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RN 101611275

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

August 19, 2004

Mr. Kerry D. Maroney, P.E.
Biggs & Mathews, Inc.
2500 Brook Street
Wichita Falls, Texas 76901

Subject: Cypress SWTP Expansion Project - Revisions
City of Wichita Falls - PWS I.D. #2430001
Plan Review Log No. 204-142
Wichita County, Texas

Dear Mr. Maroney:

We have completed our review of your letter dated February 10, 2004, and the revised engineering drawings and specifications for the proposed expansion project of the Cypress Surface Water Treatment Plant (SWTP). Your letter and associated data were submitted in response to our letter dated December 20, 2002. Based on our review, we find that the revised engineering drawings and specifications addressed all but one of our concerns with the construction specification contained within the Texas Commission on Environmental Quality's (TCEQ) Rules and Regulations for Public Water Systems. Based on this review, we **are granting conditional approval to construct** provided the following modification is made.

An acceptable block-n-bleed valve arrangement, or another TCEQ acceptable cross connection protection method, must be installed on each microfiltration (MF) tank's clean-in-place (CIP) feed piping. Your request to rely on process control and the differences in head in lieu of modifying the proposed design is **denied**. The TCEQ has maintained that CIP solutions must be isolated by an air gap or some cross connection protection method since beginning the review of MF and ultrafiltration (UF) membrane treatment plants.

I have reviewed and discussed with my co-worker, Marlo Berg, P.E., the design specifications for the CIP pump and operating heads of the settled water trough and MF membrane tanks during CIP procedures. While it is true that an approximate head difference of eight feet will exist over the settled water side of the butterfly valve, the CIP pumps are rated at 2,000 gallons per minute (gpm) at 30 feet of head and there will exist a common wall in violation of 30 TAC §290.42(d)(2). We note that the CIP pump is discharging against a little over ten feet of head in the membrane tank during the CIP procedure and there is a loss in head through the CIP feed piping, but this still results in left over pumping head.

Also, the CIP feed solution's flows enter at right angles to each settled water butterfly valve and the influent to each membrane tank creating a turbulent flow against the settled water butterfly valve. Any malfunction of a butterfly valve or wear of the valve seat will result in the CIP solution entering the settled water basin and discharging through the online membrane tanks.

Finally, our review of the EPA's Membrane Filtration Guidance Manual (EPA 815-D-03-008), Section 7.3.4, Cross Connection Control, specifically addresses the fact that protection of online membrane units and treated water must have cross connection protection from CIP solutions. This guidance document was published to accompany the upcoming Long Term 2 Enhanced Surface Water Treatment (LT2ESWTR). While this document does not contain regulations, it is intended as a guidance to the States and regulated community in implementing the LT2ESWTR. Failure to require this design to meet historical and upcoming TCEQ requirements would result in retrofitting this proposed SWTP later on.

Other TCEQ site-specific and membrane filtration SWTP comments:

- We previously accepted the membrane pilot study report for this site as verifying a filtrate flux of 19.6 gallons per square-foot per day (gfd) at 20 degrees C. **Based on 24 hours of continuous operation for the proposed five tanks of 504 USFilter HF MF membrane modules having 334.9 sf of filtrate side area each, the TCEQ is approving a net filtrate production of 13.939 MGD, at 20 degrees C.**

- As previously noted, the TCEQ issues a capacity rating for HF membrane facilities based on a filtrate flux corrected to 20° C. The TCEQ understands, and accepts, that an increase in membrane feed water temperature normally results in an increase in the filtrate flux rate and a corresponding increase in potable water available for customer use. A decrease in water temperature will result in a reduction of the filtrate flux rate and a corresponding decrease in potable water available for customer use. However, this seasonal increase and decrease of water temperatures correspond to the accepted increase of summer and decrease of winter customer demands. This change in production shall have TCEQ approval provided it does not exceed a flux rate based on the following calculation:

$$\text{filtrate flux}_{\text{at feed water temperature}} = (\text{TCEQ approved filtrate flux}_{\text{at } 20^{\circ}\text{C}}) \times (e^{(-0.0239 \times (20-T))})$$

Where T is the HF membranes' feed water temperature (temperature adjusting the flux to) in degrees centigrade at the time.

- The TCEQ previously issued preliminary acceptance of a RO flux rate of 12.0 base on only 30 days of pilot data. The submitted full-scale design was based on an average RO flux rate for six, two-stage RO treatment trains of 14.9 gfd. **The TCEQ's rated capacity of the RO membrane treatment train is contingent on conformation of the full-scale RO membrane permeate capacity being verified by 60 days of full-scale pilot data after completion of construction. This 60 days of verification data must be received by the TCEQ Public Drinking Water within 180 days after RO permeate is sent to distribution.**
- The Cypress SWTP's overall TCEQ approved capacity rating will be based on the achieved blending ratio required to produce a potable water quality that meets all of the TCEQ's drinking water standards. This blending ratio must be provided with the above RO flux verification data.

- A revised CT study will be required for the Cypress SWTP to include the two new proposed treatment trains as required in 30 TAC §290.111. Since we have had historical problems with reviewing CT studies based on our construction approval letters, **we are requesting that you submit this required CT study after reaching 90-percent completion of the project with as-built basin dimensions and volumes.** This will prevent approval of incorrect T_{10} times for basins that are modified during construction. Thank you for this consideration.

As proposed with continuous coagulation, flocculation and clarification in front of the HF MF and RO membranes, this treatment train will receive a 2.0-log removal credit for viruses, a 3.0-log removal credit for *Giardia lamblia* cysts and a 2.0-log removal credit for *Cryptosporidium* oocysts. The removal credits for *Giardia lamblia* cysts and *Cryptosporidium* oocysts will be based on continuous integrity monitoring of each MF membrane rack's filtrate with a Hach FilterTrak laser turbidimeter and a TCEQ approved direct integrity test method. The direct integrity test method must have the ability to detect at least a 3.0-micron defect. Currently the TCEQ is accepting the calculation for determining the direct integrity test pressure level that will detect 3.0-micron defect for each vendor's membrane fiber as it is required by the July 2001 draft of ASTM's Standard Practice for Integrity Testing of Water Filtration Membrane Systems.

- The City's operators will be required to monitor each membrane rack in accordance with the PDW Program Staff Guidance titled, Monitoring, Operating and Report Requirements for Membrane Installations (April 1, 2004). This document and the TCEQ's Membrane Monthly Operating Report Addendum for individual membrane rack monitoring and reporting requirements has been enclosed for the City operator's use. **The Membrane Monthly Operating Report Addendum pages are to be completed in addition to the individual filter pages in the TCEQ's Surface Water Monthly Operating Report (SWMOR) form and be submitted each month to the TCEQ with the rest of the SWMOR form.**

Please be aware that the USEPA has a draft proposal for a direct integrity test to be conducted at least once a day to receive removal credits for SWTPs using membrane filtration. At this time, the TCEQ is continuing to only require a direct integrity test once per week and after each CIP procedure with continuous rack/tank monitoring of the particle counts or laser turbidity levels. However, this requirement will change in the future. At that time, the TCEQ capacity rating for this and other membrane filtration plants may also be modified.

The new treatment trains will be operated by the City Wichita Fall's (PWS I.D. #2430001) certified surface water operators and located at the existing Cypress SWTP. The raw water sources for the proposed new 2003 conventional treatment train will be Lake Arrowhead and Kickapoo. Engineering plans and specifications for the addition of raw water pumps at the City's Secondary Reservoir were received and reviewed under Plan Review Log No. 207-146.

The raw water source for the integrated HF MF and RO membrane treatment train will be Lake Kemp through Diversion Lake and the Southside Canal and by a new raw water transmission facilities. All of the HF MF membrane's filtrate will be treated by the RO membranes. The RO membrane permeate will be blended with the combined granular media filtered water from the 1961, 1987 and new 2003 conventional treatment trains to achieve a blended filtered/permeate water that meets state and federal drinking water standards.

Our review indicates that we have not received any drawings or specifications for a raw water intake structure, pumps and transmission piping from the Southside Canal to the HF MF/RO membrane treatment train. If engineering plans and specifications have not been submitted for this facility, please submit them to the TCEQ's Utilities Technical Review Team (MC 153). Please note that all requirements contained within 30 TAC §290.41(e) must be met for this new raw water intake. This information will need to include the location where the Southside Canal takes the raw water from Diversion Lake and the location where the raw water transmission piping takes its suction from the Southside Canal.

The original submittal included an engineering report, six volumes of engineering specifications and three volumes of drawings containing 631 sheets. Revised drawings and specifications were received with correspondence dated November 5, 2003 and February 10, 2004. The proposed project includes:

Common Facilities

- A new Administration and Laboratory building;
- A new Maintenance building;
- Modifications to the existing Chemical building;
- Relocate existing anhydrous ammonia storage tank;
- One new anhydrous ammonia welded steel storage tank having an equivalent water volume of 6,000 gallons with a 7-foot diameter and a 25-foot overall length;
- A new anhydrous ammonia feed system consisting of two vacuum regulator/check units, two 2,100-pounds per day (ppd) evaporators, eight 1,400-ppd ammoniators, eight 500-ppd ammonia ejectors, two ammonia injector booster pumps rated at 115 gpm each at a tdh of 220 feet each, associated controls and piping;
- Two new 25-ton chlorine gas bulk storage tanks having an equivalent water volume of 4,688 gallons each, a maximum chlorine gas withdraw of 10,200 ppd and an operating pressure of 265 psig;
- A new chlorine feed system consisting of four 10,000-ppd chlorine vacuum regulator/check units, two 10,000-ppd chlorine gas evaporators, one chlorinator with a maximum withdraw of 3,000 ppd and a 1,500-ppd flow rate, nine chlorinators with a maximum withdraw of 3,000 ppd and a 1,000-ppd flow rate, one chlorinator with a maximum withdraw of 200 ppd and a 250-ppd flow rate, 11 chlorine injectors rated at 1,000 ppd, chlorine gas leak detection system, two 60,000-pound scales, two chlorine injection booster pumps rated at 482 gpm each at a tdh of 200 feet, associated controls and piping;
- A chlorine scrubber system with a 3,000 scfm capacity and consisting of one 21,850-gallon 20% sodium hydroxide storage/recycle fiberglass reinforced plastic tank, one 21,850-gallon 20% sodium hydroxide storage tank, two recirculating pumps, associated controls and piping;
- One raw water splitter box with adjustable gates for raw water flow control to the existing 1961 and 1987 treatment trains and the new 2003 conventional treatment train;
- A 23% hydrofluosilicic acid system consisting of a 6,000-gallon polyethylene bulk storage tank, one 94-gallon polyethylene day tank, two 60-gallon polyethylene day tanks, two transfer pumps rated at 10 gpm each, four chemical feed pumps rated at 0.0 to 4 gph each, associated controls and piping;
- A 25% sodium hydroxide system consisting of a 6,768-gallon filament-wound fiberglass reinforced plastic bulk storage tank, two recirculation pumps rated at 225 gpm each, two chemical feed pumps rated 1.25 to 19.5 gph each, one transfer pump (to RO CIP system) rated at 10 gpm, associated controls and piping;
- A cationic polymer system consisting of supplier's 55-gallon drums, five chemical feed pumps rated at 0.0 to 0.42 gpm each, associated controls and piping;
- A scale inhibitor system consisting of five chemical metering pumps rated at 0.0 to 0.42 gph, each,

- associated controls and piping;
- A recarbonization system consisting of two 60,000-pound liquid carbon dioxide storage tanks, heaters, mixers, two 4,009-ppd injectors and two 167-gpm booster pumps for the 1961 treatment train, one 8,019-ppd injector and one 333-gpm booster pump for the 1987 treatment train, one 3,341-ppd and one 1,670-ppd injectors and one 208-gpm booster pump for the new 2003 conventional treatment train, associated controls and piping;
- One process waste water sump and two submersible pumps rated at 720 gpm each at a tdh of 32 feet;
- New filter backwash supply and high service pump station;
- Three filter backwash supply vertical turbine pumps with two rated at 7,200 gpm each at a tdh of 32 feet and one rated at 1,500 gpm at a tdh of 32 feet;
- Backwash supply anionic polymer feed system consisting of supplier's 55-gallon drums, two chemical feed pumps rated at 0.0 to 0.42 gph each, associated controls and piping;
- Five high service vertical turbine pumps rated at 9,000 gpm at a tdh of 170 feet each with two equipped with variable frequency drives and three with constant speed drives;
- One filter-to-waste sump and two submersible pumps rated at 720 gpm each at a tdh of 32 feet;
- Four filter backwash return vertical turbine pumps rated at 1,300 gpm each at a tdh of 25 feet; and,
- Related appurtenances, in-plant piping and fittings.

New 10.0-MGD 2003 Conventional Treatment Train

- One single-stage, rapid mix basin equipped with a variable speed reducer and 7.5 HP motor having a minimum hydraulic detention time of 20 seconds;
- One raw water parshall flume rated at 0 to 12 MGD;
- A ferric sulfate system located at the modified Chemical building that consists of two 16,000-gallon filament-wound fiberglass reinforced plastic bulk storage tanks, three 400-gallon polyethylene day tanks, two transfer pumps rated at 80 gpm each, six chemical feed pumps rated at 0.0 to 20 gph, associated controls and piping;
- A lime softening system consisting of a lime silo having a maximum product weight of 125,000 pounds, screw feeder, lime slaker tank, slurry aging tank, associated controls and piping with a total maximum delivery capacity of 16,680 ppd;
- One Accelerator® solids-contact clarification unit rated at 6,944 gpm with an outside radius of 90 feet, an outer draft tube radius of approximately 22 feet and an outside side water depth of 16 feet 5 inches resulting in a minimum hydraulic detention time of 120 minutes and a surface overflow rate of 1.21 gallons per minute per square foot of settling area;
- Lime sludge pump station No. 2 with two transfer vertical cantiliver pumps rated at 350 gpm each at a tdh of 56 feet;
- One two-stage, baffled recarbonation basin approximately 48 feet by 33 feet with a side water depth of 19 feet;
- Filter influent channel equipped with individual filter influent weir gates for flow control;
- Five deep bed, multi media filters each rated at 1,800 gpm, 15 feet in width by 24 feet in length, with 12 inches of sand with an effective size range of 0.45 millimeters (mm) to 0.55 mm at an uniform coefficient of 1.4, and 48 inches of anthracite with an effective size range of 0.95 mm to 1.05 mm at an uniform coefficient of 1.4;
- Filter media air scour system;
- Individual filter effluent turbidity meters and flow measuring devices equipped with transmitters and alarms;
- A combined filtered water effluent basin having an approximate volume of 19,000 gallons;
- A filtered/permeate baffled clearwell having an approximate volume of 201,00 gallons for blending

- of the 2003 filtered water effluent with the RO permeate; and,
- Four vertical turbine blended filter/permeate transfer pumps with two rated at 3,850 gpm each at a tdh of 51 feet and two rated at 7,500 gpm each at a tdh of 50 feet.

New Integrated 10.0-MGD HF MF and RO Membrane Treatment Train

- Approximately 170 l.f. of 42-inch diameter raw water transmission pipe (this project);
- A new Membrane building;
- Two parallel static mixers, one 12-inch for low flow and one 24-inch for high flow;
- A raw water flow control vault;
- One radial flow clarification unit having a 155-foot diameter, a 39-foot diameter flocculation tube, and approximate volume of 4.01 MG resulting in a rated flow rate of 16.4 MGD at a hydraulic detention time of 360 minutes;
- Settled sludge pump station No. 3 with two vertical cantilever pumps rated at 350 gpm at a tdh of 56 feet;
- A ferric sulfate system consisting of a 9,729-gallon filament-wound fiberglass reinforced plastic bulk storage tank, two chemical feed pumps rated at 2 to 32 gph, associated controls and piping;
- Five USFilter/Memcor Model 540S10V units consisting of 504 Model S10V HF MF membrane modules per unit (tank), 334.9 sf of filtrate surface area per membrane module, and having an approximate total filtrate production of 2.788 MGD (temperature adjusted to 20° C) per unit available for the RO membranes feed water;
- Five HF MF filtrate vacuum horizontal end suction centrifugal pumps rated at approximately 2.98 MGD;
- Two horizontal end suction centrifugal backwash supply pumps to be supplied by manufacturer;
- A membrane backwash 12.5% sodium hypochlorite system consisting of a 470-gallon filament-wound fiberglass reinforced plastic storage tank, two chemical feed pumps rated at 45 gpm each;
- One HF MF filtrate, bolted steel storage tank having a volume of 158,600 gallons;
- Equipment air system;
- A HF MF membrane manufacturer provided CIP system consisting of a 6,000-gallon filament-wound fiberglass reinforced plastic CIP solution tank, heater, CIP solution circulation pump rated at 2,000 gpm at 30 feet tdh, one 9,350-gallon citric acid filament-wound fiberglass reinforced bulk storage plastic tank, one 470-gallon citric acid filament-wound fiberglass reinforced plastic day tank, citric acid transfer pump, and associated controls and piping;
- A HF MF membrane manufacturer provided chemical waste neutralization system consisting of a 26,000-gallon tank, two mixers, a 470-gallon sodium hydroxide filament-wound fiberglass reinforced plastic tank, a 12-gpm sodium hydroxide pump, a 30-gpm sodium bisulfite feed pump for use with 55-gallon drums, associated controls, chemical monitoring equipment and piping;
- One 24-inch diameter RO feed static mixer;
- Six RO membrane feed pumps to be supplied by manufacturer;
- Six two-stage RO membrane trains containing 8-inch diameter by 40-inch long elements, rated at 2.0 MGD net permeate production per train, and an average flux of 14.9 gfd per two-stage train at a feed pressure at startup of 185 psig;
- Individual vessel and two-stage continuous conductivity monitoring equipment;
- A sulfuric acid system consisting of a 2,115-gallon phenolic lined, welded carbon steel bulk storage tank, two chemical feed pumps rated at 0.3 to 8.0 gph each, associated controls and piping;
- A scale inhibitor system consisting of a 1,375-gallon filament-wound fiberglass reinforced plastic bulk storage tank, two chemical feed pumps rated at 0.2 to 4 gph each, associated controls and piping;

- Two RO permeate storage tanks constructed of filament-wound fiberglass reinforced plastic and having a volume of 17,848 gallons each;
- Two horizontal end suction centrifugal RO flush pumps rated at 400 gpm at tdh of 46 feet;
- RO membrane CIP system consisting of a 2,000-gallon filament-wound fiberglass reinforced plastic CIP solution tank, cartridge filter, heating element, feed pump, associated controls, monitoring equipment and piping;
- A citric acid system consisting of a 995-gallon filament-wound fiberglass reinforced plastic bulk tank, two transfer pumps rated at 18 gpm each, associated controls and piping; and,
- Brine pump station equipped with two pumps rated at 3,600 gpm at a tdh of 47 feet and 2,300 gpm at a tdh of 65 feet.

1961 Treatment Train Modifications

- New raw water static mixer;
- Remove existing lime slaker and slurry aging tanks and associated piping;
- Two new lime softening systems consisting of screw feeders, two new lime slaker tanks, two new slurry aging tanks, associated controls and piping with a total capacity of 26,730 ppd; and,
- Three additional filtered water transfer vertical turbine pumps rated at 5,600 gpm each at a tdh of 60 feet with two being variable speed and one constant speed.

1987 Treatment Train Modifications

- A new lime softening system consisting of two lime silos having a maximum product weight of 125,000 pounds each, two screw feeders, two lime slaker tanks, two slurry aging tanks, associated controls and piping with a total maximum delivery capacity of 26,730 ppd;
- Lime sludge pump station No. 1 equipped with four vertical cantilever pumps rated at 620 gpm each at a tdh of 32 feet;
- Remove existing high service pumps only; and,
- Three new high service pumps rated at 5,200 gpm at a tdh of 190 feet, 5,700 gpm at a tdh of 170 feet and 6,300 gpm at a tdh of 150 feet.

Sludge Dewatering Facilities

- One sludge thickener with a maximum influent flow rate of 1,100 gpm and a maximum sludge withdraw rate of 1,400 gpm;
- Two sludge blend tanks;
- Three sludge transfer/recirculating pumps rated at 1,400 gpm each at a tdh of 55 feet;
- Four belt filter press pumps rated at 50 to 175 gpm each;
- Three belt filter presses;
- Dewatering lift pump station equipped with three submersible pumps rated at 740 gpm each at a tdh of 50 feet;
- Three belt filter press wash water pumps rated at 150 gpm each at a tdh of 196 feet;
- Polymer feed system consisting of one 50-pph dry feeder, two 750-gallon mixing/holding tanks; two mixers, four feed pumps rated at 0 to 35 gpm each, associated controls and piping;
- One auxiliary chemical feed system for polymer or potassium permanganate with one 2,300-gallon fiberglass reinforced fiberglass plastic tank, mixer, three feed pumps rated at 0 to 15 gpm; associated controls and piping; and,
- Solids conveyor and storage system.

Mr. Kerry D. Maroney, P.E.

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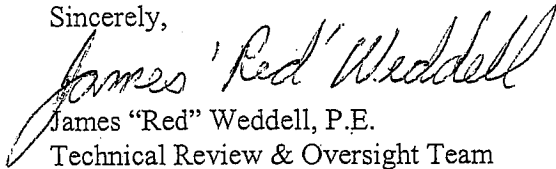
August 19, 2004

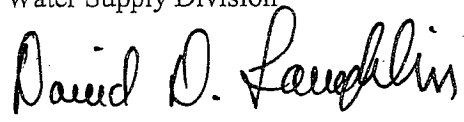
This approval is for the construction of only the above listed items. **An appointed engineer must notify the TCEQ's Region 3 Office at (915) 698-9674 when construction will start. Please keep in mind that upon completion of the water works project, the engineer or owner must notify the TCEQ's Water Supply Division, in writing, as to its completion and attest to the fact that the completed work is substantially according to the plans and change orders on file with the commission as required in 30 TAC §290.39(h)(3) of the Rules.** You can include any change orders with the written notification of construction completion. Refer to Plan Review Log No. 204-142 in these future correspondences.

For your reference, you can review part of the TCEQ Utilities Technical Review Team's database to see if we have received future projects. Also, you can download most of the well construction checklists and the latest revision of Chapter 290 Rules and Regulation for Public Water Systems from this site.

In you have any questions or comments concerning this letter, please contact me, Red Weddell at the commission's address or by telephone at (512) 239-4798.

Sincerely,


James "Red" Weddell, P.E.
Technical Review & Oversight Team
Public Drinking Water Section (MC 155)
Water Supply Division


David D. Laughlin, P.E.
Utilities Technical Review Team
Utilities & Districts Section (MC 153)
Water Supply Division

DDL/JSW/sr

Enclosures: Monitoring, Operating and Report Requirements for Membrane Installations
 Membrane Monthly Operating Report Addendum (2 Pages)

cc: TCEQ Abilene Region Office
 Mr. Jack C. Schulze, P.E., TCEQ Surface Plant Evaluation Team (MC 155)
 Melissa Peralta, TCEQ Drinking Water Monitoring Team (MC155)
 Mr. John Scott Taylor, P.E., Director of Public Works, City of Wichita Falls
 Ms. Jennifer Henke, P.E., CH2MHill