

TECHNICAL MEMORANDUM

FOR:

JOHN TAMEZ

271 ACRE TRACT

NUECES COUNTY, TEXAS

CONCEPTUAL WASTEWATER PLANS

PREPARED BY:



LJA Engineering, Inc.

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DATE: JULY 24, 2019

JULY 24, 2019

INTRODUCTION

A. BACKGROUND

The John Tamez 271-acre tract, as shown on Exhibit 1, is located south of, and adjacent to, the Oso Creek. The tract is in Nueces County and in the ETJ of the City of Corpus Christi. Mr. Tamez intends to develop the property into a primarily single-family residential subdivision. In order to accomplish this, wastewater service to the tract must be approved by the City of Corpus Christi. In order to address this issue, Mr. Tamez engaged LJA Engineering Inc. to prepare conceptual layouts and opinions of probable cost for options which may be available to serve the wastewater requirements of the proposed development.

B. PURPOSE OF THIS MEMORANDUM

As stated above, this memorandum will explore options, in a very conceptual way, to extend wastewater service to the Tamez tract. This memorandum is not intended to be a preliminary engineering report or a design memorandum, both of which require very detailed information and surveys not included in the scope of this report.

C. LONDON AREA WASTEWATER PLAN

The London Area Wastewater Plan, originally prepared circa 2007, was approved by the City Council in April 2017. The plan indicates that the Tamez tract would be served by a gravity sewer which would direct flows to a major lift station called CR 204 LS in the Plan. According to the Plan, the CR 204 Lift Station would have a peak design flow of 39.29 MGD. This would seem to indicate that the size and cost of the station would make it very unlikely to be constructed in any near-term scenario. The Plan calls for all flows to be directed to the Greenwood WWTP.

D. MODIFICATIONS TO THE LONDON WASTEWATER PLAN

Since the plan calls for wastewater service to the Tamez tract to be directed to the major CR 204 Lift Station, which would appear to be a very long-term plan, it presents an obstacle to a near term development. Hence, LJA has investigated the option of situating a lift station on the Tamez tract with a wet well sized for an ultimate service area of approximately 525 acres, on two of the options (Options 2 & 3). Another option (Option 1) would serve only the Tamez tract and would direct flows (for approximately 800 residences) from the lift station to an existing gravity sewer in the King's Lake Subdivision, which is located across the Oso Creek from the Tamez tract. The property which would be utilized in the subdivision for the Oso Creek crossing, is adjacent to the Creek and is owned by Mr. Tamez. The flows in this option, which would allow construction of approximately 800 residences, would be accommodated by the Lakes Lift Station which is in the OSO WRP Basin. This option as well as the other three options, would require an amendment to the Wastewater Plan.

E. OPTIONS FOR PROVIDING WASTEWATER SERVICE TO THE TAMEZ TRACT

LJA has developed three options for providing wastewater service to the Tamez tract. They are shown in conceptual form in Exhibits 2,3 and 4. They are briefly described as:

Option 1 – New Lift Station (wet well sized for 200 acres, pumps sized for flow from 800 residences), 8" Force Main to Kings Lake Drive Gravity Sewer and Lakes Lift Station upgrade. Ultimately to the Oso WRP.

Option 2 – New Lift Station (wet well and pumps sized for 525 acres of mixed use development) and 12" Force Main to new London Lift Station No. 1 and ultimately the Greenwood WWTP.

Option 3 – New Lift Station (wet well and pumps sized for 525 acres of mixed use development) and 12" Force Main to the Greenwood WWTP.

Preliminary Opinions of Probable Cost, which detail the items required for each option, are shown on pages 4 through 6.

ANALYSIS OF OPTIONS

A. GENERAL

Engineering analysis of the various options utilized the following criteria and parameters:

Residential Housing Density: 4 residences/acre

Persons Per Residence: 3.5

Per Capita Daily Wastewater Flow :100 Gallons Per Person

Peak Flow Factor (Peak Two Hour Flow) – New Development: 3.0

Peak Flow Factor (Peak two Hour Flow) – Lakes Lift Station: 2.5

I/I Flow: 400 Gallons/Acre/ Day

Wet Well Volume Sizing

TCEQ Design Criteria, Chapter 217 of TAC 30

$$V = T \times Q / 4 \times 7.48$$

Where

V= Active Volume (cubic feet)

Q = Peak Pumping Capacity (Gallons per Minute)

T= Cycle Time (Minutes)

For Pump motors with a horsepower rating less than 50, T = 6 minutes

Wet well sizing will be for the ultimate flows however, the wet wells can be constructed in phases with the initial wet well construction incorporating a stub out for an interconnecting pipe between the near term and future wet wells being provided. The lift station site plan must take into account future wet well additions.

B. OPTION 1 – New Lift Station and 8" Force Main to Kings Lake Drive Gravity Sewer and Lakes Lift Station Upgrade. (Oso WRP Basin) See Exhibit 2

Peak Pump Flows (Calculated Peak Flow + 10%)
Ultimate Peak Pump Flow (800 Homes): 700 GPM

Wet Well Capacity New Lift Station
Ultimate Flow 140 CF

It is judged that a combination of interconnected wet wells with diameters between 6' and 8', depending on actual calculated flows derived from final land plans and usages, will be utilized.

The Lakes Lift Station Exhibits 5 and 6 show the capacity analysis for the Lift Station. Based on pumps run time data and 1983 vintage as-builts furnished by the City of Corpus Christi it was judged that the Lift Station does not have the pumping capacity to accommodate the 700 GPM additional flow from the Tamez Property. With the additional flow, the estimated peak pumping flow from the station will be 1,900 GPM in comparison with the existing calculated pumping capacity of 1,500 GPM. The existing wet well capacity is deficient if the capacity is calculated to not allow wastewater to "back up" into the incoming sewer lines. If the Tamez property flow option is considered, and as reflected on the opinion of probable cost, it is recommended that a lift station upgrade be performed. The upgrade would preliminarily include an additional wet well and upgrade of pumps and piping. This assumes there is no conflict with facilities constructed on the site after the initial lift station construction as shown on the 1983 as-builts. It should also be noted that no hydraulic analysis was done for the existing Wastewater System after the discharge of the Lakes Lift Station force main into a manhole located in a utility easement between Lethaby Drive and Lake Nocona Drive. This hydraulic modeling should be performed to ensure the additional flows do not create any capacity constraints on the existing system.

Preliminary Opinion of Probable Cost for Option 1: \$3,084,000

C. OPTION 2 – New Lift Station and 12" Force Main to New London Lift Station (Greenwood WWTP) See Exhibit 3

Predicted Flows and Wet Well Capacities same as Option 1. Final design must take into account interim flows maintaining a minimum flow velocity of 2 fps in the 12" force main. The force main will be routed as shown on the Exhibit in an on-site UE on the Tamez property, then in County Road ROW and finally in the dedicated 65' UE to the London Lift Station No. 1.

Preliminary Opinion of Probable Cost for Option 2: \$6,890,000

D. OPTION 3 – New Lift Station and 12" Force Main to Greenwood WWTP. (Greenwood WWTP) See Exhibit 4

Predicted Flows and Wet Well Capacities same as Option 1. Final design must take into account interim flows maintaining a minimum flow velocity of 2 fps in the 12" force main. The force main will be routed as shown on the Exhibit in an on-site UE on the Tamez property, then in County Road ROW, then in a dedicated 65' UE, continuing in City of Corpus Christi Street ROW's to the influent lift station at the Greenwood WWTP.

Preliminary Opinion of Probable Cost for Option 3: \$8,855,000

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OPTION 1 - NEW LIFT STATION, 8" FORCE MAIN TO KINGS LAKE DRIVE, AND LAKES LIFT STATION UPGRADE					
ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
PART 1A - GENERAL					
1A1	Mobilization (Max. 5% of Project Total)	LS	1	\$ 66,700.00	\$ 66,700.00
1A2	Bonds & Insurance	LS	1	\$ 44,500.00	\$ 44,500.00
1A3	Storm Water Pollution Prevention Plan	LS	1	\$ 7,500.00	\$ 7,500.00
1A4	Traffic Control	LS	1	\$ 5,000.00	\$ 5,000.00
1A5	Ozone Action Day	DAYS	1	\$ 1,750.00	\$ 1,750.00
1A6	Inlet Protection	EA	2	\$ 400.00	\$ 800.00
1A7	Silt Fence	LF	2,500	\$ 5.00	\$ 12,500.00
1A8	Contingency Allowance for Unanticipated Adjustments/Improvements	LS	1	\$ 50,000.00	\$ 50,000.00
TOTAL PART 1A - GENERAL (Items 1A1 thru 1A8)					\$ 188,750.00
PART 1B - WASTEWATER IMPROVEMENTS					
1B1	New Lift Station (Includes Lift Station with Wetwell & Pumps Sized for 200 Acres Developed, Access Road Paving, Overhead Power, Emergency Generator w/ Foundation)	LS	1	\$ 910,000.00	\$ 910,000.00
1B2	Directionally Drilled 8" (DR-18) FPVC Force Main	LF	1,650	\$ 280.00	\$ 462,000.00
1B3	Bore Pit Trench Safety	EA	2	\$ 6,000.00	\$ 12,000.00
1B4	8" C900 (DR-18) PVC Force Main (0'-6')	LF	410	\$ 75.00	\$ 30,750.00
1B5	Trench Safety for Open Cut Pipe Installation	LF	410	\$ 6.00	\$ 2,460.00
1B6	Well Pointing	LF	410	\$ 30.00	\$ 12,300.00
1B7	8" Plug Valve & Box	EA	2	\$ 2,500.00	\$ 5,000.00
1B8	8" 11.25° Bend	EA	2	\$ 1,200.00	\$ 2,400.00
1B9	2" Air/Vacuum Release Valve in 5' Diameter F/G Manhole	EA	2	\$ 12,500.00	\$ 25,000.00
1B10	6' Diameter F/G Manhole	EA	1	\$ 15,000.00	\$ 15,000.00
1B11	Manhole Trench Safety	EA	3	\$ 1,000.00	\$ 3,000.00
1B12	Connect Existing 8" WW to New Manhole	EA	1	\$ 5,000.00	\$ 5,000.00
1B13	Full Depth Pavement Repair	SY	430	\$ 75.00	\$ 32,250.00
1B14	Remove and Replace Curb and Gutter	LF	30	\$ 30.00	\$ 900.00
1B15	Lakes Lift Station Upgrade	LS	1	\$ 625,000.00	\$ 625,000.00
TOTAL PART 1B - WASTEWATER IMPROVEMENTS (Items 1B1 thru 1B15)					\$ 2,143,060.00
SUBTOTAL OPTION 1 (PARTS 1A THRU 1B)					\$ 2,331,810.00
15% CONTINGENCY					\$ 349,771.50
TOTAL OPTION 1 (PARTS 1A THRU 1B)					\$ 2,681,581.50
PART 1C - PROFESSIONAL SERVICES					
1C1	Engineering Basic Services	LS	1	\$ 241,400.00	\$ 241,400.00
1C2	Engineering Additional Services	LS	1	\$ 80,500.00	\$ 80,500.00
1C3	Topographic Survey, Easement Survey, and Mapping	LS	1	\$ 53,700.00	\$ 53,700.00
1C4	Geotechnical	LS	1	\$ 13,500.00	\$ 13,500.00
1C5	Testing	LS	1	\$ 13,500.00	\$ 13,500.00
TOTAL PART 1C - PROFESSIONAL SERVICES (Items 1C1 thru 1C5)					\$ 402,600.00
TOTAL OPTION 1 PROJECT COST (PARTS 1A THRU 1C)					\$ 3,084,181.50

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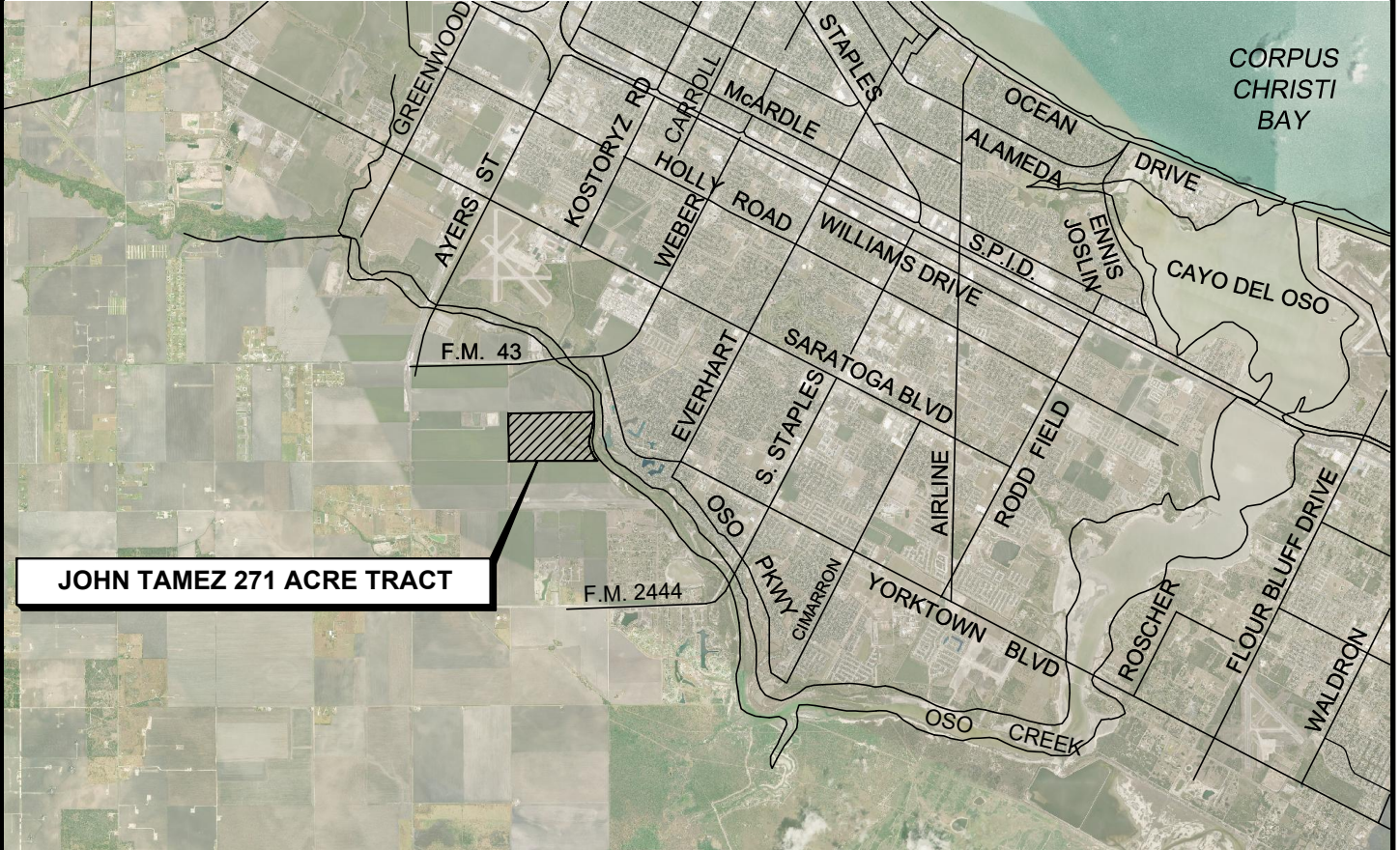
OPTION 2 - NEW LIFT STATION AND 12" FORCE MAIN TO LONDON LIFT STATION					
ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
PART 2A - GENERAL					
2A1	Mobilization (Max. 5% of Project Total)	LS	1	\$ 148,900.00	\$ 148,900.00
2A2	Bonds & Insurance	LS	1	\$ 99,300.00	\$ 99,300.00
2A3	Storm Water Pollution Prevention Plan	LS	1	\$ 15,000.00	\$ 15,000.00
2A4	Traffic Control	LS	1	\$ 15,000.00	\$ 15,000.00
2A5	Ozone Action Day	DAYS	1	\$ 1,750.00	\$ 1,750.00
2A6	Silt Fence	LF	20,000	\$ 5.00	\$ 100,000.00
2A7	Contingency Allowance for Unanticipated Adjustments/Improvements	LS	1	\$ 50,000.00	\$ 50,000.00
TOTAL PART 2A - GENERAL (Items 2A1 thru 2A7)					\$ 429,950.00
PART 2B - WASTEWATER IMPROVEMENTS					
2B1	New Lift Station (Includes Lift Station with Wetwell & Pumps Sized for 525 Acres Developed, Access Road Paving, Overhead Power, Emergency Generator w/ Foundation)	LS	1	\$ 1,200,000.00	\$ 1,200,000.00
2B2	Encased 12" (DR-18) FPVC Force Main	LF	750	\$ 180.00	\$ 135,000.00
2B3	Directionally Drilled 16" (DR-18) FPVC Casing	LF	750	\$ 410.00	\$ 307,500.00
2B4	Bore Pit Trench Safety	EA	4	\$ 6,000.00	\$ 24,000.00
2B5	12" C905 (DR-18) PVC Force Main (0'-6')	LF	19,415	\$ 115.00	\$ 2,232,725.00
2B6	Trench Safety for Open Cut Pipe Installation	LF	19,415	\$ 6.00	\$ 116,490.00
2B7	Well Pointing	LF	19,415	\$ 30.00	\$ 582,450.00
2B8	12" Plug Valve & Box	EA	10	\$ 8,500.00	\$ 85,000.00
2B9	12" 11.25° Bend	EA	4	\$ 2,500.00	\$ 10,000.00
2B10	12" 22.5° Bend	EA	1	\$ 2,500.00	\$ 2,500.00
2B11	12" 45° Bend	EA	2	\$ 2,500.00	\$ 5,000.00
2B12	12" 90° Bend	EA	1	\$ 2,500.00	\$ 2,500.00
2B13	4" Air/Vacuum Release Valve in 5' Diameter F/G Manhole	EA	4	\$ 15,000.00	\$ 60,000.00
2B14	Manhole Trench Safety	EA	4	\$ 1,000.00	\$ 4,000.00
2B15	Full Depth Pavement Repair	SY	100	\$ 75.00	\$ 7,500.00
2B16	Connect to Existing London Lift Station	LS	1	\$ 5,000.00	\$ 5,000.00
TOTAL PART 2B - WASTEWATER IMPROVEMENTS (Items 2B1 thru 2B16)					\$ 4,779,665.00
SUBTOTAL OPTION 2 (PARTS 2A THRU 2B)					\$ 5,209,615.00
15% CONTINGENCY					\$ 781,442.25
TOTAL OPTION 2 (PARTS 2A THRU 2B)					\$ 5,991,057.25
PART 2C - PROFESSIONAL SERVICES					
2C1	Engineering Basic Services	LS	1	\$ 539,200.00	\$ 539,200.00
2C2	Engineering Additional Services	LS	1	\$ 179,800.00	\$ 179,800.00
2C3	Topographic Survey, Easement Survey, and Mapping	LS	1	\$ 119,900.00	\$ 119,900.00
2C4	Geotechnical	LS	1	\$ 30,000.00	\$ 30,000.00
2C5	Testing	LS	1	\$ 30,000.00	\$ 30,000.00
TOTAL PART 2C - PROFESSIONAL SERVICES (Items 2C1 thru 2C5)					\$ 898,900.00
TOTAL OPTION 2 PROJECT COST (PARTS 2A THRU 2C)					\$ 6,889,957.25

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OPTION 3 - NEW LIFT STATION AND 12" FORCE MAIN TO GREENWOOD WWTP					
ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
PART 3A - GENERAL					
3A1	Mobilization (Max. 5% of Project Total)	LS	1	\$ 191,300.00	\$ 191,300.00
3A2	Bonds & Insurance	LS	1	\$ 127,600.00	\$ 127,600.00
3A3	Storm Water Pollution Prevention Plan	LS	1	\$ 15,000.00	\$ 15,000.00
3A4	Traffic Control	LS	1	\$ 25,000.00	\$ 25,000.00
3A5	Ozone Action Day	DAYS	1	\$ 1,750.00	\$ 1,750.00
3A6	Silt Fence	LF	26,615	\$ 5.00	\$ 133,075.00
3A7	Contingency Allowance for Unanticipated Adjustments/Improvements	LS	1	\$ 50,000.00	\$ 50,000.00
TOTAL PART 3A - GENERAL (Items 3A1 thru 3A7)					\$ 543,725.00
PART 3B - WASTEWATER IMPROVEMENTS					
3B1	New Lift Station (Includes Lift Station with Wetwell & Pumps Sized for 525 Acres Developed, Access Road Paving, Overhead Power, Emergency Generator w/ Foundation)	LS	1	\$ 1,200,000.00	\$ 1,200,000.00
3B2	Directionally Drilled 12" (DR-18) FPVC Force Main	LF	1,500	\$ 350.00	\$ 525,000.00
3B3	Encased 12" (DR-18) FPVC Force Main	LF	750	\$ 180.00	\$ 135,000.00
3B4	Directionally Drilled 16" (DR-18) FPVC Casing	LF	750	\$ 410.00	\$ 307,500.00
3B5	Bore Pit Trench Safety	EA	6	\$ 6,000.00	\$ 36,000.00
3B6	12" C905 (DR-18) PVC Force Main (0'-6')	LF	24,355	\$ 115.00	\$ 2,800,825.00
3B7	Trench Safety for Open Cut Pipe Installation	LF	24,355	\$ 6.00	\$ 146,130.00
3B8	Well Pointing	LF	24,355	\$ 30.00	\$ 730,650.00
3B9	12" Plug Valve & Box	EA	12	\$ 8,500.00	\$ 102,000.00
3B10	12" 11.25° Bend	EA	6	\$ 2,500.00	\$ 15,000.00
3B11	12" 22.5° Bend	EA	1	\$ 2,500.00	\$ 2,500.00
3B12	12" 45° Bend	EA	2	\$ 2,500.00	\$ 5,000.00
3B13	12" 90° Bend	EA	3	\$ 2,500.00	\$ 7,500.00
3B14	4" Air/Vacuum Release Valve in 5' Diameter F/G Manhole	EA	6	\$ 15,000.00	\$ 90,000.00
3B15	Manhole Trench Safety	EA	6	\$ 1,000.00	\$ 6,000.00
3B16	Full Depth Pavement Repair	SY	500	\$ 75.00	\$ 37,500.00
3B17	Connect to Existing Greenwood Wastewater Treatment Plant	LS	1	\$ 5,000.00	\$ 5,000.00
TOTAL PART 3B - WASTEWATER IMPROVEMENTS (Items 3B1 thru 3B17)					\$ 6,151,605.00
SUBTOTAL OPTION 3 (PARTS 3A THRU 3B)					\$ 6,695,330.00
15% CONTINGENCY					\$ 1,004,299.50
TOTAL OPTION 3 (PARTS 3A THRU 3B)					\$ 7,699,629.50
PART 3C - PROFESSIONAL SERVICES					
3C1	Engineering Basic Services	LS	1	\$ 693,000.00	\$ 693,000.00
3C2	Engineering Additional Services	LS	1	\$ 231,000.00	\$ 231,000.00
3C3	Topographic Survey, Easement Survey, and Mapping	LS	1	\$ 154,000.00	\$ 154,000.00
3C4	Geotechnical	LS	1	\$ 38,500.00	\$ 38,500.00
3C5	Testing	LS	1	\$ 38,500.00	\$ 38,500.00
TOTAL PART 3C - PROFESSIONAL SERVICES (Items 3C1 thru 3C5)					\$ 1,155,000.00
TOTAL OPTION 3 PROJECT COST (PARTS 3A THRU 3C)					\$ 8,854,629.50

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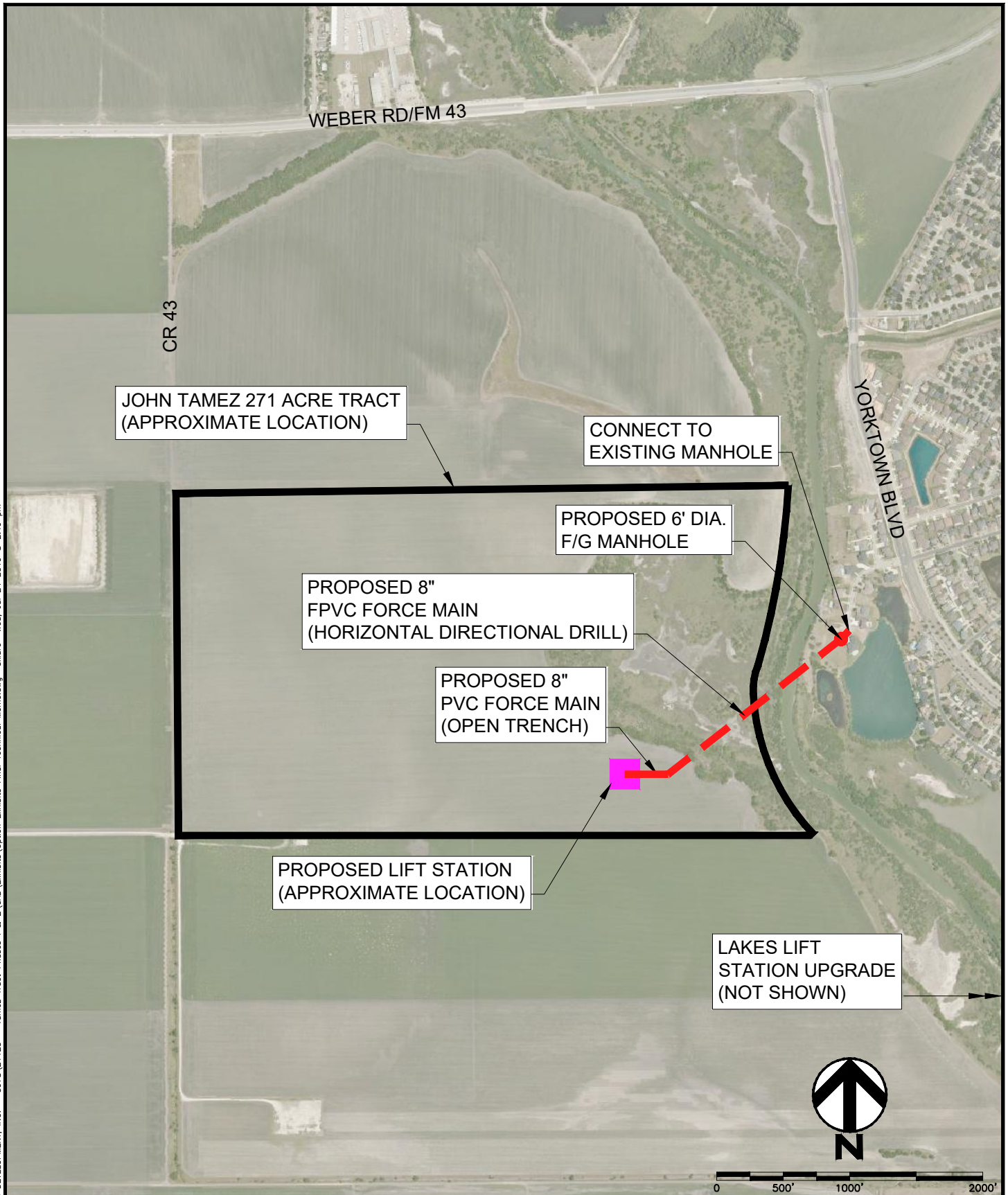


JOHN TAMEZ 271 ACRE TRACT

**EXHIBIT 1
LOCATION MAP**

SCALE:	AS NOTED
DRAWN BY:	DWK
APPROVED BY:	JCC
DATE:	JULY 2019
JOB NO.	C978-21125
SHEET NO.	1 OF 1

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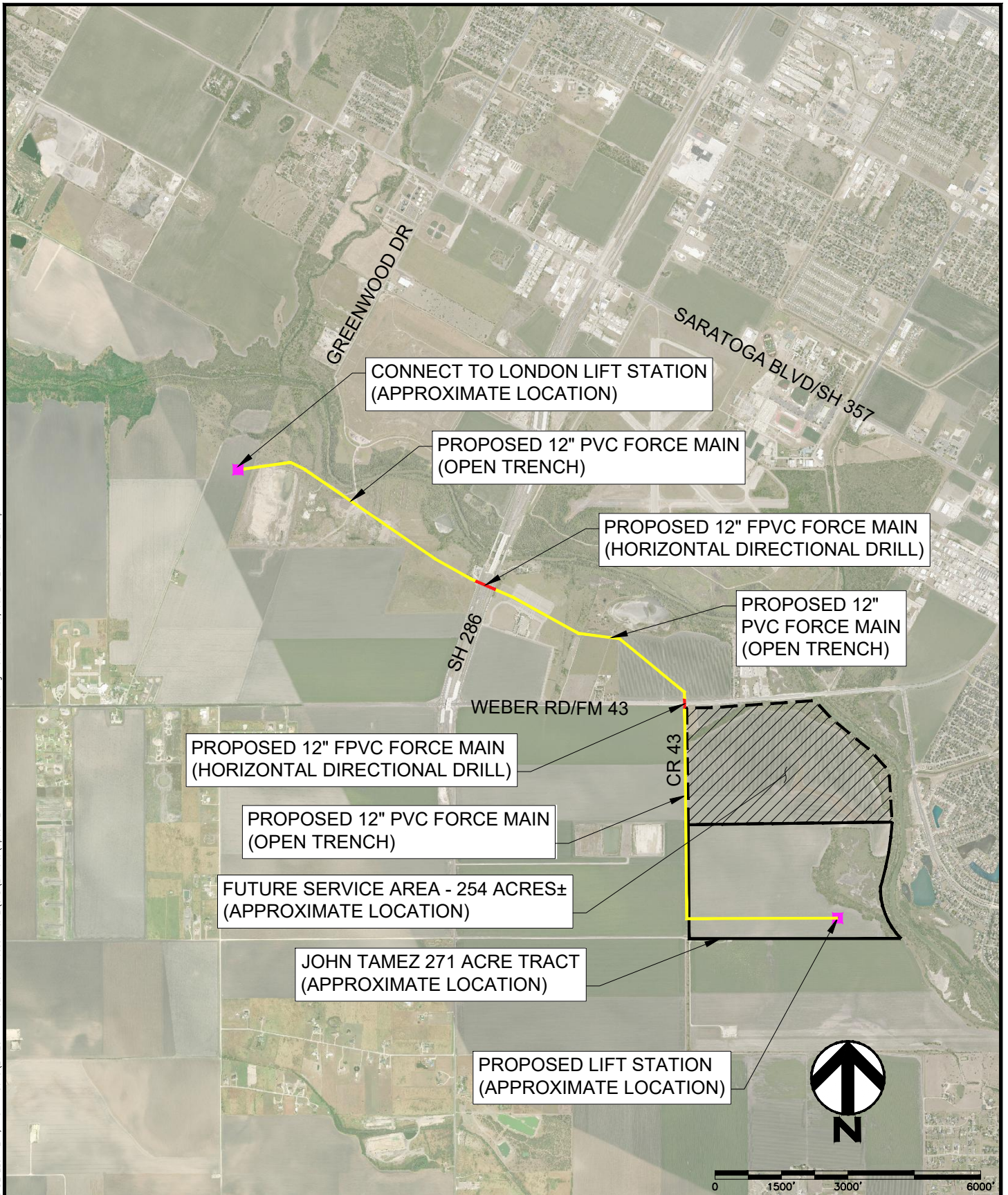


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EXHIBIT 2 OPTION 1

SCALE:	AS NOTED
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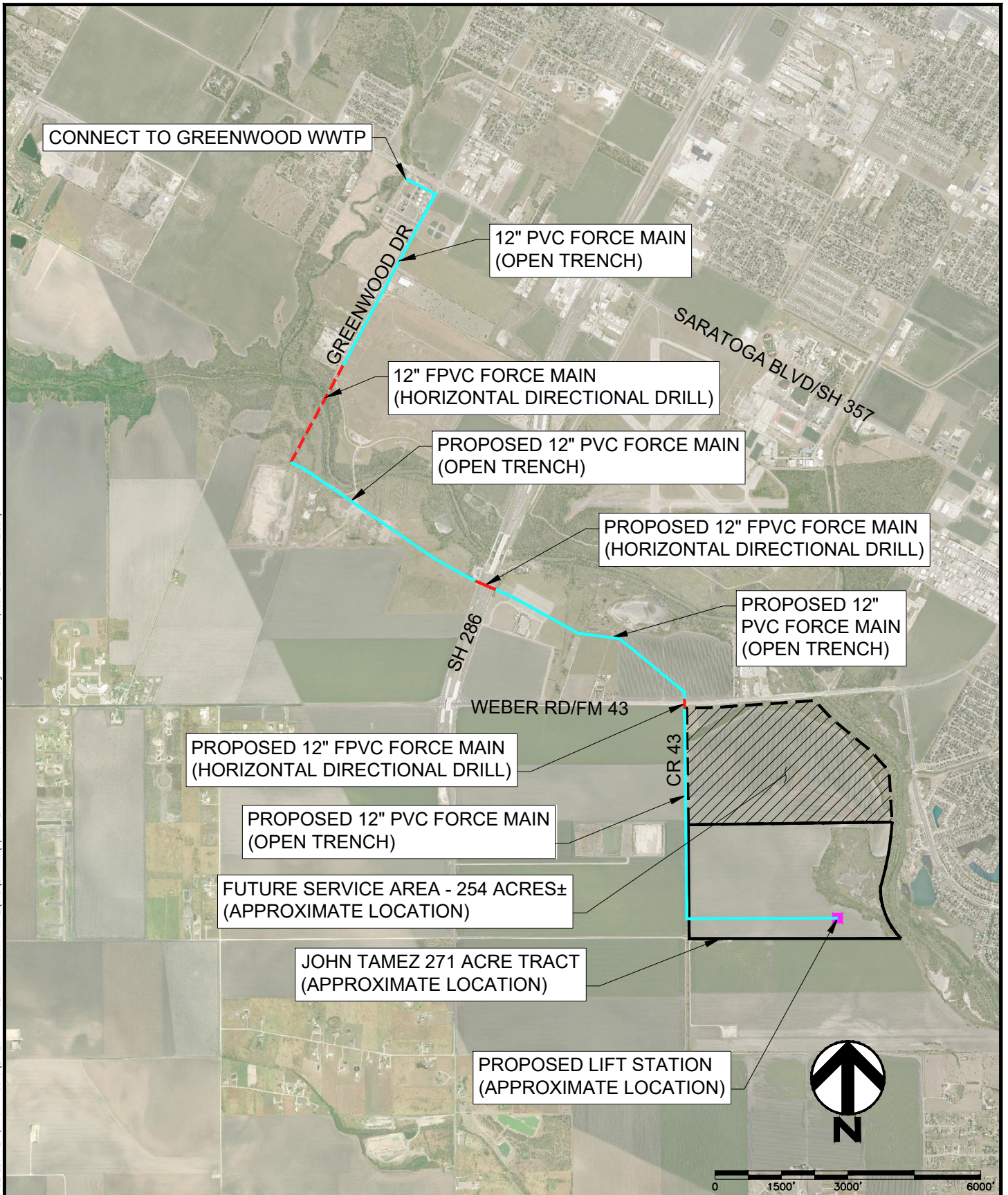


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EXHIBIT 3 OPTION 2

SCALE:	AS NOTED
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EXHIBIT 4 OPTION 3

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Exhibit 5
Lakes Lift Station Preliminary Analysis - Existing Pumps



System Curve

WW1 - Pumps in Wet Well 1 - 8" Riser to 10" FM				
Flow	Static Head Loss	Friction Head Loss	Minor Head Loss	Total
0	22	0	0	22
400	22	2.62	0.29	24.91
800	22	9.45	1.17	32.62
1200	22	20.01	2.63	44.64
1600	22	34.07	4.68	60.75
2000	22	51.48	7.32	80.8
WW2 - Pump in Wet Well 2 - 6" Riser to 10' FM (BYPASS)				
Flow	Static Head Loss	Friction Head Loss	Minor Head Loss	Total
0	22	0	0	22
400	22	3.63	1.18	26.81
800	22	13.08	4.74	39.82
1200	22	27.69	10.65	60.34
1600	22	47.15	18.94	88.09
2000	22	71.24	29.6	122.84

Pump Curve

Flygt N 3153~434		
Single Pump Flow (GPM)	Double Pump Flow (GPM)	TDH (Feet)
0	0	84
400	800	66.5
800	1600	55
1200	2400	42.5
1600	3200	28
2000	4000	14.5

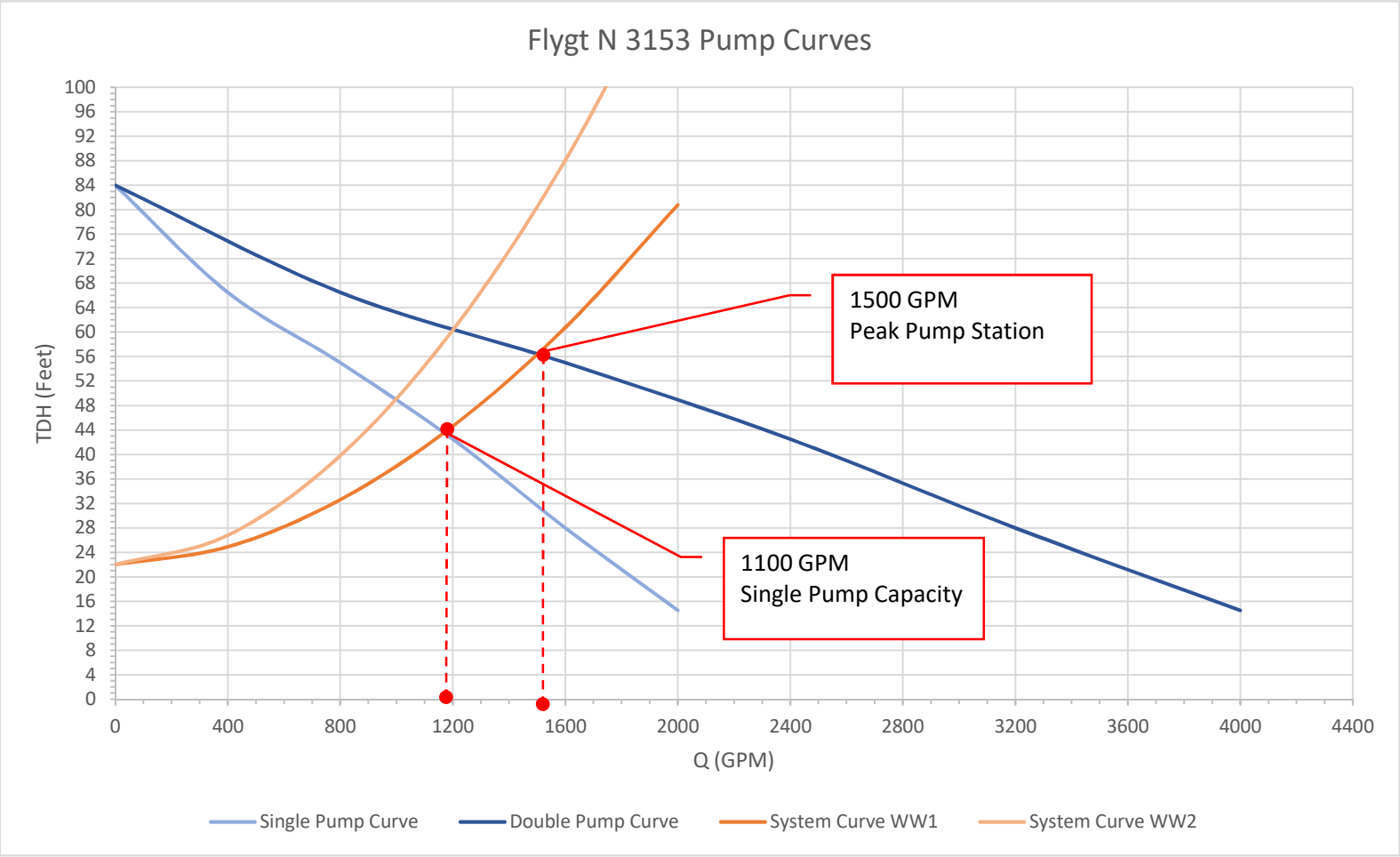


Exhibit 6
Lakes Lift Station Preliminary Analysis - Peak Flow and Wet Well Capacity



Average Daily Run Times Based on Lakes Lift Station Run Times Furnished by City of Corpus Christi

Day of Reading	Pump 1 (hrs/day)	Pump 2 (hrs/day)	Pump 3 (hrs/day)	Total Avg. Daily Run Times(hrs/day)
4/19/2019	2.9	2.1	2.5	7.5
5/2/2019	2.7	2.3	2.4	7.4

Average Daily Flow & Peak Flow

Utilized the Average Daily Run times above to calculate Average Daily Dry Weather Flow with one (1) pump operating.
Assume 3 Hrs/Day

One Pump: $Q = 3 \frac{\text{Hrs}}{\text{Day}} \times 1100 \frac{\text{Gal}}{\text{Min}} \times 60 \frac{\text{Min}}{\text{Hr}} = 198,000 \frac{\text{Gal}}{\text{Day}}$

w/ Three Pumps: $Q = 3 \text{ Pumps} \times 198,000 \frac{\text{Gal}}{\text{Day}} = 594,000 \frac{\text{Gal}}{\text{Day}} = \text{Average Daily Flow}$

w/ Peak Factor of 2.5: $Q = 594,000 \frac{\text{Gal}}{\text{Day}} \times 2.5 = 1,485,000 \frac{\text{Gal}}{\text{Day}} = 1031 \frac{\text{Gal}}{\text{Min}} = \text{Peak Flow}$

Analysis: 1031 GPM < 1500 GPM Station Capacity

Minimum Wet Well Operating Volume per TCEQ Chapter 217, Equation C.4

$V = \frac{T \times Q}{4 \times 7.48}$

Where:

V = Active Volume (Cf)

Q = Pump Capacity (GPM)

T = Cycle Time (Min) = 6 Min minimum per TCEQ Chapter 217, Table C.5 - Minimum Pump Cycle Times

7.48 = Conversion Factor (Gal/Cf)

Pump 1 $V = \frac{6 \times 1100}{4 \times 7.48} = 221 \text{ Cf}$ H = 3.9 Ft

Pump 2 $V = \frac{6 \times (1500 - 1100)}{4 \times 7.48} = 80 \text{ Cf}$ H = 1.4 Ft

Total V Required = 301 Cf H = 5.3 Ft

Existing Wet Well Analysis Based on 1982 & 1983 Vintage As-Builts Furnished by the City of Corpus Christi

Existing lift station consists of two (2) 6' diameter wet wells.

Incoming Gravity Lines:

12" VCP: Invert EL. = 1.43 Ft

12" VCP: Invert EL. = -1.07 Ft

12" VCP: Invert EL. = -1.00 Ft

Existing All Pumps Off: EL. -3.50 Ft

Pump 1 On: EL. -3.50 Ft + 3.90 Ft (From Required H for Minimum Pump 1 Volume) = EL. 0.40 > EL. -1.00 & -1.07

Per TCEQ Chapter 217.60(b)(4): A gravity pipe discharging to a wet well must be located so that the invert elevation is above the liquid level of a pumps "on" setting.