PROFESSIONAL SERVICES AGREEMENT
FOR
CITY OF PFLUGERVILLE WATER TREATMENT PLANT ENGINEERING SERVICES

WORK AUTHORIZATION NO. 2020-1

This WORK AUTHORIZATION is made pursuant to the terms and conditions of the Professional Services Agreement executed the 20th day of January, 2015 by and between the City of Pflugerville and DCS Engineering, LLC., hereinafter referred to as the Agreement.

The Consultant will perform the scope of professional services as shown and as stipulated in Attachments A through D which will include the tasks to be performed, the deliverables to be provided by the Consultant, and the milestone schedule for completing the tasks and the deliverables.

Compensation to the Consultant for the services provided pursuant to this work authorization shall be in accordance with Article 4 of the Professional Services Agreement, as further detailed in Attachment A to this Work Authorization. Attachment A shall include the method and basis for determining the compensation for this work authorization. The maximum amount payable under this Work Authorization is $85,060.00 unless amended by a Supplemental Work Authorization.

This Work Authorization does not waive any of the parties' responsibilities and obligations provided under the Professional Services Agreement.

This Work Authorization is hereby accepted, acknowledged, and is effective when fully executed below.

CITY OF PFLUGERVILLE

BY: _____
Public Works Director

DATE: _____

CONSULTANT
DCS Engineering, LLC

BY: _____

TITLE: Principal

DATE: 2/27/2020

ATTACHMENT A

SCOPE OF SERVICES

City of Pflugerville Water Treatment Plant Engineering Services
Work Authorization No. 2020-1
Surface Water Treatment Plant - Emergency Work
Attachment A

In accordance with the Professional Services Agreement for the Water Treatment Plant Engineering Support between City and Engineer ("Agreement"), City and Engineer agree as follows:

1. **Specific Project Data**
   A. Title: Surface Water Treatment Plant – Emergency Work
   B. DCS Project No.: 20101423
   C. Description:
   Per your request, we have prepared this Work Authorization to provide professional engineering services for the City related to the emergency work at the City's Surface Water Treatment Plant from October 25, 2019 to February 29, 2020. The City had miscellaneous SWTP tasks requiring engineering input to facilitate resolution. The level of engineering input varied based on the task identified. The work performed by the Engineer was done confidentially at all times. No information was shared or discussed with anyone other than the City and the City's specified interested parties unless prior authorization from the City was received in writing by the Engineer.

2. **Services of Engineer**
   A. The scope of work completed under this work authorization is listed in the following attachment. The attachment enumerates the various issues identified and completed to date at the SWTP.
      1) Attachment B - List of Completed Items by DCS and/or City SWTP Operations. This list includes all items that DCS or the City has completed since commencing emergency work efforts in October 2019.

3. **Additional Services if required:**
   A. Additional Services are those that are not currently anticipated to be a part of this work authorization, but which could become necessary or desired at some time during the project. DCS shall perform Additional Services only as authorized to do so by the City. If the City requests Additional Services, DCS will prepare a specific scope and budget for the services requested for review and approval prior to initiating the services.

4. **Schedule:**
   A. DCS coordinated with the City Staff to set priorities for the activities, projects, work tasks, etc. identified in Attachments B. Based on this coordination, implementation schedules with completion dates were developed. The total duration to complete the work identified in Attachments B is through February 29, 2020.

5. **Deliverables:**
   A. When the nature of the work requires or it is requested by the City, prepare summary of findings for work completed via email to the City.

6. **Owner's Responsibilities**
   A. Owner shall have those responsibilities set forth in the Professional Services Agreement.

7. **Payments to Engineer**
   A. City shall pay DCS Engineering, LLC within 30 days from date of City's receipt of invoice.
   B. Time & Material Fee
   We propose to provide the services described above for data analysis and recommendations on a time and material basis and reimbursable fee basis as noted below. We shall obtain prior written approval from the City if this amount is to be exceeded. We propose to bill our Project Manager, Mr. Darren Strozewski, P.E., at $165/hour and project engineers at $110 per hour. Other staff members will be billed separately per the below Standard Hourly Rate Table by Staff Category and utilized as needed.
   C. Our proposed fees for the above scope of work are shown by task in the below table. The above referenced services will be performed within the duration discussed above. The below reimbursable fees shall not be exceeded without prior written authorization from the City of Pflugerville. DCS's liability to the Client for any cause or combination of causes is in the aggregate limited to an amount no greater than the fee earned under this agreement.

D. The terms of payment are set forth in Article IV of the Professional Services Agreement and Work Authorization 2020-1– Attachment A.

Standard Hourly Rate Table

Classification	**Billing Rate**		
Principal	$215.00	-	$275.00
Senior Project Manager	$200.00	-	$240.00
Project Manager	$140.00	-	$210.00
Design Manager	$120.00	-	$170.00
Senior Engineer	$100.00	-	$160.00
Project Engineer	$90.00	-	$140.00
CAD Manager	$100.00	-	$200.00
IT Manager	$110.00	-	$160.00
IT Technician	$80.00	-	$140.00
Senior Designer	$90.00	-	$160.00
Designer II	$80.00	-	$145.00
Designer I	$70.00	-	$125.00
Senior Computer Technician	$70.00	-	$140.00
Computer Technician II	$50.00	-	$125.00
Computer Technician I	$40.00	-	$110.00
Project Coordinator	$45.00	-	$110.00
Clerical	$30.00	-	$90.00
Document Control Clerk	$30.00	-	$90.00

Fee Schedule

Task	**Description**	**Fee**
220	SWTP - Emergency Work	$85,060.00
	Total Time and Material Fee =	**$85,060.00**

8. SubConsultants:
None

9. Other Modifications to Agreement:
None

ATTACHMENT B

LIST OF COMPLETED ITEMS BY DCS AND/OR CITY SWTP OPERATIONS

City of Pflugerville
Surface Water Treatment Plant
List of Completed Items by DCS and/or City SWTP Operations
February 3, 2020

The below items have been completed by DCS or the City at the Surface Water Treatment Plant.

TEXT IN CYAN = SPECIFIC RECOMMENDATION OR REQUIREMENT PER TCEQ FROM SPE REPORT

1.1 Historical Water Treatment Plant Flows and Flow Projections

1. NA

1.2 Colorado River Intake Pumping Station and Transmission Line

1. City: Flap valve at Lake has been removed and is laying on the ground next to outfall.
2. DCS: Analyzed running three existing pumps to fill the Lake to elevation 633.5' (i.e. normal pool elevation) by November 9th. Work included building the hydraulic model in WaterCAD, analyzing surge waves, adjusting the surge relief valve, overseeing the rehabilitation of the surge relief valve, overseeing the air release valve inspections, and troubleshooting low flow measurements. Compared against measured flows over time to confirm modeled flows match actual flows.
3. DCS/City: Online with 3 pumps running on 10/29/2019.
4. City: Inspected air release valves on 16 miles of 30" pipeline and four valves inside of the pump station building.
5. DCS: Troubleshot high static psi readings at local pressure gauge.
6. DCS: Confirmed John Valley adjusted low pressure setting on surge relief valve so that the valve automatically closes after a surge event and doesn't stay open. DCS also confirmed that John completed the repairs on one of the pump valve's control system so it would close properly and the surge relief valve would operate correctly (i.e. pressure would not be bled off by slow closure causing the surge relief valve to stay open)
7. DCS: Located the MCC/SCADA submittals and O&Ms to Matt Temple. Sent via a link to the entire WTP group as of 11/10/19.
8. DCS: Troubleshot high flow readings record by SCADA at the SWTP. Issue was caused by a mis-scaled 4-20 mAmp signal that was digitally scaled in two locations (river pump station and SWTP) but only correctly updated at the river pump station. On 11/01/2019, Alterman removed the unnecessary signal scaling at the SWTP and corrected the scale to match the output of the flow meter. Flows since that point have matched the predicted flow rates given the number of pumps in service.

1.3 Lake Pflugerville

1. DCS: Calculated how long it will take to fill Lake Pflugerville from current 629.0 ft level to 633.5 ft (normal pool) using 3 pumps less water removed from lake for use at the SWTP.
2. DCS: Evaluated installation of a CL17 at the outfall to Lake outfall to measure sodium permanganate residual.

Lake Intake Pumping Station

1.4 Interim Sodium Permanganate System and Pretreatment System

1. DCS: TCEQ requested a response on this system and approval letter request to Vera Poe by 10/25/19. DCS and the City met with Vera and the rest of the TCEQ team at TCEQ offices on 10/28/19 and obtained verbal approval of the proposed plan via exhibits prepared and presented by DCS.
2. DCS: Evaluated and analyzed options on how to proceed forward with addressing zebra mussels growing in the 36" and 48" pipes. Evaluated using sodium hypochlorite instead of sodium permanganate due to small tangential benefits to membranes between the two chemicals.
3. DCS: Completed the design of the temporary system and submitted letter to TCEQ with pictures, cut sheets, and sketches of what is proposed to be installed for interim system for their review and approval prior to activating the interim system. System will dose at 2 ft below the top gate only when the pumps are on and will be flow paced. Lower gates will be closed and only opened when water level in lake requires them to be opened.
4. DCS: Prepared installation package for City to construct the temporary system. Evaluated relocating/repurposing the Manville chlorine dosing pump skid with one new pump and install on wall in Lake PS pump building, tie to flow meter so that pumps are flow paced, install drums in old

polymer totes, and calculate how much sodium permanganate is needed per day and buy volumes accordingly.

5. DCS: Calculated dosing and pump sizes required to address odor and taste issues including manganese; and TOCs to avoid TTHM formation.
6. DCS: Evaluated multiple zebra mussel shell removal alternatives (shell fragments and living mussels) from the 36" and 48" pipes from the Lake to the SWTP including but not limited to the below:
    - Perform pre and post cleaning inspection including obtaining quotes from companies to perform this work. Send ROV through 36" pipe from Lake to WTP header up to the static mixer at WTP by entrance. Send ROV from static mixer to membrane building.
    - Perform pre and post cleaning inspection. Send ROV through 48" from intake tower to pump cans. Can ROV go past BFV locations and not get caught up? Can this be ice pigged or are the organics from mussels going to have to be dealt with in the water as they die?
    - Evaluate only using sodium permanganate if growth is low inside the pipe and using only PAC with sodium permanganate to address the TOCs and odor/taste issues in conjunction with a pretreatment train to catch shell fragments that slough off over time.
    - Pig 36" transmission to WTP? Ice pig? Conventional pig? How enter/exit pipe? Blowout mussels into Train #1at the end of the inlet line, close all inlet valves to other trains, remove cassettes in this basin while work is being done and put in new frac tank to keep wet. Then send all this debris to BW clarifier and thence to WWTP for disposal?
    - Remove first cassette in each train so any remaining shells are flushed out into the basin when water is reintroduced, then do a rapid tank drain to remove shells from the basin, and then reinstall first cassette.
    - Start dosing sodium permanganate after pipeline is cleaned.
7. DCS: Evaluated the installation of online TOC analyzers to automatically activate the PAC system and/or increase the sodium permanganate dosage to reduce TOC concentrations related to odor/taste and TTHM formation. Send data to SCADA system for recording and production of trending graphs.
8. DCS: Evaluated removal of first cassette in each train and installation a temporary tarp walls (2-3 in each basin) to create a pretreatment basin (i.e. grit chamber) in each train.
9. DCS: Evaluated installation of a basket strainer on both ends of the 14" tee in each train; or a custom screening system.
10. DCS: Evaluated leaving first damaged cassette in place but turn them off so they catch the shells.
11. Evaluated the installation of a CL17 or CL10 on the raw water and permeate discharge header to measure sodium permanganate residual to confirm 0.15 mg/L is being maintained in the five trains. Send data to SCADA system for recording and production of trending graphs. Per meeting with City on December 23, 2019, ORPs will be used in lieu of CL17 or CL10 for ease of operation and an indirect measurement of Sodium Permanganate concentration.

1.5 Permanent Sodium Permanganate System

1. NA

Membrane Trains & Associated Treatment Equipment

1.6 Membrane Trains

1. DCS: Inspected cassettes in Train 3, 1st cassette in Train 1, and 1st cassette in Train 2 to determine extend of shell fragments getting into the membrane cassettes and how long it takes for them to get there. No living zebra mussels were found.
2. DCS and City: Oversaw Suez's update of 5-minute turbidity readings per TCEQ's rules and changed UCL from 0.6989 to 0.33 in computer with Suez in Suez SCADA system. Suez calculated 0.32 but WTP is approved for 0.33 per letter from TCEQ.
3. DCS and City: Relocated combined filter effluent (CFE) turbidimeter and PH meter at temperature location to CFE sampling point in blower room including sending signals via 4-20 mAmp signals back to SCADA and water drain line to drain channel. Cl17 analyzer in lab removed, boxed up, and stored.
4. DCS: Prepared and distributed an email of the membrane repair summary of Suez's field work and investigation to City with DCS recommendations. Notable items include but are not limited to: chemical damage was not found by Suez; damage was chemical = 0%, normal wear = 25%, and Zebra Mussels = 75%; buying and installing two trains in about July 2019 saved the City's production capacity; and damage pattern was primarily found on fibers located on the exterior at the bottom or top of the modules.

5. DCS: It should be noted that the City needs only 3 trains to be in service to achieve N-1 for the winter of 2019; and 4 trains to be in service to achieve N-1 for the summer of 2020 (June 1st through about October 1st).
6. City: On 11/08/2019, Craig Brown submitted a proposal to the City to return to the plant in order to repair train 3 membranes and train operators on membrane maintenance. This proposal tentatively scheduled the two week visit for mid-January. Reviewed and approved proposal from Suez for repair visit scheduled for January as of 11/8/19.
7. City: On 10/07/2019, David Simons noticed the turbidimeters readings for trains 2 and 5 were likely incorrect and recommended that the City begin manual sampling every 4 hours until the issue had been addressed. On 10/7 and 10/8 operators troubleshot the turbidimeters and found air had built up in units 2 and 5. After this point, the issue was fixed however the reported turbidimeter readings vs manual samples did not match very well until DCS worked with Operators to institute better controlled sampling protocols. On 10/15/2019, TCEQ analyzed the improvements and determined that the units had in fact been fixed on 10/8 but the sampling had not matched due to the lack of training on sampling protocol. DCS continued to work with the City after this point to refine the sampling protocol and train all operators on manual sampling technique.

1.7 Rapid Tank Drain Equipment

1. NA

1.8 Membrane Aeration

1. City: Reinstalled blower #3 in blower room and put back into operation.

1.9 Clean-In-Place Equipment

1. NA

1.10 Backpulse Equipment

1. City: Investigated reason that backpulse tank and CIP tank was continually overflowing and creating a wet floor surface in the basement that persists and fixed the level indicators and/or SCADA settings.

1.11 Recirculation Equipment

1. NA

1.12 Air Compressors

1. NA

1.13 Vacuum Ejectors/Vacuum Pumps

1. DCS: Performed troubleshooting with Suez support over two days in the field to pin point the ejector system as a root cause of MIT and turbidity problems at the SWTP. Coordinated with the City for pressure gauges to be installed at precise locations and supplemental testing to confirm air headloss calculations.
2. DCS and City: DCS identified the abandoned in place vacuum pump system, piping, and electrical equipment to the City and recommend that this equipment will no longer be used, be removed and disposed of. City demolished abandoned in place vacuum pump system, piping, and electrical equipment and disposed of.
3. DCS: Met and coordinated with City prior to and during their construction of the new 1" diameter air pipe dedicated to the vacuum ejectors per DCS email sent on 11/1/19. DCS confirmed cut sheets, pictures of route, pipe hanger information, and root cause of high turbidity readings at the on-line turbidity meters at each of the five permeate pump discharge pipes was resolved upon completion of this work.
4. DCS: Confirmed the two pressure gauges installed on the air supply piping to the ejector on Train #1 and Train #5 are reading greater than or equal to 87 psi upon completion of the 1" air piping modifications. Both gauges read 100 psi.
5. DCS: Worked with City to perform field testing on Trains 1, 2, and 4 to confirm each ejector is working correctly and evacuating the air upon completion of an MIT. Train 3 and 5 were off-line Worked with Suez and Alterman to make the required SCADA adjustments to achieve a 3 minute ejector run duration to achieve evacuation of air from the air/water separator and confirm it produces a stream of water prior to the train going back into production.
6. City: Constructed new 1" diameter air pipe dedicated to vacuum ejectors per DCS email sent on 11/1/19. Email included cut sheets, pictures of route, pipe hanger information, and explanation of

root cause of high turbidity readings at the on-line turbidity meters at each of the five permeate pump discharge pipes.

1.14 Permeate Pumps and Associated Piping

1. NA

1.15 Clearwells

1. NA

1.16 High Service Pumping Station

1. City: Installed new light bulbs in HSP building.
2. DCS: TCEQ expressed concerns about the location of the CL17 in the HSPS measuring the end of the chlorine disinfection zone because the total chlorine residual drops to zero frequently due to the water level dropping in the proximity of the sample tap on the wall. The solution is to move the CL17 to the outlet of Clearwell No. 2, tap the 48" outlet pipe, and install two peristaltic pumps to pump this water through the CL17 analyzer. This analyzer will measure pH, total chlorine residual, and temperature. This solution will be included in the Manville Installation Package; and the updated CT Study submittal to TCEQ.

1.17 Backwash Clarifier & Sludge Disposal

1. DCS: Evaluated wind barrier/fence versus heat tracing with thermostat, weather jacketed pipe insulation, and pump casing flexible insulation at this location for permanent freeze protection of recycle and sludge pumps and piping. Provided cut sheets and pictures from similar projects for all materials to City. City is acquiring materials and will install upon receipt using existing duplex outlet(s) at the pumping station for power supply. City will confirm breaker in the breaker panel supplying power to the outlet(s) is sized to handle the heat tracing load. We recommend heat tracing tape around pumps be separately wired to allow pump casing to be removed without disconnecting the entire system via the use of heat trace tap tees and branch fittings.

Chemical Systems

1.18 Sodium Hypochlorite System and CT Study

1. DCS: Reviewed technical information, pump sizing, and quote and gave recommendation to City for buying two new prominent pumps from Barbara Luedecke with 6 new hoses and one repair kit for existing pump that it damaged.
2. City: Two Prominent pumps have been purchased by the City along with one repair kit and 6 hoses.
    - Prior to the two new pumps arriving, the operators had placed the damaged prominent pump back in its slot and piped it to be ready in case the working prominent pump fails. If this happens, the operators will fix the chemical leaks from the hoses as they occur, which is likely to happen since the backup prominent in the slot has rough edges on the inside.
    - Pumps delivered on about November 19th.
    - City to touch up paint the inside of the pump per manufacturer recommended paint to be used inside the casing. Repairs to pump to be done by City.
3. DCS: Evaluated relocating chlorine injection point on 30" permeate to a vertically lower location so this is more easily accessible. This is not possible due to the strategic and limited location of the dosing point to achieve the required process parameters.
4. DCS: In the 10/28/2019 meeting with TCEQ, DCS relayed that the residual for disinfection zone #1 in the proposed CT study will be increased and, therefore, the volume from Clearwell No. 1 will not be necessary to achieve log removal. It was also conveyed that the Manville re-route and new CT study will help in dedicating all of the sodium hypochlorite stored on site to the 17.14 mgd needs in the future rather than using more material to breakpoint chlorinate. This material will now be needed for the plant since it is approaching its design capacity and will likely have its capacity increased to 20.5 mgd via the high service pump installation prior to being expanded to 30 mgd.
5. DCS: Analyzed max distance from chlorine sampler to sample point for chlorine residual analyzers per TCEQ review comment. DCS recommends that the shorter the distance the better. DCS identified four options for residual sampling as part of the "brainstorming" phase of re-routing Manville:
    a. Option 1: Tap 36" Clearwell No. 1 effluent pipe and insert traffic rated box with cinder blocks. Connect to exit line going to CW No. 1 tap. Keep the CL17 inside HSPS Building (where it is now). The CL17 would be about 60 ft away from sample point. This tap would be before the LAS and Chlorine injection point, and would include Clearwell No. 1 in the CT Study.

b. Option 2: use exist tap on 36" pipe after the tee in valve vault between Clearwell No. 1 and Clearwell No. 2. Pipe sample tap back to exist CL17 in HSPS. The CL17 would be about 420ft away. Clearwell No. 1 would not be included in this CT study.
c. Option 3: Use exist tap on 36" pipe at tee in valve vault between Clearwell No. 1 and Clearwell No. 2. Pipe sample back to exist CL17 in Manville vault (about 420 ft. away). Clearwell No. 1 would not be included in this CT study.
d. Option 4: use exist tap on 36" pipe at tee in the valve vault mount CL17 in SST enclosure-use exist electrical to MOV. Abandon MOV in place and convert to manual. Pipe about 400 ft to HSPS for drain or into pipe bedding below. Clearwell No. 1 would not be included in this CT study.

6. DCS: Evaluated the existing sodium hypochlorite generation and storage system for interim operation to achieve the required chlorine residual by using the existing pumps prior to installation of the upgraded system/pumps.
    - Chlorine generator can produce 18,000 gpd of 0.80% solution.
    - City has two 12,500 storage tanks and these are each dedicated to different sets of pumps with no ability to utilize the other tank as a "back-up" supply for other pumps.
    - Calculated that at 17.14 mgd max day flow and 3.5 mg/L chlorine concentration would require 7,500 gallons of sodium hypochlorite. If the chlorine generator breaks, there is 3.33 days of storage in the two 12,500 gallon tanks available to dose at 3.5 mg/L. This volume does not include recovery/maintenance cleans during these days. Since the both tanks are not piped to supply the pumps, the storage volume is actually 1.67 days or less with one tank (assuming the tank was full when the sodium hypochlorite generator broke).
    - Thus, we recommend installing additional supply piping so all the sodium hypochlorite is available to all pumps. DCS evaluated connecting all suction piping together to minimize required work. However, this will not work due to the suction header being generated by the different peristaltic pumps which will result in the larger pumps overpowering the smaller pumps and preventing them from drawing chemical (by the vacuum they create on the suction piping).
    - For the interim period, one Prominent pump is being utilized to dose about 3.5 mg/L into the permeate header to achieve about 3.4 mg/L residual going into the distribution system after the high service pumps. This will be modified back to a two location dosing scheme after the CT Study is approved with a 0.5 mg/L residual at the end of the disinfection zone #1 and a total residual of about 3.5 mg/L after the high service pumps via a second dosage point.
7. DCS: Analyzed using different methods to measure free chlorine due to "phantom chlorines" to address concerns voiced by TCEQ for accuracy of methods when measuring free chlorine below 0.50 mg/L at the end of the disinfection zone. In the end, this concern became mute since DCS configured the CT Study on a minimum residual of 0.50 mg/L and the SCADA dosing system will be setup to maintain residual between 0.50 to 0.60 mg/L.
    - There are three different methods to successfully measure chlorine residuals: amperometric titration method, FACTS method, and indophenol colorimetric method. Of these three, the indophenols colorimetric method is the easiest for application at the City since it requires buying new reagents.
8. DCS: Evaluated original issues identified for resolution. These items will be addressed once the Installation Package construction has been completed and the SCADA system updated with new programming associated with these systems:
    - Obtaining required chlorine residual without Manville water turned on
    - Obtaining required chlorine residual with Manville water turned on
    - Turn Manville on ASAP to avoid water cost issues
    - Update CT study using totalized permeate flow (max of 27.6 mgd per membrane capacity) but recognize HSPS can only pump out 17.14 mgd from SWTP using 2 of the 3 pumps (i.e. firm capacity).
        - The CT Study will include the permeate piping after the membranes to Clearwell No. 2. This will make the CT Study correct if the plant's peak instantaneous high service pump capacity was sized for 32.12 mgd (i.e. 25.7 mgd membrane capacity with 125% to meet peak hour on max day). The target residual at the end of the disinfection zone is 0.5 mg/L.
        - Relocate CL17 to the outlet of Clearwell No. 2. The CL17 will be mounted to Clearwell No. 2 and measure chlorine residual, temperature, and pH. All this data will be conveyed to the SCADA system for recording and reporting purposes; and for calculating the log removal. This will be the end of the new Disinfection Zone 1. Electrical and communication will need to be routed to the CL17. A small peristaltic

pump is needed to provide flow to the CL17 at all times even when Clearwell No. 2 is empty due to the static lift.
    - Contacted TCEQ to confirm the flow to use for the SWMOR in disinfection tab for CT Study is the totalized permeate flow. The City has been using peak raw water flow per TCEQ direction at the Lake Intake Pumping Station. Depending on the extent of the variability seen in the permeate flow due to trains being in different stages of operations at different times, this totalized flow may need to be based on time dampened average flow instead of the instantaneous flow per TCEQ.
- DCS: Analyzed and developed plan to reconfigure hypochlorite chemical system for pumps, SCADA, and dosing process.
    - Suction piping of all hypochlorite pumps to be reconfigured so that all volume of hypochlorite can be used. Connecting the two hypochlorite bulk tanks at the bottom will not work since existing outlet is only for the exterior tank and the tanks are double walled.
    - Relocate LAS and Cl_2 dosing point to 48" pipe between clearwells to achieve complete mixing before Manville is introduced to the system. Clearwell No. 1 outlet will remain closed in this operation and the water will flow in and out of Clearwell No. 1 through the inlet.
    - Manville will be re-piped to the high service pumping station suction header stub out (with butterfly valve). DCS analyzed this scenario to ensure the pressure from the system did not negatively impact the high service pumps. It was determined that the existing cla-valve is a rate of flow control valve. This valve reduces the Manville distribution system pressure from about 100 psi to match the downstream pressure in order to achieve the desired flow rate (i.e. about 10 psi in this application). When power is lost, the valve fails to a closed position. The existing controller is where the flow is entered to regulate the valve. An electronic pressure gauge will be installed as another safeguard to protect the pumps from pressures above about 10 psi so the high service pumps are not negatively affected. An alarm to SCADA and shutdown will occur if this happens.
    - Note: The Manville contract does not specify max flow that can be taken from Manville or a specific drop in their pressure system.
    - Chlorine pumps will be dosing at the 30" permeate header and at the HSPS suction header. The LAS pump will be dosing at the HSPS suction header between the two clearwells. Since ACH, sodium bisulfite, etc., are not required for a treatment technique, these chemicals are not required to have backup pumps; however, backup pumps are planned to be installed or stocked in the warehouse for standby use.

9. Prepared installation package for City and Contractor to implement the proposed modifications/construction to reconfigure the system. Sent package to four contractors to obtain quotes for the Contractor portion of items to be installed. Generated a letter of recommendation to City for the quotes obtained so the City can award to the low bidder who was under $50,000.

1.19 Brine System

1. NA

1.20 Liquid Ammonium Sulfate (LAS) System

1. DCS: Evaluated existing pump system (one pump) sizing and evaluated installing a second standby pump for redundancy that is piped in for immediate use or purchasing a backup pump for storage in the warehouse that can be installed if the first pump fails. LAS is flow paced using the high service pump flow meter and high service pump turning on.
2. DCS: Prepared a layout and specification/cut sheet data for inclusion in the Manville Installation package for making the required modifications by City Staff. As part of this package, DCS relocated the dosing location to a new manhole located between Clearwell No. 1 and No. 2. This information was also included in the plan submittal to TCEQ for their review and approval of changes being made to the WTP.
3. DCS: Evaluated the existing LAS and sodium hypochlorite injection locations for achieving minimum contact/mixing/chemical reaction durations prior to the water reaching the high service pumping station and/or mixing with the Manville water being introduced into the suction header.
4. City: Installed the LAS line that was ran on grade in a new below grade conduit with a 3/8" diameter tube in it to the existing injection point at manhole near Clearwell No. 1.

1.21 Aluminum Chlorohydrate (ACH) System

1. NA

1.22 Citric Acid System

1. NA

1.23 Sodium Bisulfite System

1. NA

1.24 Sodium Hydroxide (Caustic Soda)

1. NA

1.25 Powder Activated Carbon (PAC) System

1. DCS: Researched the existing PAC material for NSF 61 approval and age of material. Material has been found to not be NSF 61 approved and due to its 14 years of age has been rendered ineffective for use. Thus, the two pallets of material and the material hanging in the PAC system should be thrown away by the City.
2. DCS: Analyzed required pipe diameter to the static mixer to keep PAC solution in suspension from the mixing system to the point of delivery via maintaining 3-5 fps. Selected PAC dosing pump to meet this flow and head condition across the 1 mg/L to 25 mg/L dosing range.
3. DCS: Reviewed existing PAC system design and O&M manuals for operational limits and capacities including maximum PAC concentration it can produce.
4. DCS: Analyzed the total contact time of PAC with the water at an anticipated max production capacity of 20.5 mgd using 4 trains (i.e. N-1 membrane capacity) in the raw water pipe after the static mixer and in the treatment train (due to re-suspension of PAC by the aeration system). Recommended contact time is 15 minutes. A total of 9.4 minutes is achieved for this configuration.
5. DCS: DCS and City discussed reactivating PAC system in detail on 1/23/20 and jointly agreed that slow dosing sodium permanganate poses a low risk of odor and taste generation per similar experiences at other entities in Central Texas. DCS to participate in developing dosage plan with City Operators prior to start of dosing sodium permanganate. Dosage strength, duration, sampling protocol, and ORP use to monitor sodium permanganate residual will be part of the plan which will be developed.
6. DCS: Evaluated this system for use as a backup to remove TOCs from the raw water that may not removed by the sodium permanganate system so that 1-2 mg/L is achieved prior to the membranes to prevent TTHM formation when chlorine is dosed. Meet with City to discuss pros and cons of reactivating the system with respect to cost to repair the system from EI2.
7. DCS: Coordinated with EI2 and obtain quote for them to restore the existing system and perform a new startup and testing of the system. Quote has been obtained and is being evaluated by City and DCS. If approved, City to issue purchase order to EI2 to perform required work. This system will include two metering pumps, one for backup.
8. DCS: Sized the new PAC peristaltic pumps for dosing 1 mg/L to 25 mg/L of PAC solution from the existing mixing tank.
9. DCS will work with Suez on selection of new PAC material so that damage to the membrane fibers does not occur (i.e. fibers become clogged with the PAC if the wrong type is used) and which is NSF 61 approved.

1.26 Chemical Building and Storage Area

1. City: Repainted all CMU walls inside day tank/chemical pump areas including areas damaged by pipe leaks to protect the CMU from further deterioration.

1.27 SCADA Modifications

1. DCS: Per conference call on 10/18/2019 with Suez, Alterman, Operators, and DCS, trains have been programmed to enter MIT after a high turbidity alarm. The trains cannot go back into production before passing an MIT. If another train is already performing an MIT, the train goes into standby until it is able to perform an MIT.
2. DCS: Coordinated with Alterman to fix all filter turbidity meters are recording and output with the same analog range (0-1,000 mNTU) to SCADA.
3. DCS and City: Confirmed with Suez the five minute high turbidity alarm is working. As of 11/6/2019, MIT's were triggered for periods that do not meet the high turbidity alarm definition. (IE: MIT's triggered for turbidity spikes less than five minutes long.) This has been resolved. There was a clock sync issue between SCADA and the PLC clocks that was resolved on 10/25/2019. This issue was causing MITs to be triggered/not triggered because they were/weren't recognized by the PLC.

4. DCS: Followed-up with operators and Suez about the period that train 5 could not be put into a manual MIT on 10/19/2019. The issue was resolved and train 5 can be put into a manual MIT now.

1.28 Submittals to TCEQ

1. DCS and City: TCEQ removed the 4 hour manual turbidimeter requirement on October 15 along with the daily reporting requirement to TCEQ. DCS continued to QC daily reports and converted to a daily turbidimeter calibration check.
2. DCS: Prepared and submitted the Manville Interconnect plans and specs to TCEQ on 10/28/19 along with updated CT Study. On 11/5/19, these documents were formally withdrawn from TCEQ to allow for new modified plans and specs to be submitted at a later date.
3. City: Revised and resubmitted SWMOR-Alts from July 2018 to August 2019. TCEQ determined compliance and issued Notices of Violations based on the revised reports. DCS generated Excel macro to aid City in entering the IFE high turbidity in the SWMORs.

1.29 Standard Operating Procedures (SOP)

1. DCS and City: Operators have been trained to include regular calibration and calibration checks of the instruments at the water plant. This includes a 90 day online turbidimeter calibration, 7 day calibration check, and a calibration check of the benchtop turbidimeter every time an operator runs a series of tests. This training is being documented the SOPs that are under development.
2. DCS: During DCS's work with the City Operators over about 2.5 months of reviewing the daily SWMOR reports (10/10/2019 – 12/31/2019), the operators demonstrated thoroughness in their reporting; and record keeping through the shift report emails. DCS discontinued review of daily SWMORs per coordination with City. Brandon and/or Brian are now reviewing these daily reports.
3. DCS and City: After December 31, 2019, city will cease submitting SWMOR to DCS for review; and City will stop taking daily turbidimeter calibration samples.
4. Per recommendation by TCEQ, operator shift reports (Day, Mid, and Night shifts) have been implemented to document operators progress on tasks, record day to day activity at the SWTP, help coordinate between operators between shifts, and provide a written account of any major events that occur at the plant. Shift reports are communicated via email to City management, DCS, and amongst all operators.

1.30 TCEQ Violation Letter and Public Notification

1. DCS: Reviewed Notice of Violation letter from TCEQ with attachments. Worked with City to draft public notice, advise on technical issues, talking points for press release, meetings with TCEQ, and phone calls with TCEQ regarding the tier 2 violations that was published on 11/4/2019.
2. DCS: Provided support to City to answer technical questions about the TCEQ violations and their causes.
3. DCS: Prepared presentation on WTP status/violations; and presented to Council on November 12, 2019.

1.31 General Items

1. City: Painting Well No. 6 Ground Storage Tank, South Stand Pipe, and other tanks in the City's system was identified by the City to DCS that this needed to be acted upon. The City issued an RFQ on November 7, 2019 for a company to perform asset management and maintenance services on the City's tanks.
2. DCS and City: Met with TCEQ at their offices on 10/28/19 to go over proposed conceptual plans regarding Manville re-route, revisions to CT Study, interim sodium permanganate dosing system at Lake Pumping Station, and other process design improvements.
3. DCS: On Friday October 4, 2019, at about 10:00 PM, the City requested a status report and summary of events that have occurred related to the Water System Odor and Taste Improvement Project; and Zebra Mussel Impacts to the Water Treatment Plant since the March 12, 2019 City Council Work Session. The requested goal of the technical memorandum was to provide an update to City Management including but not limited to the status of the project's implementation as measured against the original schedule. DCS sent the above mentioned Tech Memo to the City on Tuesday, October 8, 2019, which includes a summary and timeline of actions taken by the City starting from the beginning of Zebra Mussel discovery.
4. DCS: On October 7, Craig Brown (Suez) recommended installing the HACH Weir Flow Controller for air removal. After evaluating the proposed device and discovering the ejector air pressure supply issue, DCS recommends keeping the existing Hach air separator and not install this new device. We recommend reconsidering this device only if turbidity spikes persist after the ejector air pressure issue has been resolved.

5. DCS: Evaluated the HACH 5400 and 5300 online turbidimeters ability to use RFID tagged sample bottles to transfer information from the online unit to the bench top analyzer. DCS evaluated implementing this into plant SOP for manual sampling but determined the additional protocol would only complicate the procedures for the Operators.
6. DCS: At the 11/12/2019 City Council meeting presentation Darren gave, it was conveyed that this WTP is highly sophisticated and that not many operators are trained to operate this type of plant. Additionally, the City has hired an A licensed operator for the WTP per Sereniah at the meeting.
7. DCS: Calculated the headloss in the 12" Manville waterline to be 12.24 feet (5.3 psi) excluding the backflow preventer and the strainer prior to the cla-val in the vault.
8. City: Hired new Utility Superintendent and SWTP Foreman who both started on 12/9/19.
9. DCS: Macro Priorities (set on 10/7/19) per meeting the City Staff and City Manager. At this meeting, DCS was assigned the lead role in resolving the various active SWTP and TCEQ regulatory issues:
    - Solve three violations made aware of on September 20, 2019 by City from TCEQ; and work to discontinue TCEQ daily operation report reviews. (completed)
    - Three trains min in operation for going into winter 2019 (completed); then four min in operation for June 1, 2020 (completed)
    - Programming modifications by Suez UCL =0.33. (completed)
    - List of all known items to solve. (completed)
    - Solution set buy in meeting with TCEQ. (completed)