

May 20, 2016

Mr. Bob Morrison
City of League City
1505 Dickinson Avenue
League City, Texas 77573

VIA EMAIL

Re: GLO Water Plant Improvements
Final Well Construction
Cobb Fendley Project No. 1212-026-03-02

Dear Mr. Morrison:

The pilot hole analysis for the water well at Dickinson Pump Station is complete. Weisinger Inc. performed electric logs, a deviation log, and water chemistry samples. The electric log indicates that there are four thin layers of water-bearing sands. Water samples were taken from each of the four sand layers and chemistry analysis was performed on each sample. The depths sampled were:

Test Well 4 screen:	390 to 400 feet (10')
Test Well 3 screen:	450 to 460 feet (10')
Test Well 2 screen:	540 to 570 feet (30')
Test Well 1 screen:	680 to 710 feet (30')

A summary of the chemical analysis is attached to this letter. Overall, each test well had constituents that exceed TCEQ maximum contaminant levels for drinking water. Three out of the four test wells have arsenic concentrations higher than the limit of 0.010 mg/L. Test Well 1 has high levels of chloride and total dissolved solids, indicating that the water is brackish. Well pumping rates were recorded for each test well. The City indicated that they wanted 1,500 gpm of well capacity at this site. The maximum pumping rate for each test well is:

Test Well 4:	99 gpm
Test Well 3:	177 gpm
Test Well 2:	47 gpm
Test Well 1:	10 gpm
Total:	333 gpm

We have several options for you to consider for construction of the well. The construction costs presented are engineering estimates and not quotes from the Contractor.

Option 1 – Abandon the pilot hole and plug it. Pilot hole abandonment and plugging costs approximately \$30,000. The Contractor to date has performed work equal to approximately \$251,040, for a proposed contract total of \$301,040. The bid amount was \$1,193,300 leaving a remaining fund balance of \$892,260. If the project is not constructed to provide a 'beneficial use' to the community, GLO would require the City to reimburse engineering fees paid to date. The remaining funds would have to be reallocated to another GLO approved project through an Amendment and Performance Statement change.

Option 2 – Install screens in all sand intervals in order to achieve the highest capacity possible. Installing screens in all four sand layers, we anticipate achieving 333 gallons per minute (gpm). The water quality of this well would not meet TCEQ requirements. A filtration system would need to be constructed to lower the Total Dissolved Solids (TDS) and arsenic concentrations. A reverse osmosis

system can be used to treat the brackish water and arsenic. Preliminary cost estimate for this system is \$1 million to \$1.5 million. A major obstacle is that the site does not contain a sanitary sewer for backwash operations.

Option 3 – Install screen only in Test Wells 2 and 3 (540-570' and 450-460'), and install a blank liner in Test Wells 1 and 4. This option avoids the brackish water in Test Well 1 and the low capacity of Test Well 4. Weisinger estimates that this will result in pumping capacity between 300 and 600 gpm. A collective chemical analysis of these two sand layers together is recommended to determine if the arsenic concentration is acceptable. If the arsenic concentration is below TCEQ limits, this option will not cost any additional funds to the project and may result in a small deduct due to a smaller quantity of screen. However, an arsenic level greater than 0.010 mg/L would require blending from another water source or additional treatment.

Preliminary costs of an Omni-Sorb media filtration system are \$900,000. The filter can reduce concentrations of Iron, Manganese, and Arsenic. The site has existing piping to allow for the ground storage tank to be filled by League City's distribution line on FM 646, or by an interconnect with WCID No. 1. These connections could potentially be used as sources of water for blending, depending upon their operational status. Filling the tank from the waterline on FM 646 would create a circular pattern in the water plant, thereby not diluting the arsenic to acceptable levels. The City is no longer able to purchase water from WCID No. 1 through the existing interconnect piping.

A third source of blending water is available in an existing waterline on Ohio Street, which is east of the water plant site. Preliminary cost estimate for an 8-inch waterline from Ohio Street to Dickinson Pump Station is approximately \$260,000.00. This construction cost is within the acceptable limits of a change order (25%) to the existing contract.

Blending treated water with the well water is an acceptable method of diluting or reducing the concentration of arsenic to meet TCEQ maximum contaminant levels. TCEQ reviews this method as an "exception", which requires submission of the well completion data, engineering report, plans and specifications of the blending line. CobbFendley has successfully implemented blending for the Town of Quintana, and is currently in the exception review process for the City of Angleton. We have notified TCEQ of the initial pilot hole results for Dickinson Pump Station. See attached email correspondence with Mr. Jonathan Pi.

CobbFendley recommends final construction of the well as described in Option 3, with screens in water bearing sands at intervals 540-570' and 450-460', which would produce approximately 300 to 600 gpm. We recommend construction of an 8-inch waterline with connection to the ground storage tank for blending. This will provide the City with a project that provides a beneficial use to the community. If you have any questions or require additional information, I can be contacted at (936) 224-7114.

Sincerely,

COBB, FENDLEY & ASSOCIATES, INC.



Amber Hurd, P.E.
Project Manager



City of League City - Dickinson Pump Station Well
Groundwater Quality Data and Pumping Data for 4 Temporary Test Wells in Pilot Hole

Temporary Test Well Screen Interval Date of Sample Collection	Test Well 1 680 to 710 feet 3/10/2016	Test Well 2 540 to 570 feet 3/13/2016	Test Well 3 450 to 460 feet 3/17/2016	Test Well 4 390 to 400 feet 3/20/2016	TCEQ MCL or SCL for Public Drinking Water
<i>Constituent and Units*</i>					
pH (no units)	7.79	7.90	7.68	7.84	>7
Total Dissolved Solids, mg/L	1,050	514	592	598	1,000
Chloride, mg/L	420	150	118	138	300
Total Hardness as CaCO ₃ , mg/L	48.7	20.6	32.5	33.9	---
Color, PCU	9.8	6.1	9.0	9.9	15
Total Turbidity, NTU	2.42	3.15	1.47	3.96	1
Dissolved Turbidity, NTU	0.11	0.60	0.26	0.19	---
Total Aluminum, mg/L	0.355	0.426	0.487	0.035	0.05 - 0.2
Dissolved Aluminum, mg/L	0.019	0.095	0.027	0.012	---
Total Arsenic, mg/L	0.016	0.009	0.012	0.046	0.010
Dissolved Arsenic, mg/L	0.013	0.007	0.011	0.041	---
Total Iron, mg/L	0.323	0.268	0.682	0.054	0.3
Dissolved Iron, mg/L	0.054	0.074	0.043	0.015	---
Total Manganese, mg/L	0.037	0.026	0.075	0.048	0.05
Dissolved Manganese, mg/L	0.034	0.025	0.045	0.038	---
Total Fluoride, mg/L	1.33	1.19	1.00	1.04	4 (MCL), 2 (SCL)
Dissolved Fluoride, mg/L	1.15	0.92	0.71	0.74	---
Hydrogen Sulfide, mg/L	<0.05	<0.05	<0.05	<0.05	0.05
Gross Alpha, pCi/L	1.0 +/- 0.4	1.2 +/- 0.5	5.0 +/- 0.6	4.1 +/- 0.7	15
Gross Beta, pCi/L	4.5 +/- 3.3	1.8 +/- 1.8	0.5 +/- 1.1	1.8 +/- 1.2	50
Radium-226, pCi/L	0.9 +/- 0.3	0.6 +/- 0.3	0.9 +/- 0.4	0.5 +/- 0.3	5 combined for Ra-226 + Ra-228
Radium-228, pCi/L	0.6 +/- 0.5	0.1 +/- 0.5	0.9 +/- 0.5	0.9 +/- 0.5	
Uranium, micrograms/L (calc)	0.0 +/- 0.3	0.3 +/- 0.5	0.0 +/- 0.3	0.9 +/- 0.6	30
Test Well Pumping Rates	83 to 99 gpm	126 to 177 gpm	16 to 47.8 gpm	5 to 10 gpm	Field data
Static Water Level	99.1 feet	112.0 feet	94.3 feet	98.3 feet	provided
3-Hour Pumping Level at Rate	546.1' @ 86 gpm	235.3' @ 176.4 gpm	322.2' @ 47.8 gpm	352.1' @ 10 gpm	by
3-Hour Specific Capacity	0.19 gpm/ft	1.43 gpm/ft	0.21 gpm/ft	0.04 gpm/ft	Weisinger &
Water Temperature (lab data)	69.8 °F	80.6 °F	75.2 °F	72.3 °F	Envirodyne

EXPLANATION

Laboratory analyses performed by Envirodyne Laboratories, Inc., Houston, Texas, and its subcontractor labs. Lab completed dissolved analyses for a few constituents that are listed after filtering of test well water samples. Dissolved drilling mud in water sample may result in higher concentration(s) of color, turbidity, aluminum, arsenic, iron, and/or manganese, and possibly fluoride.

TCEQ = Texas Commission on Environmental Quality.

MCL = TCEQ Maximum Contaminant Level for public drinking water.

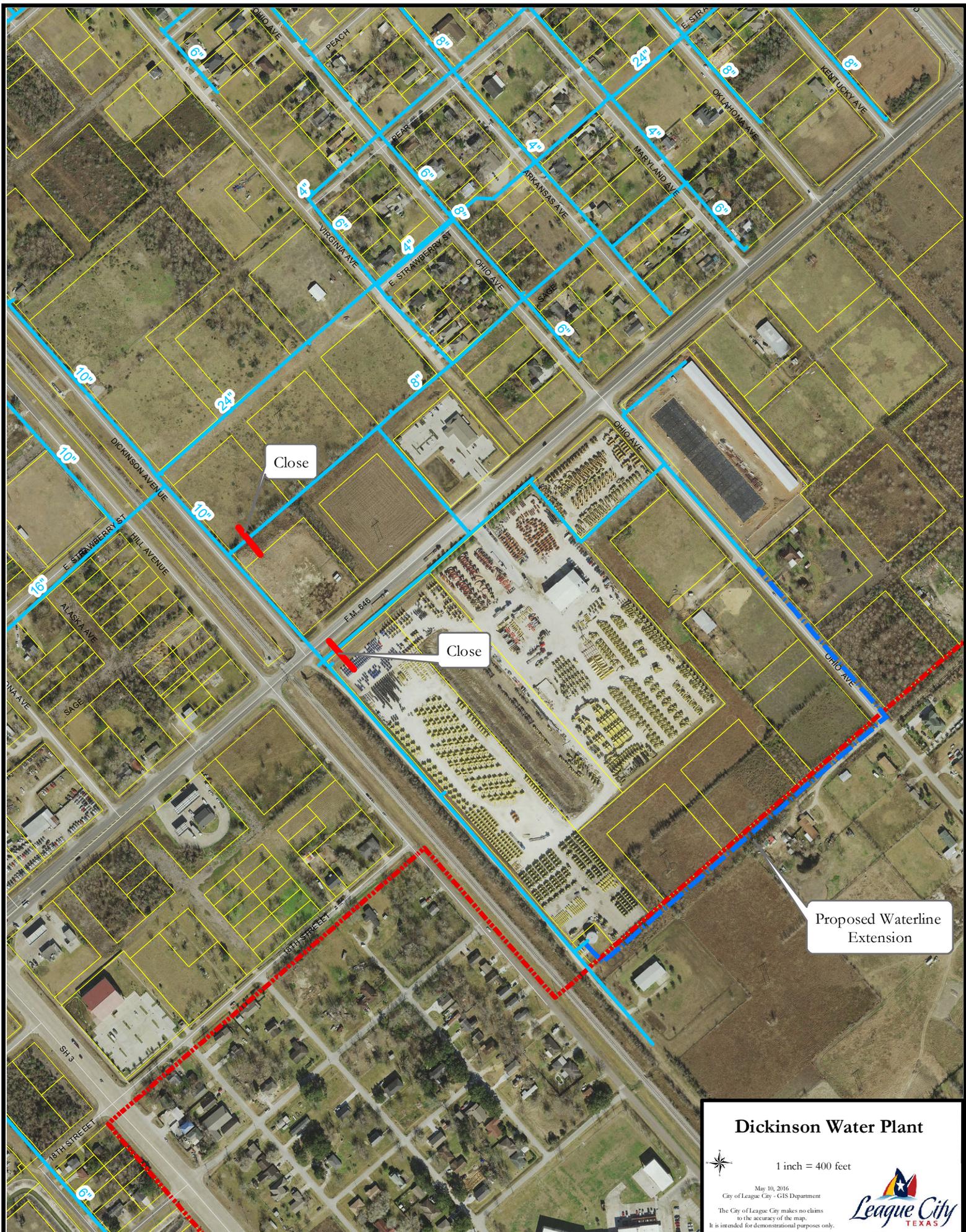
SCL = TCEQ Secondary Contaminant Level for public drinking water.

*All constituent units are milligrams per liter (mg/L) unless noted otherwise.

mg/L = milligrams per liter. NTU = Nephelometric Turbidity Units.

pCi/L = picoCuries per liter. PCU = Platinum Cobalt Units.

Highlighted & bold value = concentration equals or exceeds corresponding TCEQ MCL, SCL or standard.



Close

Close

Proposed Waterline Extension

Dickinson Water Plant



1 inch = 400 feet

May 10, 2016
City of League City - GIS Department

The City of League City makes no claims to the accuracy of the map. It is intended for demonstrational purposes only.



Amber Hurd

From: Jonathan Pi <Jonathan.Pi@tceq.texas.gov>
Sent: Wednesday, April 20, 2016 10:50 AM
To: Amber Hurd
Subject: RE: Well for PWS #0840007

Ms. Hurd,

For arsenic treatment, we don't have any specific guidance. However we will review it accordingly. Based on your email, it appears that you are considering filtration or blending.

If filtration is the selected treatment, an exception request (See below) needs to be submitted to TCEQ's Technical Review and Oversight Team (TROT) under 30 TAC §290.42(g) per 30 TAC §290.39(l). After the exception is granted, you may submit the well completion data, and plans and specifications for the arsenic filtration system to Plan review Team.

If blending the high arsenic water with another source, you may submit the following to Plan Review Team:

1. Well completion data;
2. Engineering report for blending; and
3. Plans and specifications for the blending.

Please note that the TCEQ has updated well completion check to request addition corrosive parameters (See attached). So, when the well completion data is submitted, please include the corrosive parameters in the chemical analysis report.

Exceptions must be requested in writing and must be substantiated by carefully documented data. The request for an exception shall precede the submission of engineering plans and specifications for a proposed project for which an exception is being requested as required in 30 TAC Section 290.39 (l)(1). Written exception request must be submitted to the TCEQ's TROT at the following address:

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

For information about the exception process, please go to the URL below:

<http://www.tceq.texas.gov/drinkingwater/trot/exception>

Please note that an "Exception Request Form" must be completed for all exception submittals.

If after you have reviewed the information available at the webpage above you have a question regarding the exception process, please call (512) 239-4691 and ask to speak to a member of the TROT about exceptions.

Let me know if you have any other questions.

Thanks,

Jonathan Pi, P.E.
Plan Review Team

From: Amber Hurd [mailto:AHurd@cobbhendley.com]
Sent: Wednesday, April 20, 2016 10:13 AM
To: Jonathan Pi
Subject: Well for PWS #0840007

Mr. Pi,

The City of League City has constructed a pilot hole for the proposed water well at 2050 Dickinson Avenue. The pilot hole data indicates a possibility of arsenic that is higher than the MCL of 0.010 mg/L. We are contemplating options to remedy the arsenic issue such as blending or a filtration system. Does the TCEQ have guidance on which methods are acceptable for reducing the arsenic below the MCL? Feel free to call me to discuss further. Attached is the approval letter for this project for your reference.

Thank you,

AMBER HURD, P.E.
Principal



office **936.224.7114**
fax **713.462.3262**
direct **713.485.8162**

16610 IH 45, Suite 250 | Conroe, TX 77384

cobbhendley.com | TBPE No. F-274 | TBPLS No. 100467

City of League City
Water Line Extension Preliminary Cost Estimate
5/2/2016

Construction Cost Items				
Item	Unit	Qty.	Unit Cost	Total
8" PVC Water open cut	LF	1950	\$80.00	\$156,000.00
8" PVC Water Auger	LF	50	\$150.00	\$7,500.00
8" Plug and Clamp	EA	1	\$1,000.00	\$1,000.00
6" D.I. Water open cut	LF	75	\$80.00	\$6,000.00
Fire Hydrant	EA	2	\$3,000.00	\$6,000.00
6" Solenoid Valve with conduit/wire and programming	EA	1	\$15,000.00	\$15,000.00
Trench Safety	LF	1950	\$5.00	\$9,750.00
Tank Modifications	LS	1	\$5,000.00	\$5,000.00
Site Restoration	LS	1	\$5,000.00	\$5,000.00
Traffic Control	LS	1	\$5,000.00	\$5,000.00

Subtotal \$216,250.00
20% Contingency \$43,250.00
Construction Cost Total \$259,500.00

Original Contract Amount \$1,193,300.00
Percent of Original Contract 22%