

Final Report for the December 2013 Targeted Performance Improvement Visit at the City of Wichita Fall Cypress Street 2010 Water Treatment Plant

Executive Summary

TCEQ staff from the WSD, the Region 3 office, and a TCEQ subcontractor provided on-site technical assistance at the City of Wichita Falls Cypress Street Water Treatment Plant. The purpose of the trip was to tour the plant to evaluate the proposed design modifications related to the use and advanced treatment of wastewater for direct potable reuse and to assess the data collection, analysis, and reporting practices used by the plant staff. The TCEQ staff identified a potential design issue related to the relative locations of the chlorine and ammonia injection points in the raw water splitter box for the 2010 Water Treatment Plant (WTP). They also identified some issues with the data collection, analysis, and reporting procedures used at the 2010 WTP and the Reverse Osmosis (RO) Membrane Plant (RO Plant). The findings were discussed with plant staff and utility administrators throughout the on-site visit and during an exit meeting with City staff.

Jennifer Dorsey (WSD) and Jack Schulze, P.E. (subcontractor) performed the data review at the 2010 WTP while Marlo Wanielista-Berg, P.E. (WSD), and David Williams, P.E. (WSD), and staff from TCEQ Region 3 performed the data review at the RO Plant. All of these individuals participated in the plant tour. This report covers the findings of the team that worked on the 2010 WTP facilities; the findings of the team that worked on the RO plant are covered in a separate report.

Technical Summary

The team conducting the 2010 WTP review identified the following design and data reporting issues which the plant staff needs to address.

1) Design Issues

- a) The chlorine and ammonia injection points at the 2010 WTP splitter box are located too close to one another to ensure that all of the water passing through the splitter box will be exposed to free chlorine before it is exposed to ammonia. (see Attachment 1)

The CT requirements for chloramine, the 2010 WTP's primary disinfectant, are based on the assumption that all of the water being treated with chloramine has been exposed to free chlorine, chlorine dioxide, or ozone prior to treatment with chloramines. As a result, the City will need to:

- i) maintain a detectable chlorine dioxide residual in the raw water line from the secondary reservoir at all times, or
 - ii) redesign the chlorine and ammonia injection points to ensure that all of the water is exposed to free chlorine before ammonia is injected, or
 - iii) increase the chloramine contact time or the chloramine residual so that the plant can provide additional viral inactivation as a safety factor to replace the safety factor achieved if alternate disinfectants are used.
- b) The Combined Filter Effluent (CFE) monitoring site for the 2010 WTP plant is located at the Cypress Street high service pump station rather than at the 2010 WTP filtered water transfer pump station. Consequently, the 2010 Plant's CFE turbidity levels are not measured before the

2010 CFE is blended with the CFE from the 67, 84, and RO plants and diluted in the three large above grade clearwells.

Since the GST battery currently contains a mixture of 2010 plant CFE and RO plant CFE and the two plants have different Boil Water Notice triggers (CFE > 5.0 NTU for the 2010 plant and CFE > 1.0 NTU for RO plant), the City needs to sample the two CFE streams before they are blended.

It should be noted that none of the IFE readings from the 2010 plant were above 0.4 NTU (and the max daily IFE readings were above 0.3 NTU on only 1 of the 9 days that data was reviewed. Basically, as long as the two plants continue to operate as they have in the past, the erroneous CFE sampling site is an administrative issue as opposed to a public health concern.

2) Data Collection, Analysis, and Reporting (see Attachment 2)

- a) None of the CT calculations on the SWMOR included the chlorine dioxide (ClO₂) residuals reported on the daily lab sheets. Although the daily ClO₂ lab sheets show zones D1A, D1B, and 3 columns for D1C (for up to 3 analyses), the results are not included when the plant determines the level of pathogen inactivation is achieved on a daily basis. Because ClO₂ is an effective disinfectant, these results need to be included when completing the CT calculations portion of the SWMOR.

Furthermore, the 2011 CT Study treats these three segments as sequential zones rather than parallel segments. Consequently, it looks like the lab sheet has not been updated to reflect the CT study. On the other hand, since they are only sampling at one location on the pipeline, it may be more representative of actual operational practices although the CT study needs to be updated to show an increasing cumulative pipe length instead of the length of individual segments.

- b) The IFE data reported on the SWMOR is based on a subset of all the 15-minute data points recorded by the SCADA system.

The SCADA system automatically records IFE data every 15 minutes whenever a filter is discharging to the clearwell. It also automatically keeps track of periods when the filter is off-line or operating in a filter-to-waste mode. The SCADA system also displays the real-time IFE readings on the computer screen in the control room. The operators transcribe the instantaneous IFE turbidity readings shown on the screen to the daily log sheet once every hour. The data from the log sheet is then evaluated and the highest of these log sheet readings is copied over to the SWMOR. As a result, the SWMOR data is based on the 24 1-hour IFE data subset instead of the entire set of 96 15-minute readings. Therefore, unless the highest IFE readings occurred when one of the 1-hour data points was recorded, the SWMOR will contain erroneous information.

However, as noted previously, none of the IFE readings from the 2010 plant were above 0.4 NTU (and the max daily IFE readings were above 0.3 NTU on only 1 of the 9 days that data was reviewed. Basically, as long as the 2010 plant continues to operate as it has in the past, the erroneous IFE data on the SWMOR is more of an administrative issue as opposed to a public health concern.

- c) The raw water pumpage data reported on the SWMOR is collected using a relatively atypical procedure. The operators record the instantaneous raw water flow rate on the daily log sheet every 2 hours and then average the readings to get the (average) daily Raw Water Pumpage. The method is less precise than simply calculating the total production using the raw water meter readings at the beginning and ending of the day. Consequently, the plant staff should use the more traditional method of calculating the total amount of water treated by the 2010 WTP.

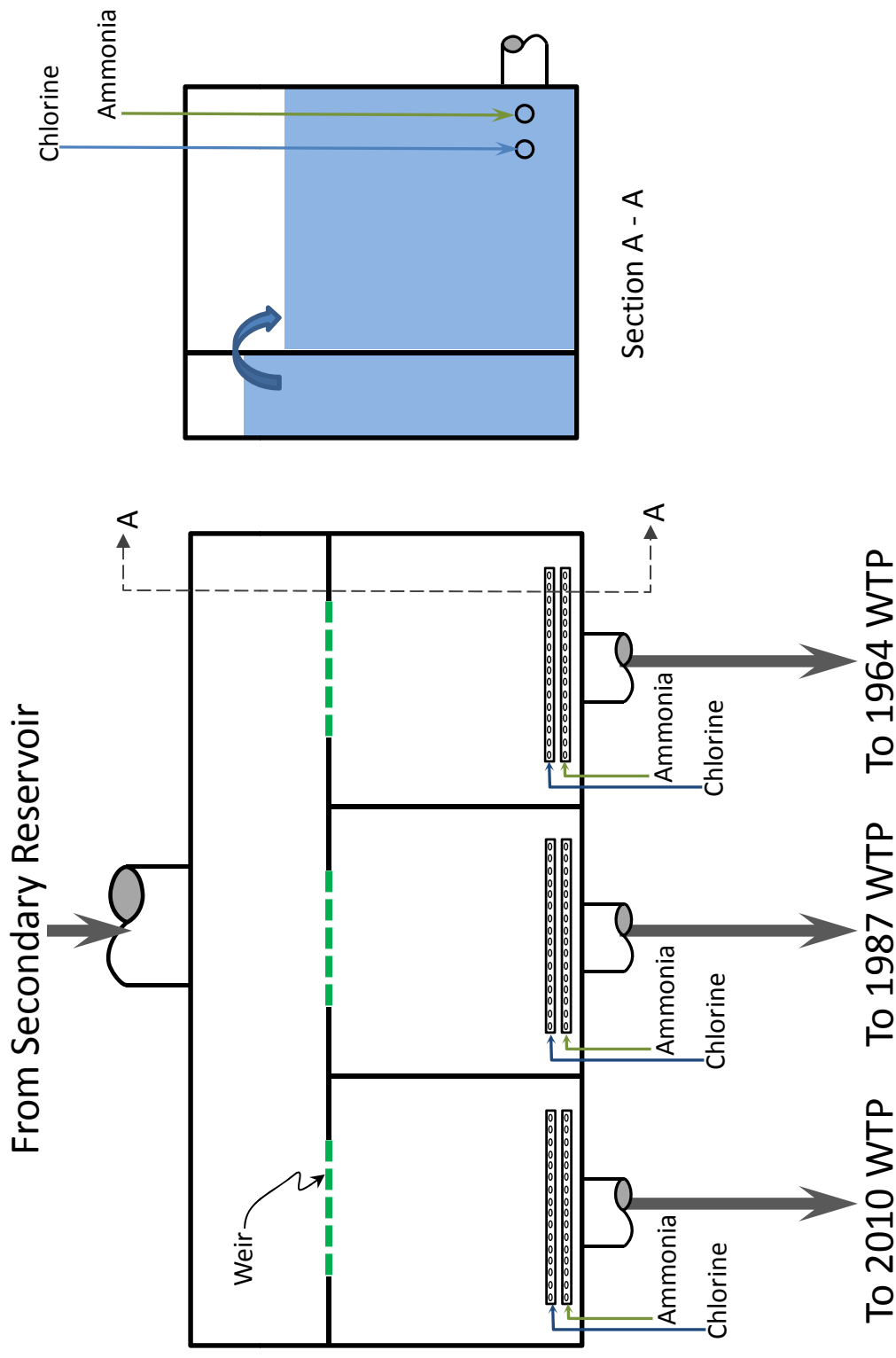
Recommendations

The Wichita Falls TPI project was completed successfully. However, addressing following issues could improve the TCEQ's productivity and capability if similar assignments are needed in the future.

- 1) Regional and WSD staff should continue to take the opportunity to participate in TPI training events. During the TPI, regional staff and Jennifer Dorsey had the opportunity to become more familiar with the Data Audit procedures used during Special Performance Evaluations and gained a better understanding of the constraints that impact the design and operation of chloramination facilities. In addition, the TPI team was able to field test some of the checklists being developed for Directed Assistance Module No. 3 Alternative (DAM3-Alt).
- 2) It may be beneficial to for the TCEQ to develop a short questionnaire, similar to the ones used when contractors provide DAM training, to solicit feedback from the plant staff and regional staff that participate in a TPI event.

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Wichita Falls December 2013 TPI – Attachment 1



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Wichita Falls December 2013 TPI - Attachment 2

DATA REVIEW				
Treatment Plant Name			City of Wichita Fall's 2010 Cypress Water Treatment Plant	
PWS ID No.			2430001	
Reason for Audit				
To determine if the plant staff needed to adjust the monitoring or reporting practices and procedures used at the 2010 Cypress Water Treatment Plant. The site visit was conducted because of some concern about the data collection, analysis, and reporting practices at the RO plant. However, while TCEQ was at the site for that evaluation, it took the opportunity to check out those used at the 2010 plant.				
Month & Year	Reason Selected	Date	Reason Selected	Description of Discrepancy
December 2012	Highest Maximum CFE	12/28/12	Max CFE	RW Pumpage and POE residual on the daily log sheets and SWMORs both match but the approach used to calculate total pumpage is somewhat unusual(see comment 1 below) all six CFE readings match (but there CFE sampling location is incorrect, see comment 2 below) CT Study Data matches (except for systematic error discussed in comment 3 below) IFE: with the exception of Filter 5, the IFE the daily log sheets, SWMOR readings, and SCADA system data match. There is a discrepancy between daily logs/SWMOR and the SCADA system for Filter 5 (due to the systematic error discussed in comment 4 below) F5 log & SWMOR = 0.14, SCADA = 0.17
		12/15/12	Min Inactivation	RW Pumpage, CT, CFE, and POE residual data all match IFE: the daily log sheets,SWMOR, and SCADA data for Filters 3 & 4 all match but there are discrepancies between daily logs/SWMOR and the SCADA system for Filters 1, 2, and 5 F1 log & SWMOR = 0.23, SCADA = 0.251 F2 log & SWMOR = 0.23, SCADA = 0.24 F5 log & SWMOR = 0.18, SCADA = 0.21
		12/17/12	Random	RW Pumpage, CT, CFE, and POE residual data all match IFE: with the exception of Filter 5, the IFE data for all three sources match. There is a very slight discrepancy between daily logs/SWMOR and the SCADA system for Filter 5 F5 log & SWMOR = 0.14, SCADA = 0.146 (which should be reported as 0.15)
February 2013	Reviewer Choice	02/27/13	Reviewer Choice	RW Pumpage: The 13.82 MGD shown on the SWMOR is the total flow shown on the daily lab sheet for 2010 plant and RO plant instead of 10.12.MGD for the 2010 plant. (It looks like a random error, i.e., the operator read the wrong column on the daily log sheet.) CT, CFE, and POE residual all match The daily log sheet for CIO2 results is missing. The CIO2MOR indicates that dioxide was used that day so we know the sheet is missing. IFE: the three data sources for Filters 1, 2, &5 all match but there are discrepancies between daily logs, SWMOR, and SCADA system for Filters 3 & 4. F3 log & SWMOR = 0.17, SCADA = 0.225 F4 SWMOR = 0.13, log = 0.174, SCADA = 0.215 (The discrepancy between SWMOR and daily log looks like a random error, i.e., the operator missed one reading on the daily log sheet.)
		02/20/13	Min POE Residual	RW Pumpage, CT, IFE, and POE residual data all match CFE: one random error (that actually over-reported one of the six readings); SWMOR = 0.11, daily log = 0.05
		02/26/13	Min Inactivation	RW Pumpage: The 12.8 MGD flow shown on the SWMOR is closer to the 12.8 total lake flow (Arrowhead + Kemp) recorded on the daily lab sheet instead of the corresponding 10.0.MGD flow for the 2010 plant. (It looks like a random error but the SWMOR readings doesn't exactly match anything on the daily log sheet.) CT, CFE, and POE residual matches IFE: with the exception of Filters 3 & 4, the IFE data for all three sources match. There is a very slight discrepancy between daily logs/SWMOR and the SCADA system for Filter 3 and 4 F3 log & SWMOR = 0.15, SCADA = 0.157 (which should be reported as 0.16) F4 log & SWMOR = 0.14, SCADA = 0.146 (which should be reported as 0.15)

DATA REVIEW (cont)

Treatment Plant Name				PWS ID No.
City of Wichita Fall's 2010 Cypress Water Treatment Plant				2430001
Month & Year	Reason Selected	Date	Reason Selected	Description of Discrepancy
September 2013	Highest Maximum IFE	09/28/13	Max IFE	RW Pumpage, CT, CFE, and POE residual data all match IFE: lots of discrepancies F1 SWMOR = 0.23, log = 0.291, SCADA = 0.351 F2 SWMOR & log = 0.27, SCADA = 0.349 F3 SWMOR & log = 0.29, SCADA = 0.397 F4 SWMOR = 0.24, log = 0.299, SCADA = 0.314 F5 SWMOR & log = 0.274, SCADA = 0.350
		09/08/13	Max CFE	RW Pumpage, CT, CFE, and POE residual data all match IFE: Filters 3 & 5 match, the other 3 have discrepancies F1 log & SWMOR = 0.21, SCADA = 0.218 F2 log & SWMOR = 0.19, SCADA = 0.222 F4 log & SWMOR = 0.18, SCADA = 0.186
		09/01/13	Reviewer Choice	Steve's B'day; RW Pumpage, CT, and CFE data all match IFE: Filter 2 matches but the other 4 all have discrepancies F1 log & SWMOR = 0.18, SCADA = 0.192 F3 log & SWMOR = 0.15, SCADA = 0.162 F4 log & SWMOR = 0.18, SCADA = 0.271 F5 log & SWMOR = 0.17, SCADA = 0.196

ADDITIONAL COMMENTS

- 1) The operators record the instantaneous raw water flow rate on the daily log sheet every 2 hours and then average the readings to get the (average) daily Raw Water Pumpage. The method is less precise than simply calculating the total production using the raw water meter readings at the beginning and ending of the day.
- 2) The CFE sampling point for the 2010 plant is currently located downstream of the ground storage tank battery that Cypress WTPs high service pump stations rather than at the 2010 transfer pump station clearwell. Consequently, the 2010 Plant's CFE turbidity levels are not measured before the 2010 CFE is blended with the CFE from the 67, 84, and RO plants and diluted in the three large above grade clearwells. Since the GST battery currently contains a mixture of 2010 plant CFE and RO plant CFE and the two plants have different Boil Water Notice triggers (CFE > 5.0 NTU for the 2010 plant and CFE > 1.0 NTU for RO plant), the City should consider sampling the two CFE streams before they are blended. It should be noted that none of the IFE readings from the 2010 plant were above 0.4 NTU (and the max daily IFE readings were above 0.3 NTU on only 1 of the 9 days that data was reviewed. Therefore, none of the CFE readings were above 1.0 NTU. Basically, as long as the two plants continue to operate as they have in the past, the erroneous CFE sampling site is an administrative issue as opposed to a public health concern.
- 3) With the exception of 02/27/13 for which there was no daily lab sheet for ClO₂ results, none of the CT calculations included the ClO₂ residuals reported on the daily lab sheets for zone D1C are included in the daily CT calculations. The daily ClO₂ lab sheets show zones D1A, D1B, and 3 columns for D1C (for up to 3 analyses). The 2011 CT Study treats these three segments as sequential zones rather than parallel segments. Basically, it looks like the lab sheet has not been updated to reflect the CT study. On the other hand, since they are only sampling at one location on the pipeline, it may be more representative of actual operational practices although the CT study needs to be updated to show an increasing cumulative pipe length instead of the length of individual segments.
- 4) The SCADA system automatically records IFE data every 15 minutes whenever a filter is discharging to the clearwell. It also automatically keeps track of periods when the filter is off-line or operating in a filter-to-waste mode. The SCADA system also displays the real-time IFE readings on the computer screen in the control room. The operators transcribe the instantaneous IFE turbidity readings shown on the screen to the daily log sheet once every hour. The data from the log sheet is then evaluated and the highest of these log sheet readings is copied over to the SWMOR. As a result, the SWMOR data is based on the 24 1-hour IFE data subset instead of the entire set of 96 15-minute readings. Therefore, unless the highest IFE readings occurred when one of the 1-hour data points was recorded, the SWMOR will contain erroneous information. However, as noted previously, none of the IFE readings from the 2010 plant were above 0.4 NTU (and the max daily IFE readings were above 0.3 NTU on only 1 of the 9 days that data was reviewed. Basically, as long as the 2010 plant continues to operate as it has in the past, the erroneous IFE data on the SWMOR is more of an administrative issue as opposed to a public health concern.