

ELAN KELLER

WATER AND WASTEWATER STUDY

CITY OF KELLER



SEPTEMBER 2020 | VERSION 1

PREPARED BY:

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PURPOSE & SCOPE

This study analyzes the water and wastewater demand for the Elan Keller, a ±21.63 acre, 475-unit multifamily and 24,000sf retail development in the City of Keller. As demonstrated by this study, the development can be adequately served by the existing water and wastewater systems with the proposed infrastructure improvements.

The study analyzes the capacity of the existing sewer system, including existing sewer lines constructed to serve Milestone Church and Marshal Ridge (lines S-1, S-13 and OS-2). The analysis also considers certain future development by others anticipated to be served by the subject infrastructure. Certain future development includes an additional 34,500sf of retail development and a 57 lot single family development. The study shows the proposed impact to the existing water system. The proposed development is located South of Ridge Point Parkway and East of US Highway 377 as shown in **Figure 1** below.

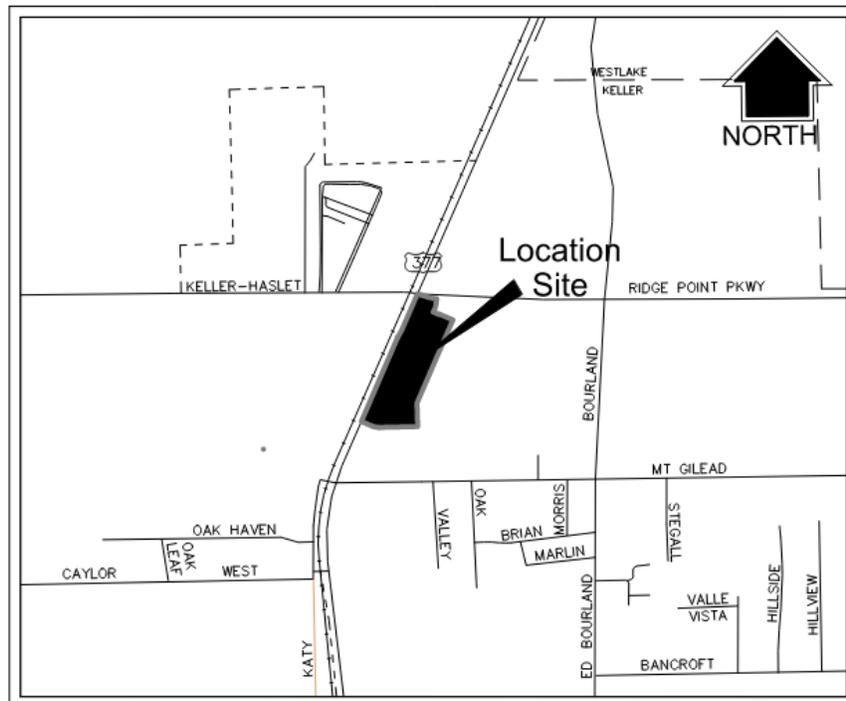


Figure 1: Project Location Map

PROPOSED WASTEWATER DEMAND

The tables below show the existing and proposed wastewater discharge based on both existing discharges provided to Kimley-Horn by the City of Keller and proposed estimated discharges from the fully built-out Elan Keller Development.

Based on the projected land use, estimated average flows for each area are shown in **Table 1**. A peaking factor was used to project the peak flow as required by the City of Keller. The following assumptions were used to generate the projected wastewater demands:

- Single-family Residential
 - Occupancy = 3.5 persons per Unit
 - Average per capita sewer demand = 100 gpd
- Multi-family Residential
 - Occupancy = 2.5 persons per Unit
 - Average per capita sewer demand = 85 gpd
- Commercial/Retail
 - Occupancy = 1 persons per 400 sf
 - Average per capita sewer demand = 35 gpd

Table 1: Elan Keller Estimated Wastewater Discharge

Estimated On-Site Wastewater Discharge							
BASIN	Type of Use	Units/ Building Area (SF)/ Basin (Acres)	Capita Factor	Population (Capita)	Average Flow (gpm)	Peaking Factor (M)	Peak Flow (gpm)
GS-1	Multi-Family	475	2.5 per Unit	1188	70.1	3.75	262.8
GS-2	Retail	24,000	1 per 400 sf	60	1.5	4.30	6.3
ON-SITE TOTAL				1,248	71.5	3.74	267.3
Estimated Off-Site Wastewater Discharge							
RCM-1	Single-Family	57	3.5 per Unit	200	13.9	4.15	57.6
RCM-2	Retail	34,500	1 per 400 sf	87	2.1	4.26	9.0
TOTAL				1,535	87.5	3.67	321.4

The fully developed Elan Keller site generates 267.3 gpm of peak wastewater flow. Considering future development, the total additional wastewater demand on the system is 321.4 gpm Existing flows were calculated using the previous wastewater study by Weir provided to Kimley-Horn by the City of Keller. Reference **Exhibit A** for a site layout with additional information on location(s) of existing and proposed wastewater lines to serve the Elan Keller development.

PROPOSED WATER DEMAND

The following assumptions were used to generate projected water demands:

- Single-family Residential
 - Occupancy = 3.5 persons per Unit
 - Average per capita water demand = 200 gpd
- Multi-family Residential
 - Occupancy = 2.5 persons per Unit
 - Average per capita water demand = 180 gpd
- Commercial/Retail
 - Occupancy = 1 persons per 400 sf
 - Average per capita water demand = 50 gpd

Water demand calculations are shown in **Table 2**.

Table 2: Water Demand Calculation Table

Estimated Water Demand											
Area	Use	Quantity	Units	Capita Factor	Capita	Average Flow (mgd)	Average Flow (gpm)	Max Day (gpm)	Required Fire Flow (gpm)	Max Day + Fire Flow (gpm)	Max Hour
GS-1	Multi-Family	475	Units	2.5 people/unit	1188	0.21	148.50	334.13	1500	1,834.13	668.25
GS-2	Retail	24,000	sf	1 person/400 sf	60	0.00	2.08	4.69	1500	1,504.69	9.38
RCM-1	Single-Family	57	Units	3.5 people/unit	200	0.04	27.78	62.50	1000	1,062.50	125.00
RCM-2	Retail	34,500	sf	1 person/400 sf	87	0.00	3.02	6.80	1500	1,506.80	13.59
TOTAL						0.26	181.38	408.11		1,908.11	816.22

Note: All fire flow demands are based on construction type and building square footage (International Fire Code 2015).

*MGD = million gallons per day, gpm = gallons per minute

Fire flow was based on the following assumptions:

- Single Family (less than 3,600 sf)
 - No installation of an approved automatic sprinkler system
- Multifamily
 - Type V-A or higher construction (based on *International Building Code*)
 - Installation of an approved automatic sprinkler system
- Commercial/Retail
 - Type V-A or higher construction (based on *International Building Code*)
 - Installation of an approved automatic sprinkler system

Reference **Exhibit A** for a site layout with additional information on location(s) of existing and proposed water lines to serve the Elan Keller development.

WASTEWATER SYSTEM ANALYSIS

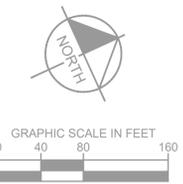
Table 2 below shows the capacity analysis of the existing sewer lines to serve the proposed development. The tables also show the cumulative peak flow to each of the sewer lines. The capacities shown are based upon a calculation of Manning's equation of peak flow through a pipe. As shown in Table 2, improvements are proposed beginning at STA. 30+48 of the "Marshal Ridge PH1 "S-1"" sewer line. **Exhibit B** shows the sewer main analyzed, as well as the proposed improvements necessary to serve the proposed and future developments.

Table 2: Line Capacity – Proposed Condition

Line Capacity										
Sewer Line	Beginning Design Point (STA)	Ending Design Point (STA)	Existing Flow (MGD)	Ex. Pipe Size (inches)	Ex. Grade (%)	Max Capacity (MGD)	Existing + Proposed Peak Flow (MGD)	Prop. Pipe Size (inches)	Prop. Grade (%)	Max Capacity (MGD)
Milestone Church	13+09	15+76	0.008	8	0.50%	0.553	0.4709	8	0.50%	0.5535
Milestone Church	10+13	13+09	0.008	8	0.50%	0.553	0.4709	8	0.50%	0.5535
Milestone Church	6+59	10+13	0.008	8	0.50%	0.553	0.4709	8	0.50%	0.5535
Milestone Church	3+07	6+59	0.008	8	0.40%	0.495	0.4709	8	0.40%	0.4950
Milestone Church	2+51	3+07	0.008	8	0.40%	0.495	0.4709	8	0.40%	0.4950
Milestone Church	0+00	2+51	0.008	8	0.40%	0.495	0.4709	8	0.40%	0.4950
Marshal Ridge "OS-2"	12+38	14+17	0.008	8	0.40%	0.495	0.4709	8	0.40%	0.4950
Marshal Ridge "OS-2"	11+29	12+38	0.008	8	0.40%	0.495	0.4709	8	0.40%	0.4950
Marshal Ridge "OS-2"	6+29	11+29	0.024	8	1.41%	0.929	0.4869	8	1.41%	0.9294
Marshal Ridge "OS-2"	3+04	6+29	0.024	8	0.40%	0.495	0.4869	8	0.40%	0.4950
Marshal Ridge "OS-2"	1+00	3+04	0.032	8	0.40%	0.495	0.4949	8	0.40%	0.4950
Marshal Ridge PH1 "S-13"	0+00	4+56	0.032	8	0.40%	0.495	0.4949	8	0.40%	0.4950
Marshal Ridge PH1 "S-1"	32+77	36+31	0.112	8	0.74%	0.673	0.5749	8	0.74%	0.6733
Marshal Ridge PH1 "S-1"	30+48	32+77	0.128	8	0.89%	0.738	0.5909	8	0.89%	0.7384
Marshal Ridge PH1 "S-1"	27+18	30+48	0.144	8	0.41%	0.501	0.6069	10	0.41%	0.9087
Marshal Ridge PH1 "S-1"	25+66	27+18	0.488	10	0.25%	0.710	0.9509	12	0.25%	1.1539
Marshal Ridge PH1 "S-1"	23+09	25+66	0.496	10	0.25%	0.710	0.9589	12	0.25%	1.1539
Marshal Ridge PH1 "S-1"	20+37	23+09	0.504	10	0.25%	0.710	0.9669	12	0.25%	1.1539
Marshal Ridge PH1 "S-1"	18+16	20+37	0.512	10	0.25%	0.710	0.9749	12	0.25%	1.1539
Marshal Ridge PH1 "S-1"	16+07	18+16	0.52	10	0.25%	0.710	0.9829	12	0.25%	1.1539
Marshal Ridge PH1 "S-1"	13+52	16+07	0.592	10	0.25%	0.710	1.0549	12	0.25%	1.1539
Marshal Ridge PH1 "S-1"	11+76	13+52	0.6	10	0.25%	0.710	1.0629	12	0.25%	1.1539
Marshal Ridge PH1 "S-1"	9+10	11+76	0.608	10	0.25%	0.710	1.0709	12	0.25%	1.1539
Marshal Ridge PH1 "S-1"	5+31	9+10	0.624	10	0.25%	0.710	1.0869	12	0.25%	1.1539
Marshal Ridge PH1 "S-1"	3+56	5+31	0.76	10	0.25%	0.710	1.2229	12	0.52%	1.6641
Marshal Ridge PH1 "S-1"	1+80	3+56	0.76	10	0.25%	0.710	1.2229	12	0.52%	1.6641
Marshal Ridge PH1 "S-1"	0+00	1+80	0.76	10	0.96%	1.390	1.2229	12	0.52%	1.6641

CONCLUSION / RECOMMENDATIONS

Based upon the information provided in this report, it has been concluded that the existing sewer lines with the proposed improvements have adequate capacity to convey the proposed condition of the proposed development.



UNION PACIFIC RAILROAD

U.S. HWY 377
(DENTON HWY) (N. MAIN STREET)
INST. NO. D205227982
O.P.R.T.C.T.

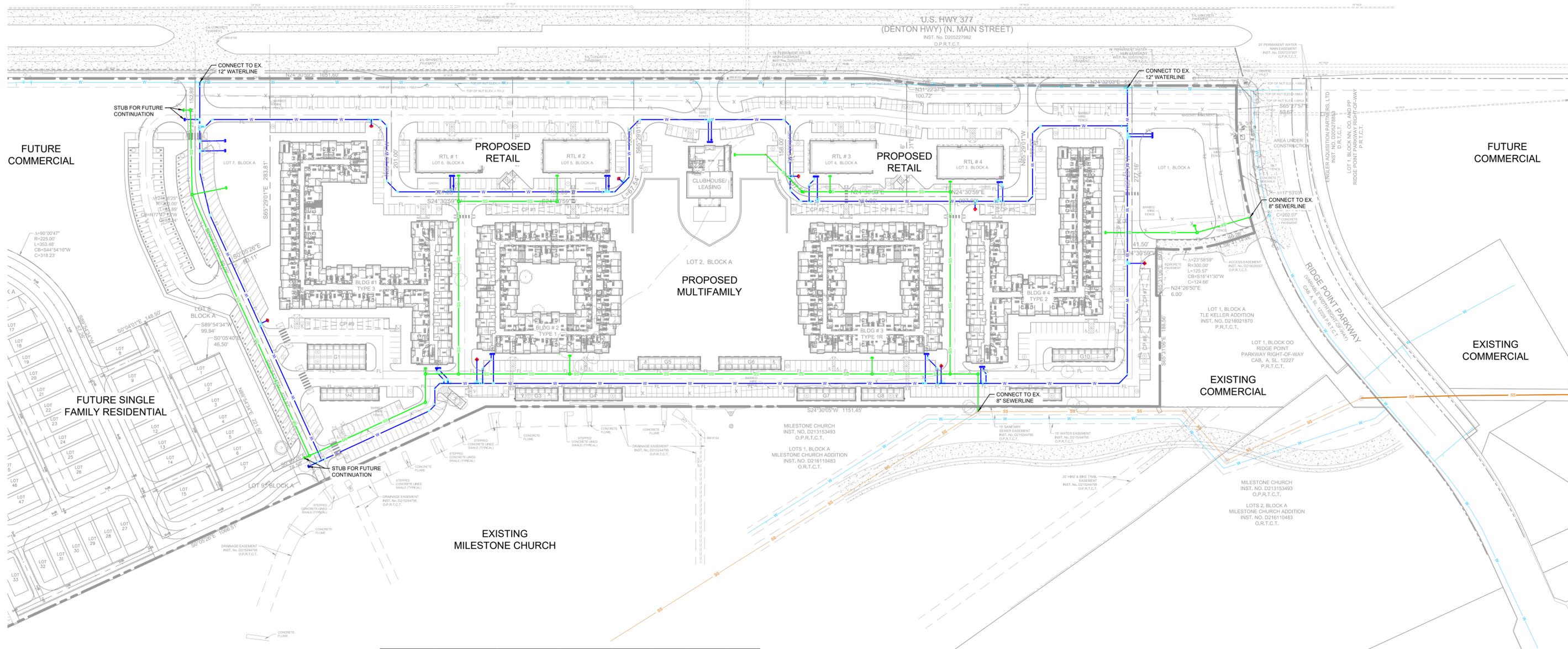


EXHIBIT A: WATER AND SEWER LAYOUT

ELAN KELLER
City of Keller, Texas
September 2020

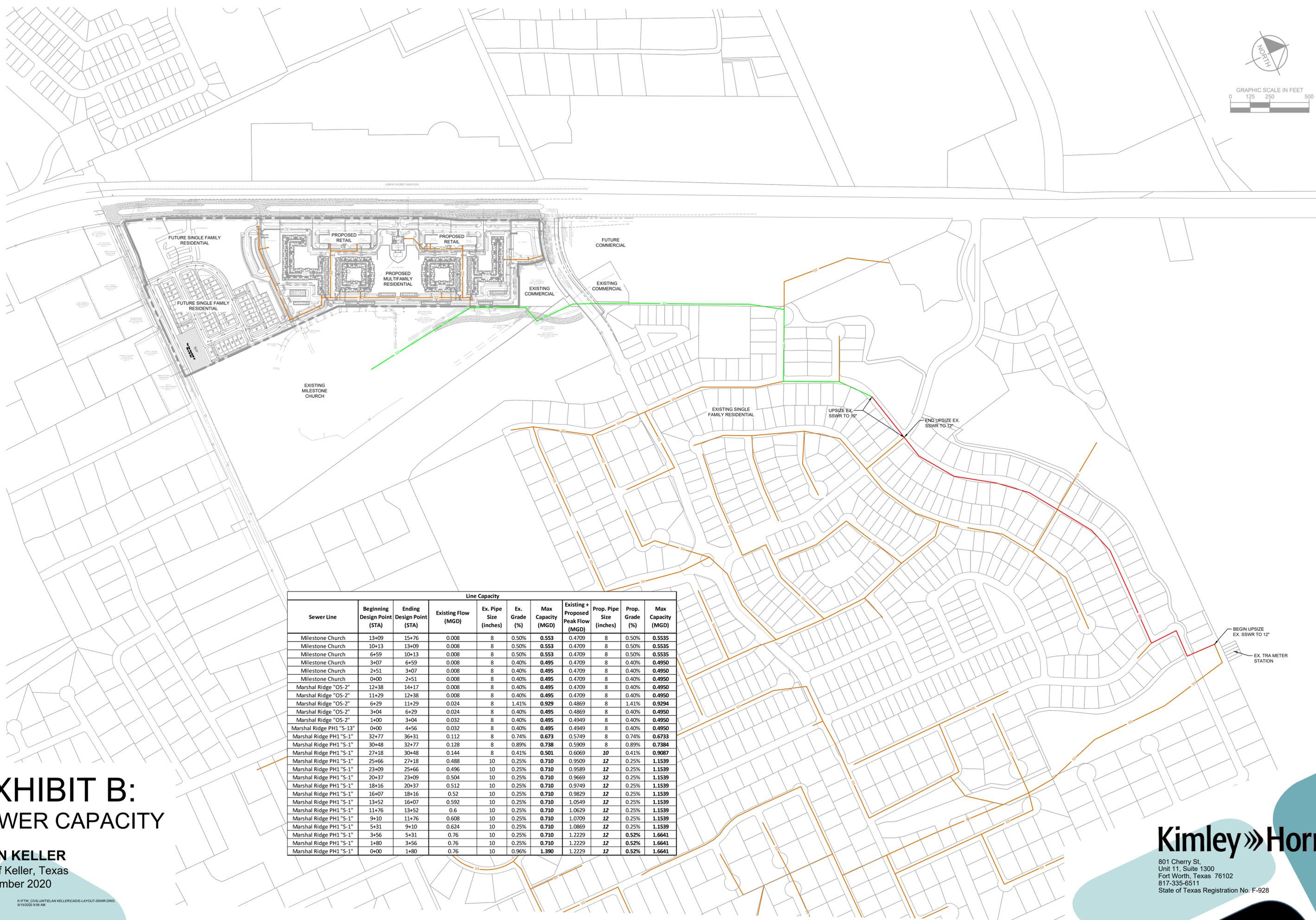
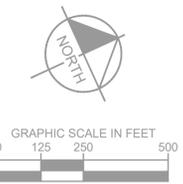
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EXHIBIT B: SEWER CAPACITY

ELAN KELLER
City of Keller, Texas
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State of Texas Registration No. F-928

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