturable Viruses in the Wastewater Effluent in excess of 22.2 MPN/L.
- Wastewater Effluent does not meet the permit limits for the Discharge Permit or the Type II limits from the 210 Reclaimed Water Authorization.
- Any indication that there is toxicity in the daily microscopic exam. (A microscopic exam will be done while water is being sent to purification and before the start up of sending water to purification. The exam is lined out in the Standard Operating Procedures and is also included in Appendix I.

Any shutdown triggering will be reported by telephone, within 24 hours, to the TCEQ Central Office Water Supply Division and the Abilene Regional Office.

MF/RO and 2010 Cypress WTP Operating Procedures: Both the MF/RO and the conventional 2010 Cypress WTP facilities are also well maintained and are manned 24 hour a day 7 days a week by experienced and highly qualified personal. As previously mentioned a listing of the water plant site personnel along with documentation of their qualifications is provided in Appendix I.

As added operational protection and enhanced monitoring and control of the treatment process, both the MF/RO and 2010 conventional plant currently have some continuous online monitoring instrumentation, and specifically for the temporary reuse project the City proposes to provide for additional instrumentation on the MF/RO and the conventional plant. The following is a listing of both existing and proposed online monitoring for each facility:

MF/RO Flow Control Vault Instrumentation:

- Existing Flow Meter
- Proposed pH Meter
- Proposed Available Free Ammonia
- Proposed Free Chlorine
- Proposed Monochloramines
- Proposed Total Chlorine

MF Trough Influent Instrumentation:

- Existing Turbidity Meter
- Existing Chlorine Residual
- Existing pH Meter
- Existing Temperature

MF Filtrate Instrumentation:

- Existing Turbidity Meter
- Existing Flow Meter
- Existing pH Meter
- Existing Chlorine Residual
- Existing Temperature
- Proposed Monochloramines
- Proposed Total Chlorine Residual
- Proposed Free Chlorine Residual
- Proposed Free Available Ammonia

RO Feed Instrumentation:

- Existing Flow Meter
- Existing pH Meter
- Existing ORP Meter
- Existing Conductivity Meter
- Proposed Turbidity
- Proposed TSS Meter

RO Permeate Instrumentation:

- Existing Flow Meter
- Existing pH Meter
- Proposed TDS Meter

RO Concentrate Instrumentation:

- Existing Flow Meter
- Existing Conductivity Meter

Washwater Return Pump Station Instrumentation:

- Existing Flow Meter

Secondary Reservoir Instrumentation:

- Proposed Turbidity Meter

2010 Parshall Flume Instrumentation:

- Existing Flow Meter
- Proposed Total Chlorine Residual
- Proposed Monochloramines
- Proposed Free Chlorine Residual
- Proposed Free Available Ammonia

2010 Filter Effluent (Filtrate) Instrumentation:

- Existing Turbidity Meter
- Existing Flow Meter
- Proposed Temperature
- Proposed pH Meter
- Proposed Free Available Chlorine
- Proposed Free Chlorine
- Proposed Monochloramines
- Proposed Chlorine Residual

2010 Clearwell Effluent Instrumentation:

- Existing Flow Meter
- Existing Chlorine Residual
- Existing Fluoride
- Existing Turbidity Meter
- Proposed Temperature
- Proposed pH Meter
- Proposed Monochloramines
- Proposed Free Chlorine Residual
- Proposed Free Available Ammonia
- Proposed Total Chlorine Residual

High Service Pump Station Instrumentation:

- Existing Flow Meter
- Existing Chlorine Residual

In addition to the online monitoring, the 2010 conventional treatment facility has filter to waste capabilities that are pre-programmed into the backwash sequence and operation of the existing plant filters that will continue to be utilized as part of the temporary reuse treatment facilities.

In the event that the MF/RO or 2010 treatment processes cannot meet the required water quality standards, the temporary reuse treatment facilities at the Cypress Site will be immediately stopped. Though not an exhaustive list, the following are shut-down triggers for the R/O and 2010 Conventional Treatment Facilities:

Violation of Primary Drinking Water Standard:

- A violation of any primary drinking water standard, measured at the POE.

Chlorine:

- CT failure (would be caused by low/no chlorine residuals in transmission line and throughout the plant)
- Systemic problems with chlorine residuals in the distribution system dropping below 1.5 ppm, collected at the distribution system bacteriological sample sites.
- Notify Supervisors if discharge chlorine residual drops below 3 ppm.

Turbidity:

- Tap turbidity is over 0.3 NTU.
- Notify Supervisors if tap turbidity is over 0.2 NTU during any hourly monitoring.
- Notify Supervisors if all IFE turbidity readings are over 0.3 NTU for 2 consecutive 15 minute intervals

Micro-filtration:

- Any MF membrane unit that fails a DIT will be removed from service until it passes a DIT.
- Any MF IFE turbidity level that exceeds 0.100 NTU for 2 consecutive 5 minute readings, will trigger a shutdown (or filter to waste) until such a time the filter can perform below 0.100 NTU.
- Any MF CFE turbidity readings that exceeds 0.15 NTU for 2 consecutive 5 minute readings, will trigger a shutdown and an investigation of the MF system.

Reverse Osmosis:

- SDI over 3, water must by-pass the RO to brine pump station until SDI is below 3.
- ORP over 500, or any detectable chlorine residual, water must by-pass the RO to Brine Pump Station.

Nitrate:

- Nitrate of 10 ppm in the conventional plant POE will require a shutdown of reuse.
- Nitrate of 10 ppm in RO permeate will require shutdown of RO train.

Coliform:

- A repeat total coliform positive sample at distribution system bacteriological sample site.
- An *E. coli* sample positive at distribution system bacteriological sample site.

THM/HAA:

- THM/HAA samples of 80/60 ppb, respectively, or greater at maximum residence sample location in distribution system.
- THM/HAA samples of 40/30 ppb, respectively, or greater at POE.

Cryptosporidium/Giardia/Viruses:

- Crypto/Giardia positive in RO permeate.
- After filtering a minimum of 15 Liters at the POE to the Distribution System and analyzing it with the EPA Method 1623, any detection of Giardia or Cryptosporidium will trigger a shutdown.
- After filtering water at the POE to the Distribution System and analyzing it for Total Culturable Viruses, any detection will trigger a shutdown.
- Using the City's methodology for on-site q-PCR, any detection of Human Pathogenic Giardia or Cryptosporidium at the POE to the Distribution System will trigger a shutdown.

Identified Waterborne Pathogen Outbreak:

- Any identified waterborne pathogen outbreak, will be researched and communicated in conjunction with the Health Department and Water Quality Task Force.

Pipeline:

- A leak in the transmission line from WWTP to Cypress WTP that requires the line be dewatered for repair.

Power Outage:

- A power outage that causes shutdown of the MF/RO, the 2010 WTP or the chemical feed systems will also require shutdown of the transmission of water from the River Road WWTP to the Cypress WTP.

Any shutdown triggering will be reported by telephone, within 24 hours, to the TCEQ Central Office Water Supply Division and the Abilene Regional Office.

Source Water Disinfection Regime: The reuse source water and the conventional source water will have multiple disinfection application points throughout various portions of the treatment process as listed below.

Conventional Source Water From Lakes:

- ClO₂ at Secondary Reservoir (1 Mile Pipeline Prior To Cypress WTP)
- Chloramines Prior to 2010 Plant Rapid Mix
- Chloramines Prior to 2010 Clearwell/Ground Storage

Reuse Source Water from RRWWTP:

- Chloramines 12.3 Mile Pipeline Prior to Cypress WTP
- Chloramines Prior to MF/RO Clarifier
- Chloramines Prior to MF Filtration
- De-Chloramination Prior to R.O.
- Chloramines Prior to 2010 Plant Rapid Mix
- Chloramines Prior to 2010 Clearwell/Ground Storage

Anticipated Removal/Log Inactivation Through DPR WTP: To insure the public health is protected from certain microbial contaminants, calculations were performed to determine the removal credits that can be expected through the various treatment trains that make up the multiple barrier DPR WTP. Calculations as shown in Appendix J were based on the existing Surface Water Treatment Rules (SWTR) and approved CT studies that provide for approved removal credits. The following prepared tables show the anticipated removal credits for each DPR treatment unit and for temperatures of 30 degrees centigrade, 7.5 degrees centigrade (MF/RO Plant) and 5 degrees centigrade for the conventional 2010 plant.

Viruses (Need 9 – Log Total)

Process	Agent	Temperature	Log Removal
Pipeline from RRWWTP	Monochloramine	30°C	3.87 ¹
		7.5°C	1.63 ¹
MF/RO Clarifier	Monochloramine	30°C	2.42 ¹
		7.5°C	1.02 ¹
Microfilters	Monochloramine	30°C	0.03 ¹
		7.5°C	0.07 ¹
Microfiltration	Physical Removal		2.0 ²
Reverse Osmosis	Physical Removal		0.0
Conventional Plant	Total Chlorine/CLO2	30°C	11.75 ¹
		5°C	2.48 ¹
Conventional Plant	Physical Removal		2.0 ³
	Total	30°C	22.07
	Total	7.5°C	9.20

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 7 – Log Total)

Process	Agent	Temperature	Log Removal
Pipeline from RRWWTP	Monochloramine	30°C	1.4 ¹
		7.5°C	1.4 ¹
MF/RO Clarifier	Monochloramine	30°C	0.88 ¹
		7.5°C	0.88 ¹
Microfilters	Monochloramine	30°C	0.01 ¹
		7.5°C	0.01 ¹
Microfiltration	Physical Removal		2.8 ²
Reverse Osmosis	Physical Removal		0.0
Conventional Plant	Total Chlorine/CLO2	30°C	4.25 ¹
		5°C	4.25 ¹
Conventional Plant	Physical Removal		4.5 ³
	Total	30°C	13.84
	Total	7.5°C	13.84

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	Temperature	Log Removal
Pipeline from RRWWTP	Monochloramine	30°C	0.0
		7.5°C	0.0
MF/RO Clarifier	Monochloramine	30°C	0.0
		7.5°C	0.0
Microfilters	Monochloramine	30°C	0.0
		7.5°C	0.0
Microfiltration	Physical Removal		2.8 ¹
Reverse Osmosis	Physical Removal		0.0
Conventional Plant	Total Chlorine/CLO2	30°C	0.0
		5°C	0.0
Conventional Plant	Physical Removal		4.5 ²
	Total	30°C	7.3
	Total	7.5°C	7.3

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).

As shown in the above tables, the calculated removal credits are above the needed minimum for Viruses, Giardia, and Cryptosporidium.

Furthermore, based on the results shown in the above tables, with the exception of Cryptosporidium and Viruses at the lower temperatures, even with a loss of any one treatment barrier, the City could still meet the minimum log removal requirements needed for Giardia and Viruses.

9.0 DPR VERIFICATION TESTING

In accordance with the TCEQ requirements, the City proposes to conduct Full-Scale Verification (FSV) testing of the DPR WTP at a finished water flow rate of 4 MGD for 30 continuous days in addition to another 15 days following a clean-in-place (CIP) procedure on the MF/RO units to verify that the CIP procedures were effective in flux recovery. The total verification testing period will be for 45 continuous days with the treatment facility continuously producing a water quality that meets or exceeds the requirements of 30 TAC 290 Subchapter F. During the 45 days, the City will need to utilize two M/F membrane filters, two R/O skid filters, and two granular filters so that each primary/lead filter can be taken out of service during the periodic backwash cycles. However, it is anticipated that the same two filters for each type of filtration would be utilized throughout the 45 day verification period.

As requested, the City has prepared a FSV Testing Protocol which has been included in Appendix K along with a schematic diagram showing the hydraulic detention times and sampling locations through the DPR WTP. In addition, the testing costs that will be incurred for this 45 day testing period is also shown in Appendix K, and totals to approximately \$133,000.

Upon completion of the verification testing, the City will produce a FSV Testing Report for TCEQ review and written approval prior to discharging treated water from the DPR WTP into the distribution system.

All water from the DPR WTP will be discharged into the Wichita River in accordance with the current waste discharge permit number WQ0004419000 issued on February 9, 2006 and included in Appendix N.

10.0 CUSTOMER AND PUBLIC NOTIFICATIONS

Both wholesale and retail water customers have been informed and notified by the City of Wichita Falls that they (City) intend to utilize treated effluent to supplement their source water supply. Documentation and description of this notification is provided below.

Wholesale Customers:

City staff and the consulting engineer held a meeting for wholesale customers on March 28, 2013 at 10:00 am at City Hall. The purpose of the meeting was to inform the customers of the City's impending Direct Potable Reuse Project.

The agenda, attendees, and the information distributed to the customers is provided in Appendix L. City staff gave a brief overview of the historical causes for the drought, discussed actions we had taken up to this point, and described for the customers the Indirect Potable Reuse (IPR) and Direct Potable Reuse (DPR) as defined by the TCEQ.

Staff then described in detail the City's DPR project, flow diagram, full scale testing protocol, and answered questions from the customers. All customers present were in support of the City DPR project.

Retail Customers:

The City's water reuse project has been promoted extensively through the following venues:

Local Television News Programs:

The NBC (KFDX-TV3), CBS (KAUZ-TV6) and ABC (KSWO TV7) television stations have covered the project several times during their morning, noon, 6pm and 10pm newscasts. These stations have also reported on the program on their websites and short promotional commercials.

Time Warner Cable Channel 11 (City Channel):

The project has been promoted and discussed many times on the City's PEG Channel (City Channel 11) during live and re-airing City Council meetings, press conferences, promotional commercials and a specific water reuse program called Downstream produced by the Water Reuse Association. This program is eight minutes long, airs several times a week and is linked to You Tube from the City's website. The potential reach of this channel is approximately 24,000 subscribers.

Local Radio Stations:

Local radio station 104.7 FM the Bear, Cumulous Broadcasting, has mentioned and discussed the program at length many times during the past three months. Newstalk 1290 AM, Town Square Media, has also discussed the program many times through their morning talk show and daily news updates. They have also included City staff during live programs to answer questions from the public and discuss the program.

Newspaper- Times Record News:

The Times Record News has covered the project extensively for several years reporting on statewide and local news and issues involving the State Legislature, Texas cities and the City of Wichita Falls. Just in 2013 they have published 20 stories covering the project in editorials, letters to the editor and news articles.

Facebook:

The program has been discussed many times on the City's Facebook page and continues to be brought up periodically. The City's page has 6535 likes with an average view of posts at 2300.

Twitter:

All items posted to the City's Facebook page are also "tweeted" to 336 Twitter followers

Public Meetings:

The project has been discussed with the public and City staff during City Council meetings, City Council Planning Workshop, the Mayor's Quarterly Public Forum, a special called meeting with the local media, Water Commission meetings, and in general as the public has inquired with City staff through emails, over the phone and in person.

Press Conferences:

To announce the need for the City to call a Stage 3 Drought Emergency the City held a press conference attended by the Mayor, City Manager, City staff and local media to discuss a wide range of issues including the water reuse project.

Press Releases:

The Public Information Office sends out press releases weekly. The water reuse project has only been mentioned specifically once, although, it is included in most general discussion under a general term of "water related issues or topics." Press releases are sent to 60 area media representatives. Posted on Facebook and Twitter and sent to just over 2400 citizens signed up to receive the releases by email through a module on the City's website called Notify Me.

Events:

The City has plans to have a booth at the upcoming Health Fair to discuss water issues and water reuse. The Mayor and staff have also addressed the issue with local clubs and organizations during luncheons and meetings.

In addition, a DPR Task Force has been created which is comprised of environmental professors, from Midwestern State University, as well as a team of doctors from the United Regional Health Care Hospital. On April 6, 2013 two medical doctors and two university professors from the task force toured both the Wastewater Treatment Plant and the Cypress Water Treatment Plant and were provided with the testing data, a project concept paper, and the TCEQ protocol for DPR projects. The medical doctors and professors that completed the tour were:

- Dr. Ahmed Mattar, MD who is a Family Practice physician and also serves as the local Health Authority and Director for Clinical Programs.
- Dr. Robert McBroom, Jr. MD who is a practicing physician and Board Certified in Internal Medicine and Infectious Diseases.

- Dr. Randal Hallford who is a professor of Physical Chemistry at Midwestern State University.
- Dr. Rebecca Dodge who is a professor of Geosciences at Midwestern State University.

Upon completion of the tours and review of the materials, staff and the task force discussed the various components of the project with favorable support from the medical doctors and the professors..

In addition, the project has been presented to the City/County Health Board as well as the Health Care Coalition and received unanimous support from both organizations.

11.0 PRO-ACTIVE HEALTH AND SAFETY INITIATIVES

The City of Wichita Falls-Wichita County Public Health District (Health District) has prepared a Disease Surveillance and Response Program which is included in Appendix M. The Health District Nursing Division is the lead unit in managing the jurisdiction's Disease Surveillance Program and works in close collaboration with the Public Health Emergency Preparedness (PHEP) Program. The reporting sources utilized and described in this program which include 1) Electronic Syndromic Disease Surveillance, 2) Health Care Provider Disease Reporting and 3) Web-based School Influenza Surveillance will assist the City of Wichita Falls in monitoring and providing early detection of any waterborne disease outbreak.

In addition, in 1997 a Water Quality Task Force (WQTF) was formed in Wichita Falls as a result of the highly publicized Cryptosporidiosis outbreak in Milwaukee (1993). The two Departments that are responsible for the Task Force are Public Works and the Health Department. They are the only two Departments that are allowed to Chair and Vice-Chair the Task Force. The primary positions that make up the WQTF are as follows:

Public Works Department:

- Director of Public Works
- Utilities Operations Manager
- Water Source/Purification Superintendent
- Wastewater Treatment Superintendent
- Water Purification Laboratory Supervisor
- Wastewater Treatment Laboratory Supervisor
- Pollution Control Specialist

Health Department:

- Director of Health
- Assistant Director of Health
- Nursing Administrator
- Preventative Health Services Supervisor
- Environmental Administrator

Public Health Preparedness
Laboratory Administrator
Environmental Inspections Supervisor

Other additional members may include personnel from the Fire Department, Public Information Office, and a representative from the City Managers' Office.

Regular meetings are held to discuss any issues pertaining to Public Health as it relates to water and/or wastewater and emergency meetings are declared if one of the triggers (from Health, Water or Wastewater) are activated. There have been several such emergency meetings, usually in response to a Health Department trigger, at which time all necessary data is collected from the plants to ensure that the problem was not originating from the drinking water. Also, testing support is provided to help confirm the origin of the problem and it should be noted that to date, we have never had the drinking water implicated in any event.

The WQTF is also tasked with providing supporting information to the City Council on Water Quality issues and development of outreach materials for the public on specific water/wastewater issues.

Water purification triggers for a WQTF meeting include the following:

- Violation of any State or Federal Drinking Water Rules. Those rules include, but are not limited, Primary Drinking Water Standards, Total Coliform Rule, Surface Water Treatment Rule, Stage 2 Disinfection/Disinfection By-Product Rule, and Lead/Copper Rule.
- Systemic loss of Total Chlorine Residuals at Bacteriological sampling points within the Distribution System.
- Accidental or Intentional contamination event within a Water Plant or the Distribution System.

Wastewater triggers for a WQTF meeting include the following:

- Raw Wastewater Quality indicating Escherichia coli (E.Coli) count cfu/l is greater than 10 fold of the 90 day mean and has ascended over seven days.
- Raw Wastewater Quality indicating Escherichia coli (E.Coli) count cfu/l is greater the 100 fold of the 90 day mean for 3 of the last four days.
- Raw Wastewater shows colored water and or material into the plant in quantities great enough to discolor all Primary treatment water and or causes staining of objects that come into contact with the water.
- Raw Wastewater shows artificially colored water and or material into the plant on a cyclical pattern after the sixth cycle.

- Raw Wastewater shows presence of petroleum products into the plant on a cyclical pattern after the sixth cycle.
- Any indication of a toxin causing the interruption of the biological process lasting longer than 72 hours and confirmed by laboratory testing and or microscopic exam.
- The presence of a surfactant either causing excessive foaming beyond the confines of the basins and or the dispersal of the biological floc.
- The presence of a surfactant either causing excessive foaming and or the dispersal of the biological floc on a cyclical pattern after the sixth cycle.

An Emergency WQTF meeting can be called by the Director of Health if there is an indication that a waterborne disease outbreak exists. For surveillance purposes, a waterborne disease outbreak is defined as an acute illness affecting two or more persons with similar symptoms epidemiologically associated with ingestion of water or other exposure to water intended for drinking.

Health Department triggers for an Emergency WQTF Meeting include the following:

- A healthcare provider or laboratory reports waterborne disease, and the resultant epidemiological investigation determine that the individual cases or group of illnesses originates, or are suspected of originating, from the municipal drinking water supply.
- The municipal drinking water supply is suspected to be the source of a waterborne illness because a cluster of cases is identified among people who drank from the same water source and who have similar dates of onset, and no alternative sources of infection have been identified.
- Electronic disease surveillance programs issues multiple alerts for an unusually high number (exceeding thresholds) of:
 - Gastrointestinal complaints;
 - Gastrointestinal complaints clustered in one area of the jurisdiction (e.g., one zip code);
 - Pharmacy sales of anti-diarrhea medications; and
 - Substantiation from hospital Infection Control Practitioners that a common illness or source is suspected or confirmed.

The decision to call for an Emergency WQTF meeting will be made by the Director of Health based on the above mentioned triggers, or any other verifiable factors that may indicate an outbreak of waterborne illness.

Any triggering of the WQTF will be reported by telephone, within 24 hours, to the TCEQ Central Office Water Supply Division and the Abilene Regional Office.

12.0 CYPRESS WTP TEMPORARY PIPING MODIFICATIONS

The City will be required to temporarily modify the site piping in order to accommodate the requirements of the DPR WTP. These proposed modifications are shown in Appendix N (Temporary Cypress WTP Piping Modifications-Sheets 1 of 8 through 8 of 8) and are generally described below.

- Minimum 24" pipe laid above ground from the 36" RO permeate line directly into the existing Lagoon No. 3. The existing 36" permeate line will be temporarily cut and disconnected from the clearwells of the 1961 SWTP and the 2010 SWTP.
- Existing 42" 90 degree bend will be removed from the 2010 SWTP transfer pump header and an 18" pipe laid above ground to an existing manhole that discharges into the existing recovery well. The 2010 SWTP transfer pumps will be disconnected from all three existing ground storage tanks.
- The existing backwash supply pumps in the High Service Pump Station will be disconnected from the existing 24" backwash line. A temporary 24" pipe will be laid above ground to supply backwash water to the 2010 SWTP filters from the 2010 SWTP clearwell.
- A temporary 18" line will be laid from the Valve Vault (located north of Lagoon No. 2), to discharge into the existing 20" Brine Line that ultimately discharges into the Wichita River.
- Piping at the Lagoon No. 3 pump station will be modified to prevent water from Lagoon No. 2 or from the FTW line from entering the pump station or entering Lagoon No. 3.
- Existing 24" valve in the Lake Kemp/Headquarters Rd. Flow Control Vault will remain closed at all times.
- Weir gates in the Cypress WTP Splitter Box feeding the 1961 SWTP and the 1987 SWTP will remain closed at all times.
- Existing drain valves in the 1961 SWTP settling basins and the 1987 SWTP Parshall Flume will remain open during the FSV testing and throughout the duration of the temporary DPR operations.

Also, included in Appendix N is a copy of the existing brine discharge permit from the Cypress WTP to the Wichita River.

Finally, as required by TCEQ, each individual MF membrane unit and each RO skid must be equipped with cross-connection protection in the form of an air gap, double block-and-bleed system, isolation valves with removable spools or another TCEQ approved method. Cross-connection protection must be in place (prior to FSV testing) for feed water piping, MF filtrate piping, RO permeate piping, backwash supply piping, backwash waste piping, RO concentrate piping, maintenance clean solution piping, maintenance clean recirculation piping, maintenance clean solution waste piping, CIP solution feed piping, CIP solution recirculation piping, and CIP solution waste piping.

13.0 UNREGULATED CONTAMINANTS

Typically, water quality is evaluated by comparing the measured concentration of a particular substance with the respective benchmark values based on drinking water standards (MCL's). However, there are many chemicals for which no regulated drinking water standard has been established. Based on their testing of numerous compounds, the City of Wichita Falls has detected forty-four (44) non regulated chemicals in their wastewater effluent. These include pharmaceuticals, personal care products, wastewater indicators, endocrine disrupters, household products, disinfection by-products and metals.

Included in Appendix O, is a listing and description of each one of the detected chemicals in addition to minimum, maximum, and average measured values. Also, as available, the acceptable daily intake (ADI) values for the various chemicals were shown.

Finally, it should be noted that there were twelve (12) of these unregulated chemicals that were also detected in either the raw surface water and/or the tap water.

14.0 TCEQ CONDITIONAL DPR APPROVAL

The proposed use of the RRWWTP effluent as a raw water source and the associated treatment processes for a DPR WTP require exceptions to 30 TAC Chapter 290, Subchapter D regulations. Exceptions are required for the following:

- The use of RRWWTP effluent in lieu of groundwater or surface water as a source of water for a public water system. (30 TAC 290.41)
- Isolation of the Cypress 1961 and 1987 Cypress WTP equipment and piping during the FSV Testing to prevent potential contamination of these facilities and a risk to the public health when the Cypress 2008 and 2010 SWTPs are returned to normal operations treating only raw surface water. (30 TAC 290.42(d)(2))
- The use of pre-formed chloramines as a pre-disinfectant. (30 TAC 290.42(e)(3)(G))

- The use of chloramines for inactivation credit. (30 TAC 290.42(e)(3)(G))
- MF membranes for the removal of pathogens. (30 TAC 290.42(g)(3))
- RO membranes for the removal of primary and secondary drinking water chemical contaminants. (30 TAC 290.42(g))
- Post-RO membrane pH adjustments. (30 TAC 290.42 (g))

In accordance with a letter dated September 5, 2013 TCEQ conditionally granted approval for all the above temporary exceptions provided the City complies with all the enumerated conditions and enclosures contained in the letter. The conditional approval is valid for a period of two (2) years from the date of the approval letter or until the City completes a TCEQ acceptable FSV Test, whichever occurs first.

The City intends to construct the required plant modifications, conduct a FSV Test of the DPR WTP, and submit a TCEQ approvable FSV Test Report within the allotted time frame.

Included in Appendix Q, is a “Summary of Temporary Exceptions & Conditions” along with the TCEQ letters and enclosures of September 5, 2013 and October 15, 2013.

For reference, page numbers have been included on the “Summary of Temporary Exceptions & Conditions” which denotes where in the Final Engineering Report the required condition has been addressed for compliance.

15.0 POST DPR DISINFECTION PROCEDURES

The treatment of wastewater effluent through the MF/RO and Conventional Plants at the cypress site, enhances the risk of increased microbial loading through the treatment processes. Therefore, as the City converts back to its standard operation (100% Lake Water), the disinfection of certain components will be warranted.

It is the City’s intent to utilize the following American Water Works Association (AWWA) Standards for the various disinfection process:

C651-05 Disinfection of Water Mains

C652-02 Disinfection of Water Storage Facilities

C653-03 Disinfection of Water Treatment Plants

MF/RO Treatment Facility:

Once the wastewater effluent line is removed from the flow control vault that supplies untreated water to the MF/RO Plant and the Lake Kemp line is restored, the City will begin its disinfection procedures for the MF/RO Plant.

- The MF/RO Clarifier will be drained (to the Brine Discharge Pump Station), washed out with fire hoses and the walls sprayed with a solution of 200 ppm chlorine. After the appropriate contact time, the clarifier will then be refilled with raw, untreated Lake Kemp water. Once the water level is at sufficient height, the chloramine biocide system will be restarted in the clarifier. Since this treatment component receives raw, untreated lake water, bacteriological tests will not be performed before it is placed into service.
- Each MF cell will be drained and cleaned out with a fire hose. Since there is no AWWA Standard for disinfecting membranes, the City will perform the manufacturer's recommended Clean-in-Place (CIP) procedure which utilizes acid solutions (down to a pH of 2) and chlorine solutions at 400 ppm. After the CIP is complete, the MF cells will be re-filled with water from the Break Tank and perform bacteriological tests for effectiveness of the cleaning procedure. If any cell fails the bacteriological testing, then the cleaning/testing procedure will be re-performed on that cell until a bacteriological test is successfully passed.
- The Break Tank will be drained to the Brine Pump Station, washed out with a fire hose and the tank disinfected with one of the approved methods found within C652-02. After the appropriate contact time, a bacteriological test will be performed on the tank for effectiveness of the disinfection process. If the Break Tank fails the bacteriological testing, then the cleaning/testing procedure will be re-performed until a bacteriological test is successfully passed.
- Each R/O skid will be drained and cleaned. Since there is no AWWA Standard for disinfecting membranes, the City will perform the manufacturers' recommended Clean-in-Place (CIP) procedure which utilizes acid solutions (down to 2 pH) and biocide solution. After the CIP is complete, the RO skids will be re-filled with water from the Break Tank and a bacteriological test performed for effectiveness of the cleaning procedure. If any skid fails the bacteriological testing, then the cleaning/testing procedure will again be performed on that skid until a bacteriological test is successfully passed.
- The two (2) Permeate Tanks will be drained to the Brine Pump Station, washed out with a fire hose and the tanks disinfected with one of the approved methods found within C652-02. After the appropriate contact time, a bacteriological test will be performed on the tanks to determine the effectiveness of the disinfection process. If any of the Permeate Tanks fail the bacteriological testing, then the cleaning/testing procedure will again be performed on that tank until a bacteriological test is successfully passed.

- Once the RO permeate line that discharges to the lagoon is disconnected from the permeate pipeline and the pipeline is reconnected to the 2010 Clearwell, both the permeate pipeline and 2010 Clearwell will be disinfected together, in accordance with C651-05 & C652-02, respectively. After the appropriate contact time, a bacteriological test will be performed on the pipeline and clearwell to test for effectiveness of the disinfection process. If either one fails the bacteriological testing, then the disinfection procedure will again be performed on both until a bacteriological test is successfully passed.

Conventional Treatment Plant Facility:

- All water within the lagoon system that contains any RO permeate that originated from treating wastewater effluent, will be completely treated through the conventional plant and replaced with 100% lake water.
- The 2010 Clarifier will be drained (to the Belt Press Holding Tanks), washed out with fire hoses and the walls sprayed with a solution of 200 ppm chlorine. After the appropriate contact time, the clarifier will then be refilled with raw, untreated lake water. The lake water will have chloramines added at the Splitter Box. Since this treatment component receives raw, untreated lake water, there will not be a bacteriological test performed before being placed back into service.
- The Recarbonation Basin will be drained (to the Belt Press Holding Tanks), washed out with fire hoses and the walls sprayed with a solution of 200 ppm chlorine. After the appropriate contact time, the Recarbonation Basin will then be refilled with chloraminated settled water from the Clarifier. Since this treatment component receives partially treated settled water, a bacteriological test will not be performed before it is placed back into service.
- Each 2010 Filter will be drained and cleaned out with a fire hose. The filter walls will be sprayed with a solution of 200 ppm chlorine. Then the filter media will be disinfected in accordance with C653-03. After the disinfection process is complete, each 2010 Filter will be re-filled with water from the ground storage tanks and a bacteriological test performed for effectiveness of the disinfection procedure. If any filter fails the bacteriological testing, then the cleaning/testing procedure will again be performed on that filter until a bacteriological test is successfully passed.
- The 2010 clearwell will be disinfected and tested in combination with the permeate discharge line and clearwell as described above.

- Any Ground Storage Tank that was utilized during the Emergency DPR will be drained to a holding lagoon and washed out with fire hoses and the tank disinfected with one of the approved methods found within C652-02. After the appropriate contact time, a bacteriological test will be performed for the effectiveness of the disinfection process. If the ground storage tank fails the bacteriological testing, then the cleaning/testing procedure will be re-performed until a bacteriological test is successfully passed.

16.0 PROJECT COSTS

Based on the required reuse conveyance and treatment facilities, the following project costs have been developed, which include, construction cost, removal cost of temporary facilities, engineering and contingency costs.

Mobilization & Insurance	LS	\$ 473,000
32" HDPE Pipe (Materials Only)	65,000 LF	\$ 5,474,950
32" HDPE Fittings (Materials Only)	5 EA	\$ 8,000
Unload All Pipe Delivers	65,000 LF	\$ 325,000
Installation & Pipe Fusing	65,000 LF	\$ 933,000
Installation of Fittings	5 EA	\$ 7,500
Furnish & Install Pipe Tethers	69 EA	\$ 180,000
Cypress WTP Control Vault Conn.	LS	\$ 30,000
Skid Mounted Pumps at RRWWTP	LS	\$ 225,000
Unload & Set Pumps	LS	\$ 28,000
Construct RRWWTP Pump System	LS	\$ 75,000
Manual Air Valves	LS	\$ 20,000
Erosion Control Facilities	LS	\$ 45,000
Sub-Total Off-Site Construction		\$ 7,824,450
Cypress Site 32" Temp. Piping	LS	\$ 75,000
Cypress Site 18" Temp. Piping	LS	\$ 60,000
Cypress Site Conn. Piping	LS	\$ 250,000
Sub-Total Cypress Site Construction		\$ 385,000
Disassemble & Remove Temp. Facilities	LS	\$ 800,000
Engineering & Design Services	LS	\$ 300,000
Contingencies	LS	\$ 3,690,550
Sub-Total Other Costs		\$ 4,790,550
ESTIMATED TOTAL COSTS		\$ 13,000,000

17.0 REPORT CLOSURE AND RECOMMENDATIONS

The City of Wichita Falls is entering its fourth year of an extended drought, which has depleted its source water reservoirs to below 30% of their storage capacity and requiring the City to declare a Stage 4-Drought Disaster. Furthermore, entering the hot summer months with such low reservoir capacities, make it very likely that the lakes will continue to decline and if aggressive action is not taken immediately, the City of Wichita Falls and its surrounding area could be out of water by the latter part of 2015.

Therefore, in an attempt to extend the useful life of the three water supply lakes, it is recommended that the City of Wichita Falls develop an aggressive action plan to utilize their wastewater effluent by diverting approximately 7.5 MGD of treated effluent from the RRWWTP and conveying it to the Cypress WTP MF/RO facility. At this location the effluent can be treated utilizing the latest membrane technology and then blending it with the Lake Arrowhead and Lake Kickapoo raw surface water sources prior to provided final treatment through the 2010 conventional treatment train at the Cypress WTP.

Finally, it is recommended that the City adopt the following implementation schedule and provide for the required funding of the proposed temporary water reuse project to augment the City's current surface water supply through this extended period of drought.

KEY TASKS

TASK COMPLETION DATE

Submitted Prelim. Engr. Report & Plans
For City Review

May 1, 2013

Submitted Prelim. Engr. Report & Plans
For TCEQ Approval

May 15, 2013

Completion of Construction

January 3, 2014

TCEQ Approval of Final Engineering
Report and Plans

January 10, 2014

FSV Testing Initiated

January 10, 2014

FSV Testing Completed

February 24, 2014

FSV Test Report Submitted

March 14, 2014

TCEQ Review of FSV Test Report

April 15, 2014

DPR Water Sent to Distribution

April 16, 2014