



LAKEPOINT CIRCLE / LAKELAND DRIVE SEWER LINE
ASSESSMENT REPORT

TRAVIS COUNTY W.C.&I.D. POINT VENTURE
FY 2023 GENERAL ENGINEERING SERVICES

July 12, 2023

Project #: 701-009-005

PREPARED BY: Trihydro Corporation

5508 Highway 290 West, Suite 201, Austin, TX 78735

PREPARED FOR: Travis County W.C.&I.D. Point Venture

18606 Venture Drive, Point Venture, TX 78645



7-12-2023

A handwritten signature in green ink, reading "David Alexander Vargas", written over the bottom right portion of the professional engineer seal.

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PEOPLE YOU CAN TRUST.

Introduction

On March 6, 2023, the Travis County Water Control and Improvement District Point Venture (the District) authorized Trihydro Corporation (Trihydro) to conduct an assessment of the pressure sewer main in which residents along Lakepoint Circle and Lakeland Drive were experiencing issues with sewer blockage and backups. The pressure sewer main is separated into two pipe segments: a 3” main that begins at 18236 Lakepoint Circle (Lot B, WTP) and ends near 18809 Lakeland Drive (Lot 382A), then transitions to a 4” main which discharges into the Whispering Hollow Lift Station at 700 Deckhouse (Lot 801). This assessment report was prepared to evaluate wastewater flow capacity, validate sewer line sizing, determine pump head requirements, and review pressure transducer field data. The assessment report concludes with a synopsis of Trihydro’s findings and recommendations to address these deficiencies.

TDH from Lot B (WTP) to Lot 801 (Whispering Hollow Lift Station)

Scenario

- Analyzing the existing 3” and 4” pressure sewer mains from 18236 Lakepoint Circle (Lot B, WTP) to 700 Deckhouse (Lot 801, Whispering Hollow Lift Station).
- There are approximately 126 lots that discharge into the pipe segment. The number of lots used in these calculations represent full build out.
- The friction head calculations utilized a flow capacity of 45 gpm, which entailed all 126 lots/connections pumping into the pressure sewer main simultaneously (i.e., worst case scenario). The flow capacity was calculated by multiplying the number of connections (126) by the flow rate per connection (170 gpd/connection) and applying a peaking factor of 3. The friction head was calculated to be 32 feet.
- Static head was determined by obtaining the minimum and maximum surface elevations along the pipe segment alignment. The minimum elevation is 730.00 near the WTP and the maximum elevation is 750.00 near 18500 Lakeland Drive (Lot 57). After the high point at Lot 57, the sewer line drops down to another low point of 730.00 near 18511 Lakeland Drive (Lot 107) and then rises to elevation 750.00 near 18614 Lakeland Drive (Lot 72) adjacent to the flushing station. Downstream of the flushing station towards the Whispering Hollow Lift Station, the elevation descends. Taking the difference of the maximum and minimum elevations resulted a static head of 20 feet.
- The head calculations found that a homeowner’s grinder pump requires a minimum 65 feet of total head (28.1 psig), including a 25% safety factor, to pump through this pressure sewer line segment and convey to the Whispering Hollow Lift Station.

References

TCEQ Chapter 290, Subchapter D
CoA Utilities Criteria Manual
Cameron Hydraulic Data (CHD)
WCID-Point Venture GIS Data (RCE) Shapefiles

Flow Calculations

Number of Equivalent Single Family Connections (ESFC) = 126

Flow Rate per ESFC = 170 gpd/ESFC

Lift Station Capacity = 126 ESFC x 170 gpd/ESFC = 21,420 gpd

Peaking Factor = 3

Peak Flow Rate = 21,420 gpd x 3 = 64,260 gpd = 44.6 gpm → 45 gpm

Velocity of 3" Pipe @ 45 gpm = 2.04 ft/s

Velocity of 4" Pipe @ 45 gpm = 1.14 ft/s

TDH Calculations

Static Head

Min. Elev. On Alignment¹ = 730.00
Max. Elev. On Alignment¹ = 750.00
WH LS Pipe Entrance CL² = 712.17
Static Head = 750.00 – 730.00 = 20.00 ft

From WTP to Lot 57, surface elevation increases from 730.00 to 750.00. From Lot 107 to Lot 72 adjacent to the flushing station, surface elevation increases from 730.00 to 750.00. From the flushing station to Whispering Hollow Lift Station, the surface elevation decreases from 750.00 to 715.00. Therefore, the static head value to use in the design calculations is 20 feet.

¹Elevations were obtained using the existing surface in AutoCAD and creating a profile from the pressure sewer main alignment.

²Pipe Entrance Elevation was obtained from the Whispering Hollow Lift Station renovation plans.

Friction Head

Exist. 3" Pressure Sewer Main from WTP 1-1/4"x3" Service Line Connection to 4"x3" Reducer near 18809 Lakeland Drive (Lot 382A)

Friction Loss in pipe fittings in terms of equivalent length. Refer to CHD friction loss table.

Description	Length of Straight Pipe (ft)	Qty	Equivalent Length (ft)
3" x 1-1/4" Service Line Connection (Branch Flow) ¹	15.3	1	15.3
3" x 1-1/4" Service Line Connection (Thru Flow) ¹	5.11	41	209.51
3" Gate Valve	2.04	12	24.48
3" Tee (Branch Flow)	15.3	2	30.6
3" x 2" Tee (Thru Flow)	5.11	1	5.11
3" 45° Bend	4.09	2	8.18
Total			293.18

¹Service Line Connections considered tee fittings.

Approximate pipe length from WTP 1-1/4"x3" Service Line Connection to 4"x3" Reducer near Lot 382A is 4,160 feet.

Per CHD, friction tables for 3-inch pipe, head loss for pump flow of 45-gpm is 0.676-feet per 100-ft. Calculate friction head.

$$h_L = \frac{0.676 \text{ ft}}{100 \text{ ft pipe length}} \times (293.18 + 4,160.00) \text{ ft} = 30.1 \text{ ft}$$

Exist. 4" Pressure Sewer Main from 4"x3" Reducer near Lot 382A to Whispering Hollow Lift Station

Friction Loss in pipe fittings in terms of equivalent length. Refer to CHD friction loss table.

Description	Length of Straight Pipe (ft)	Qty	Equivalent Length (ft)
4"x3" Reducer ²	0.68	1	0.68
4" x 1-1/4" Service Line Connection (Thru Flow) ¹	6.71	11	73.81
4" Gate Valve	2.68	2	5.36
4" 45° Bend	5.37	2	10.74
4" Pipe Entrance ³	15.14	1	15.14
Total			105.73

¹Service Line Connections considered tee fittings.

²Since reducer fittings are not included in friction loss table, calculate equivalent length:

$$\text{Equiv. Length} = \frac{k \times d}{f}$$

From CHD friction loss table, $f = 0.017$.

$$k = 2.6 \times \sin \frac{\theta}{2} \times \left(1 - \frac{d_1^2}{d_2^2} \right)^2 \text{ for gradual expansion}$$

$$k = 2.6 \times \sin \frac{8.171^\circ}{2} \times \left(1 - \frac{3^2}{4^2}\right)^2 = 0.035$$

$$\text{Equiv. Length} = \frac{0.035 \times 0.33 \text{ ft}}{0.017} = 0.68 \text{ ft}$$

³Since pipe entrances are not included in friction loss table, calculate equivalent length:

$$\text{Equiv. Length} = \frac{k \times d}{f}$$

From CHD friction loss table, $f = 0.017$.

k value for pipe entrance = 0.78

$$\text{Equiv. Length} = \frac{0.78 \times 0.33 \text{ ft}}{0.017} = 15.14 \text{ ft}$$

Approximate pipe length from 4"x3" Reducer near Lot 382A to Whispering Hollow Lift Station is 998 feet.

Per CHD, friction tables for 4-inch pipe, head loss for pump flow of 45-gpm is 0.161-feet per 100-ft. Calculate friction head.

$$h_L = \frac{0.161 \text{ ft}}{100 \text{ ft pipe length}} \times (105.73 + 998.00) \text{ ft} = 1.78 \text{ ft}$$

Total Dynamic Head

$$\text{TDH} = \text{static} + \text{friction} = 20.00 \text{ ft} + (30.1 + 1.78) \text{ ft} = 51.88 \text{ ft} \rightarrow 52 \text{ ft}$$

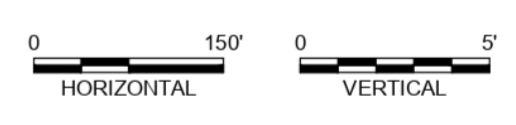
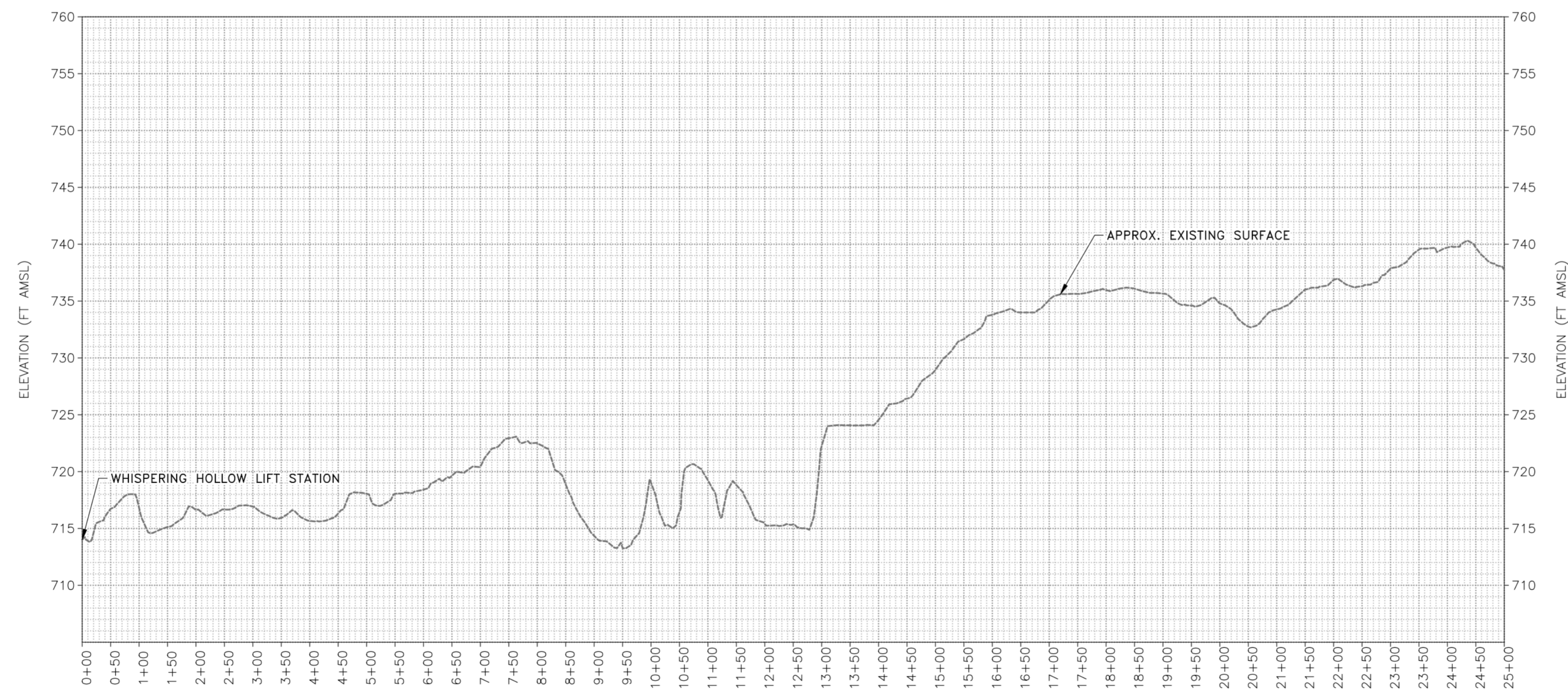
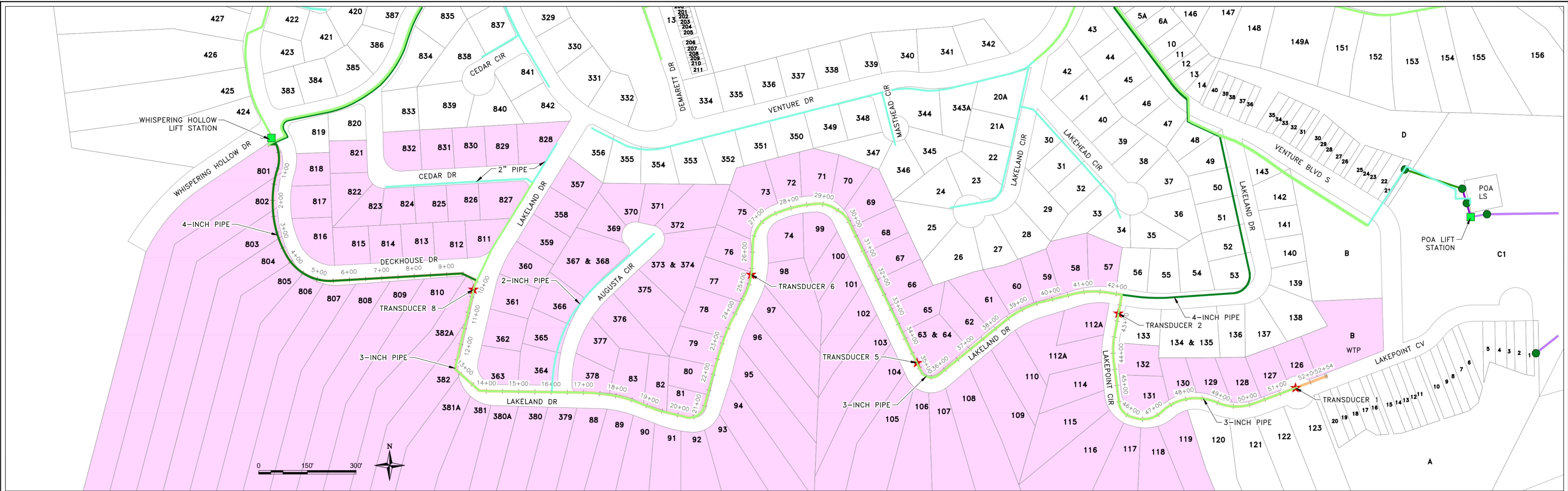
Incorporate 25% safety factor to account for potential blockage:

$$\text{TDH} = 52 \text{ ft} \times 1.25 = 65 \text{ ft} (28.1 \text{ psig})$$

Findings and Recommendations

- One pressure sewer main segment was analyzed. The segment starts at the WTP, conveys along Lakepoint Circle, Lakeland Drive, and Deckhouse Drive, and ends at the Whispering Hollow Lift Station.
- The existing pressure sewer mains are sized adequately to handle flow capacities, including peaking factors, during occurrences when all lots are pumping simultaneously.
- The flow rate per connection utilized in the design calculations was 170 gpd. This value was obtained from the approved TCEQ Bond Issuance. It is to be noted that per historical wastewater flow data, the flows are considerably less than the TCEQ value. For instance, in August 2022 (Inframark General Managers Report, Point Venture Wastewater Flow Historical), the total monthly wastewater flow was 3,080,000 gallons and the total number of connections was 965. The average flow rate per connection during the month was 103 gpd.
- The minimum head required to pump to the Whispering Hollow Lift Station is 65 feet (28.1 psig), which includes a 25% safety factor to account for potential blockage.
- On Sunday, February 26, 2023, the District provided the brand and model of the grinder pump Mr. Bornhorst uses. He is the resident who attended the February Board Meeting and lives at Lot 105. The grinder pump is a Barnes SGVF2022L, 2 Hp. Impeller size was not provided so the standard impeller size (5.13”) was assumed. In reviewing the submittal data, the pump is classified as high-flow. With relatively low head for the assumed impeller, the pump is outside the acceptable operating range and is on the extreme right side of the pump curve, resulting in the pump likely operating inefficiently. A low flow grinder pump with an appropriately sized impeller would be a more appropriate pump to operate with the pressure sewer system. A system curve was plotted to the Barnes pump curve to depict where the pump is operating, provided in Exhibit C.
- Inframark installed five (5) pressure transducers along the pressure sewer alignment to monitor pressures within the system. They are labeled Transducer 1, 2, 5, 6, & 8 as noted in Exhibit A.
- Inframark recorded one data sample every minute from Thursday, May 25 to Wednesday, May 31 for Transducers 1, 2, 5, 6, & 8 and two data samples every minute from Wednesday, May 31 to Thursday, June 7 for Transducers 1, 2, 6 & 8. The summarized data is provided in Exhibit B.
- The average pressure of all data sample readings was 3.35 psig (7.74 feet TDH). For the two weeks of recording data, the average pressure ranged between 1- to 7-psig (2.31- to 16.17- feet TDH).

- Transducer 8 recorded the lowest pressures. This is to be expected since the transducer is located closest to the Whispering Hollow Lift Station and the static pressure is minimal.
- The overall maximum reading was 22.09 psig (51.03 feet TDH), which occurred on Friday, May 26 at 9:24 AM at Transducer 1. The second highest reading was 20.38 psig (47.08 feet TDH), which occurred on Friday, June 2 at 2:19 PM at Transducer 1. This is to be expected since Transducer 1 is located near the beginning of the sewer line segment, which requires the residents in this area to pump through the entire sewer line competing against the other residents' grinder pumps feeding into the same segment.
- Transducers 6 & 8 recorded negative pressures. Both transducers are installed on upslopes along the sewer line segment, which can contribute to air pockets. Additionally, during pump off, the pipe segment is at low flow and is draining within the system and that may also contribute to negative pressure.
- The District mentioned in their Pressure Logger Report that during the Memorial Day weekend, an expected period of high flows and high demand on the system, no blockages were reported and no pressure surges were detected that would of have caused problems with a resident's grinder pump system.
- After reviewing the field data, the sewer main segment is operating sufficiently. System pressures were averaging below 10 psig (< 23.1 feet TDH). The maximum pressure observed was 22.09 psig (51.03 feet TDH), which was below our calculated pressure of 28.1 psig (65 feet TDH).
- Our recommendation is that submersible grinder pumps that are designed for low flow and high head, equipped with an appropriately sized impeller, and rated for 65 feet TDH (28.1 psig) at 45 gpm be installed within the Whispering Hollow pressure sewer system. A grinder style pump is required to prevent potential clogging of the pressure sewer mains.



- EXPLANATION:**
- GRAVITY SEWER MANHOLE
 - LIFT STATION
 - LAKELAND TO LAKEPOINT ALIGNMENT
 - ★ APPROXIMATE TRANSDUCER LOCATION
 - SERVICE PROPERTY LOTS
 - 2" PIPE
 - 3" PIPE
 - 4" PIPE
 - 6" PIPE
 - 8" PIPE

- NOTES:**
1. PARCELS SHOWN WERE OBTAINED FROM THE TRAVIS COUNTY APPRAISAL DISTRICT.
 2. SEWER LINES AND APPURTENANCES SHOWN ON PLAN VIEW AND THE ELEVATIONS DEPICTED IN THE PROFILE VIEW WERE OBTAINED FROM GIS DATA.

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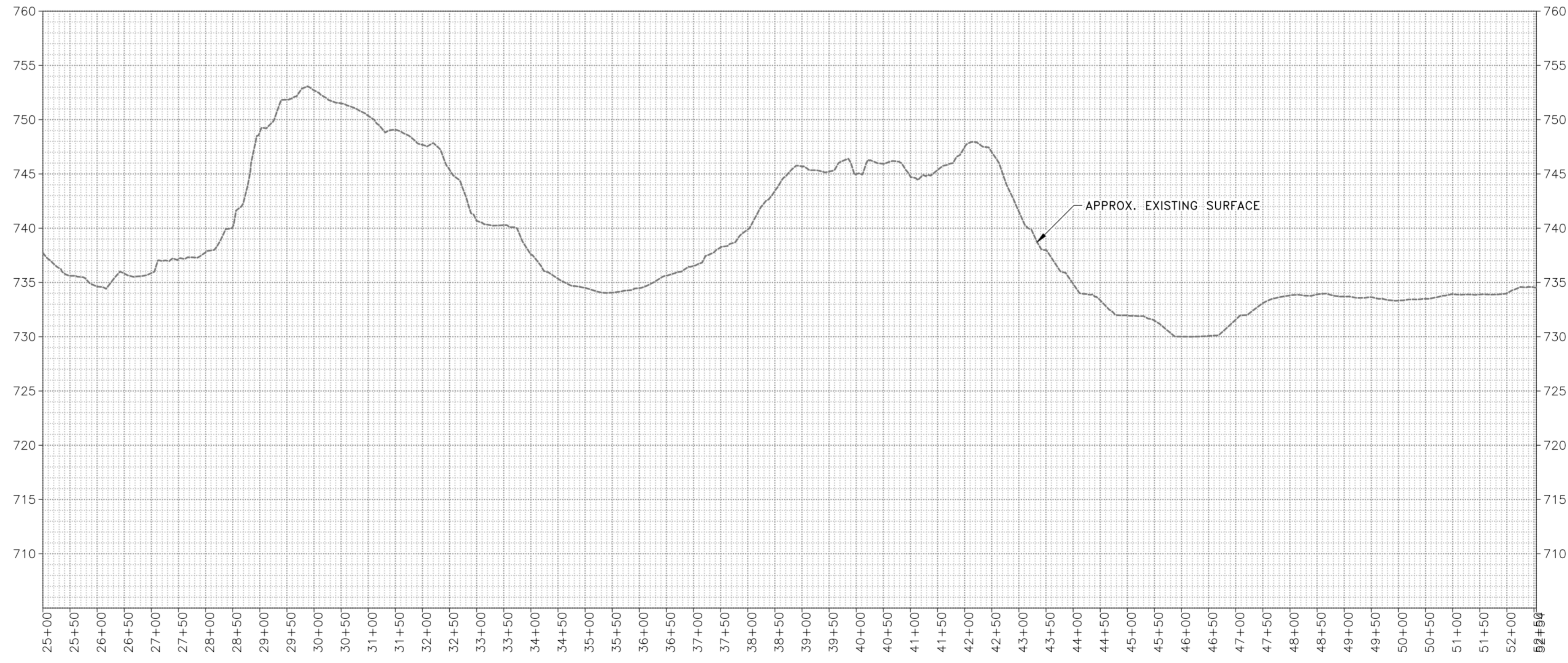
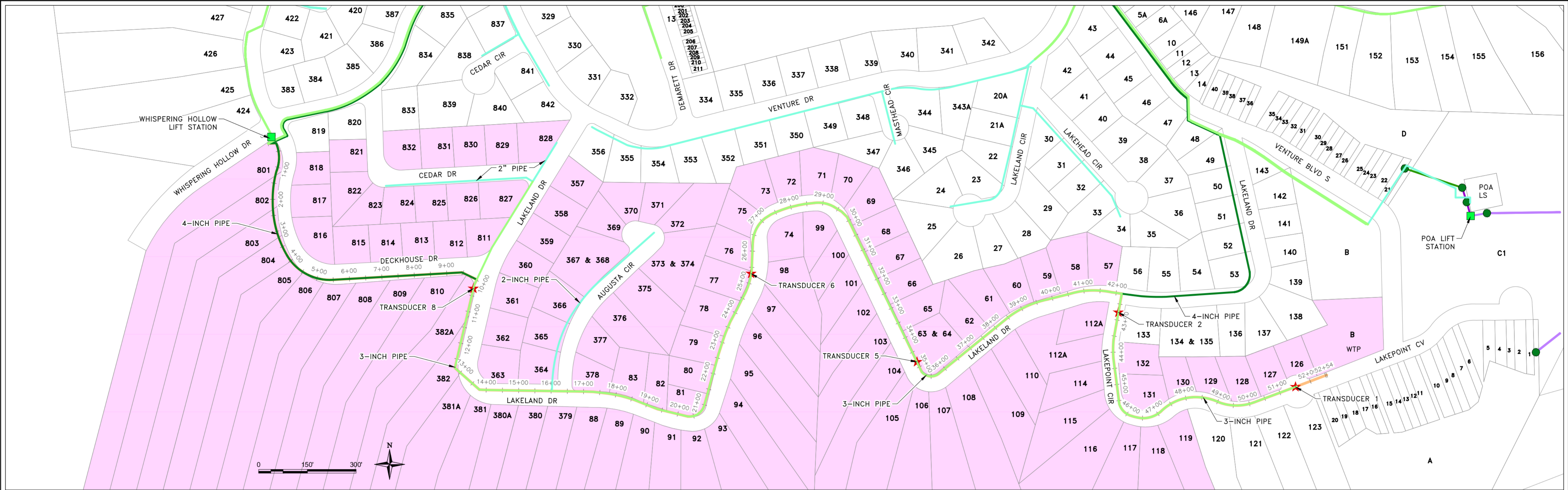
EXHIBIT A

SEWER LINE ASSESSMENT MAP (1 OF 2)
STA. 0+00 TO STA. 25+00

SEWER LINE ASSESSMENT
TRAVIS COUNTY W.C.& I.D. POINT VENTURE
POINT VENTURE, TX

Drawn By: KP	Checked By: DV	Scale: 1" = 150'	Date: 7/5/2023
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UTAH COUNTY, UTAH, POINT VENTURE - DOCUMENTS\GIS\PROJECTS\GIS\PROJECTS\GIS\PROJECTS\POINT_VENTURE_SEWER_MAP\ASSEMBLY



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EXHIBIT A
SEWER LINE ASSESSMENT MAP (2 OF 2)
STA. 25+00 TO STA. 52+54
SEWER LINE ASSESSMENT
TRAVIS COUNTY W.C.& I.D. POINT VENTURE
POINT VENTURE, TX

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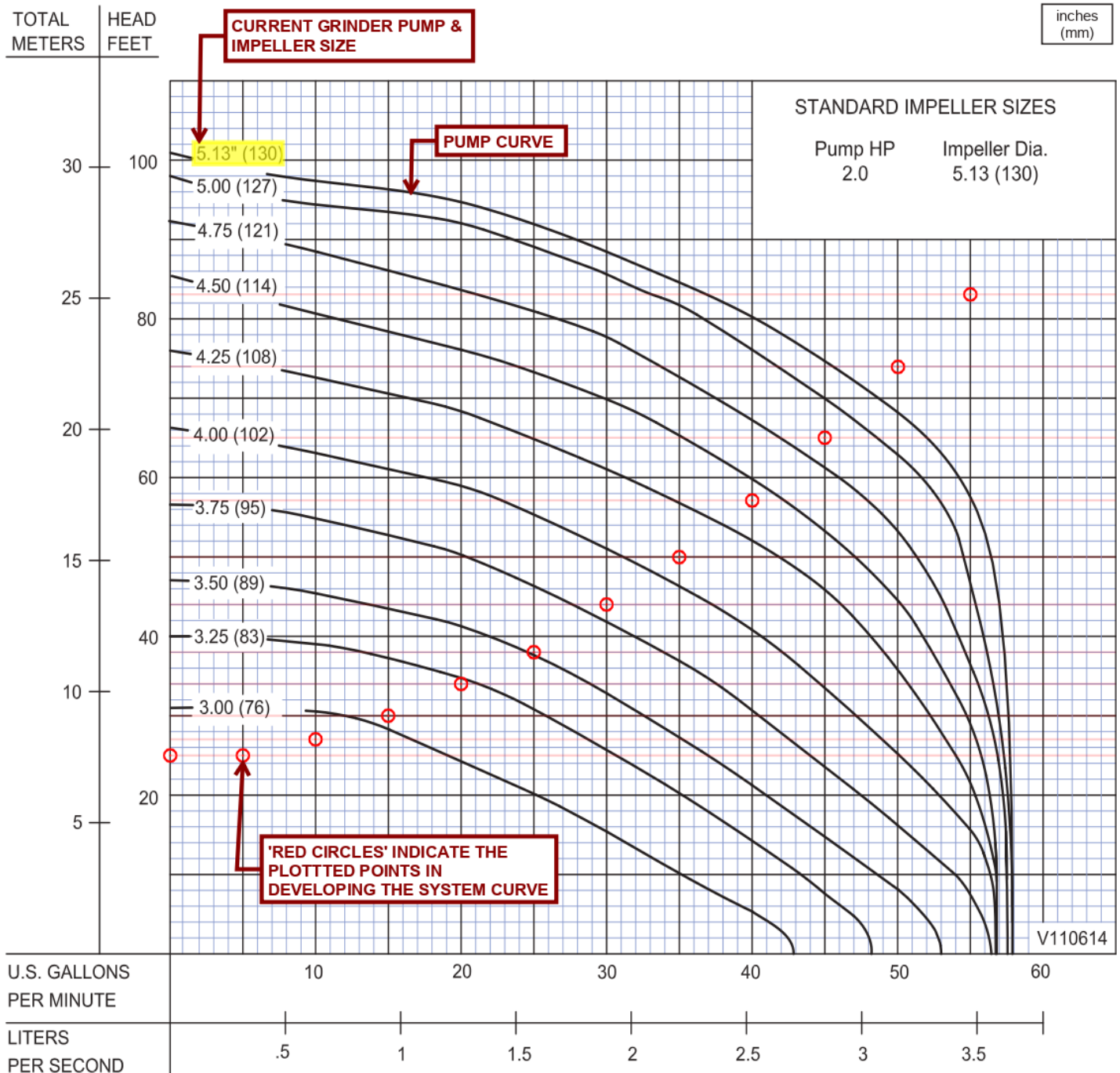
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EXHIBIT B. PRESSURE TRANSDUCER DATA

Date Range	Transducer #	Average Pressure (psig)	Avg. Pressures Excluding Negative Readings (psig)	Median Pressure (psig)	Minimum Pressure (psig)	Maximum Pressure (psig)
May 25 - May 31	1	7.07	7.07	6.81	3.08	22.09
May 31 - June 7	1	7.01	7.01	6.90	0.74	20.38
May 25 - May 31	2	2.73	2.73	2.60	1.25	8.55
May 31 - June 7	2	2.83	2.83	2.76	1.00	7.07
May 25 - May 31	5	6.35	6.35	6.22	2.32	11.49
May 31 - June 7	5	---	---	---	---	---
May 25 - May 31	6	1.47	1.47	1.30	-0.07	6.29
May 31 - June 7	6	1.09	1.10	1.04	-0.28	5.11
May 25 - May 31	8	0.04	0.94	-0.25	-1.59	5.39
May 31 - June 7	8	-0.39	0.61	-0.54	-1.75	3.93
Average Pressure (psig):						3.35
Minimum Pressure (psig):						-1.75
Maximum Pressure (psig):						22.09

I&O Manual

Submersible Grinder Pumps



Testing is performed with water, specific gravity 1.0 @ 68° F @ (20°C), other fluids may vary performance

EXHIBIT C. SYSTEM AND PUMP CURVES