Kimley»Horn

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Kimley»Horn
Engineer KEVIN J. KANE
P.E. No. 114659 Date DECEMBER 2022

December 20, 2022

Rebecca Diviney, P.E.
Director of Capital Projects / City Engineer
City of Denton Engineering Services
401 N Elm Street
Denton, TX 76201

Re: Hunter Ranch Roark Branch Interceptor – Alignment Analysis
KH No. 061324500

Dear Ms. Diviney:

Kimley-Horn and Associates, Inc. (Kimley-Horn), has prepared the following Roark Branch Interceptor Alignment Analysis memorandum for the proposed Hunter Ranch and Cole Ranch developments in Southwest Denton for your review. This memorandum has been prepared to demonstrate alignment constraints and recommendations for the proposed interceptor, and to obtain City concurrence on proposed alignment prior to beginning final design.

PROJECT BACKGROUND AND PURPOSE

Hunter-Cole Ranch is a proposed approximately 6,000-acre master-planned development in southwest Denton. The area is generally bound by the Robson Ranch Development, H Lively Road and C Wolfe Road to the west, Tom Cole Road and Vintage Boulevard to the North, IH-35W to the east (with approximately 700 acres of Hunter Ranch located east of IH-35W), and Robson Ranch Road to the south. The development's buildout is anticipated to include:

- 12,400 single-family units
- 6,450 multi-family units
- 485 commercial acres
- 256 industrial acres

In order to provide sanitary sewer service to approximately one-half of the overall development, the entirety of the Robson Ranch development (existing and proposed), and several parcels located along the Roark Branch of Hickory Creek between US 377 and IH-35W, the proposed Hickory Creek Roark Branch Interceptor ("Project") is required to be constructed. The Hunter Ranch Roark Branch Interceptor as discussed in this memorandum is generally defined as Projects D-2, D-4, and the southern leg of D-5 (see **Figure 1** below) as further defined in the *Hunter-Cole Development Analysis* by Freese and Nichols, Inc., dated February 7, 2020

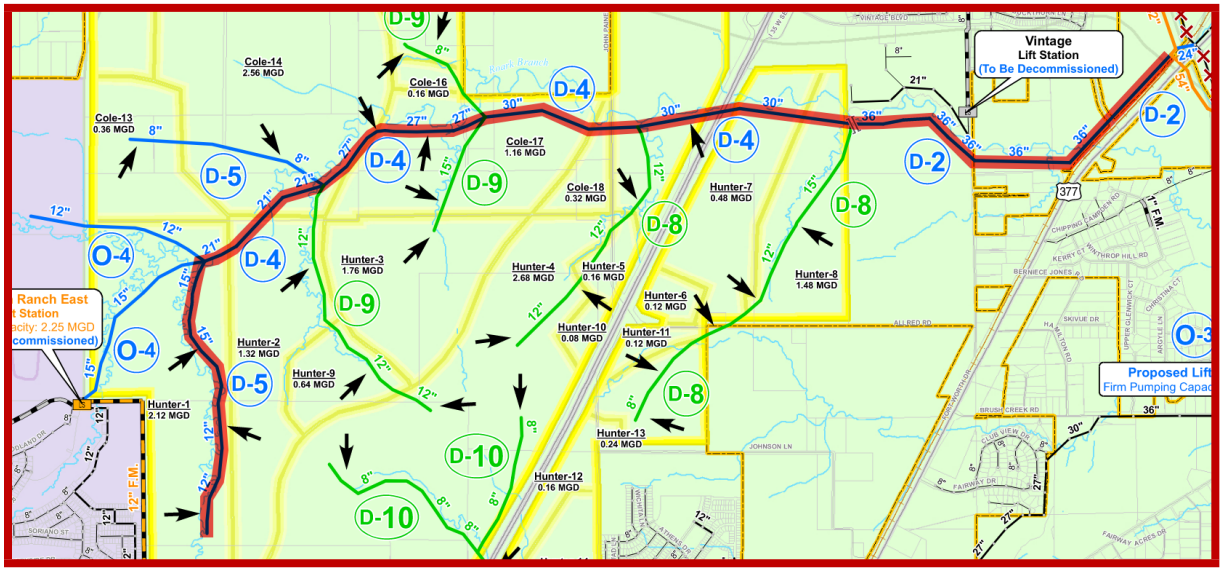

Figure 1 – Roark Branch Interceptor Project Extents
(Image Credit: Hunter-Cole Development Analysis)

The alignment is separated into the following Segments for further discussion:

- **Segment 1**
  - Beginning: Connection to an existing 54-Inch directly southwest of Hickory Creek, and adjacent to Union Pacific Railroad (UPRR) right-of-way (ROW).
  - End: West of IH-35W
  - Note this segment is further divided into a North and South alignment with several common sections.
- **Segment 2**
  - Beginning: West of IH-35W
  - End: Approximately 1,900 LF east of the Robson Ranch development and 2,900 LF north of Robson Ranch Road.

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ALIGNMENT CONSTRAINTS

The proposed alignment will generally follow the existing Roark Branch of Hickory creek and its tributaries, and is largely driven by the following constraints:

- Jurisdictional Boundaries
- Environmentally Sensitive Areas (ESAs)
- Existing Development
- Hunter Ranch Land Plan
- Minimal Impacts to Non-Floodplain Areas
- Vertical Constraints

Path through park required no open cut in existing water related habitat ESA or Riparian Buffer ESA

Existing easement goes through both and has insufficient width to permit construction of the interceptor

Alignment selected to minimize impacts to potentially developable land

Alignment selected to minimize depth; minimizes construction impact, initial cost, and future maintenance costs for City

Property south of Roark and West of Bonnie Brae fully developed single family lots

City parcel (west of Bonnie Brae) has existing interceptor, we are replacing in place

JURISDICTIONAL BOUNDARIES

n performed on-site aquatic resources delineation in general accordance wi
y Corps of Engineers elineation Manual and app
egional Supplement (G

Stream boundaries are delineate exhibits. Given the narrow area identified, it is likely the Project can be authorized by Nationwide Permit (NWP) 58 for Utility Line Activities for Water and Other Substances without notification to the USACE Fort Worth District. The need for an NWP 58 Pre-Construction Notification will be further evaluated as the Project enters the Final Design stage.

ENVIRONMENTALLY SENSITIVE AREAS

Existing Environmentally Sensitive Areas (ESAs) are identified in the attached alignment exhibits. The primary ESAs identified along the proposed alignments are floodplain and riparian buffers. In accordance with the City of Denton Environmentally Sensitive Areas Primer by City of Denton, as amended July 20, 2021, Section 6.2.3, the installation of new public sanitary sewer facilities is permitted in floodplain ESAs. It is understood that the placement of new utilities by open cut trenching or other land disturbing activities within Riparian Buffers or Water-Related Habitats is not permitted. All portions of the Project proposed to cross these areas will be installed by other than open cut methods. This will be reflected in the Final Design Drawings.

Upon receiving concurrence of the proposed alignment from the City, a tree survey will be performed which will inform the final design access, tree protection, and erosion control plans.

EXISTING DEVELOPMENT

The majority of the alignment is vacant land, however one ongoing development along the Project alignment affected the horizontal alignment. The original alignment as indicated in the *Hunter-Cole Development Analysis* depicted the alignment for this wastewater main crossing the Roark Branch as it heads south along UPRR ROW before heading west. Whereas, at the time of the previous analysis was prepared, the property south of the City of Denton property was undeveloped, construction is nearing completion on the Cambridge Brook Phases 1 and 2 single-family subdivision.

HUNTER RANCH LAND PLAN

The Hunter Ranch Land Plan (attached to this memorandum) dictated the horizontal alignment as the pipeline traverses through Hillwood properties. The parcel directly west of existing City property on the east side of IH-35W requires the interceptor to hug Roark Branch as closely as possible. As the pipeline continues southwest, the alignment is proposed to traverse west quickly and to hug the west side of existing Denton Municipal Electric (DME) transmission line easement to the south.

MINIMAL IMPACTS TO NON-FLOODPLAIN AREAS

Throughout the alignment, efforts are made to locate the interceptor alignment within floodplain, but outside of all other ESA types to maximize developable land.

VERTICAL CONSTRAINTS

DOWNSTREAM CONNECTION

The minimum vertical alignment is entirely tied into the downstream tie-in point which is a newly constructed 8-foot diameter manhole located southwest of the UPRR and Hickory Creek intersection on the Hickory Creek Interceptor Phase I and II project. The tie-in elevation assumes the proposed interceptor crown elevation can be no less than the crown of the 54-inch interceptor exiting the manhole to the east (FL = 550.86’; T/P = 555.36’).

SERVICE AREA CONSIDERATIONS

The Interceptor will need to be sufficiently deep to completely serve the entire basin. To ensure minimum elevations are met, laterals were extended at minimum slope to their limits as indicated in the *Hunter-Cole Development Analysis*, and assuming a 6-foot minimum depth at the upstream end. Creek crossings for laterals were also considered, to determine if the interceptor needed to be deeper in certain areas to maintain minimum 4-feet of cover at lateral creek crossings.

Finally, the proposed interceptor depth was compared to gravity inlet elevations for the existing Vintage and Robson Ranch Lift Stations must be deep enough to permit the abandonment of the Vintage and East Robson Ranch Lift Stations.

SEGMENT 1 – UPRR TO WEST OF IH-35W

This segment begins at a new 8-foot manhole on the Hickory Interceptor Phase I and II project on the southwest corner of UPRR ROW and Hickory Creek, then continues south and west crossing the Roark Branch either east or west of IH-35W. This segment includes discussion of the following properties: Burch, VV52 Denton, Wilkes, City of Denton, and Hillwood.

BURCH FAMILY FARM LTD

The proposed alignment is currently shown to be installed between an existing 6-inch gas line and UPRR ROW. However, on-site topographic survey and physical locates of the existing gas line will determine whether the line will be required to jog further into the property. The property is nearly entirely within existing federal floodway and it is likely that a USACE NWP 58 Pre-Construction Notification will be required due to the disturbed area on this site.

VV52 DENTON, LP / EMRIE WILKES TRUST / DAWN C MILLER TRUST / DE LA ROSA

The alignment is constrained between an ongoing development and existing ponds as it leaves the Burch property. The alignment then splits in two as it approaches the Wilkes property, and either hugs the northern property line or southern tree line of the subdivided Wilkes/Miller/De La Rosa Parcel.

The southern alignment is preferred to not install the line too deep and will likely be less challenging for easement acquisition from property owners within existing floodplain.

CITY OF DENTON

As discussed earlier, the alignment is proposed to be north of the Roark Branch on the City of Denton property as a result of ongoing development to the south. Additionally, locating the interceptor on the City of Denton property will permit abandonment of the Vintage lift station without requiring another lateral line to cross the Roark Branch.

The alignment is proposed to replace or parallel an existing 21-inch sanitary sewer line that was designed as a middle segment for a Roark Branch interceptor. Hydraulically, it is not preferred to maintain the existing line as it is likely that the smaller line will remain empty for much of the time and contribute to odor and corrosion concerns. Additionally, following the same alignment as the existing interceptor will help minimize tree removal within the existing floodplain.

HR 3200, LP (HILLWOOD)

A southern and northern option have been provided as the alignment leaves the City of Denton Property and enters the Hillwood property. The southern option crosses the Roark Branch immediately, and then hugs the existing riparian buffer ESA to minimize impacts to developable land, and then turns south paralleling IH-35W ROW until a 90-degree crossing can be made. The northern option will traverse the floodplain, cross IH-35W and head directly south on the west ROW.

The northern option is preferred as it will maximize developable area to the south while minimizing total depth. One design item of note is that this alignment will need to remain sufficiently deep to accommodate the Hunter Ranch sub-basin that extends approximately 7,500 LF to the south. The southern option will require one less creek crossing, as the line can directly serve the sub-basin to the south. However, installing the line on this side of the creek will require installation depths of up to 70-feet given a steep rise in topography near the southeast corner of the Roark Branch and IH-35W.

SEGMENT 2 – IH-35W TO ROBSON RANCH

This segment begins at the southwest corner of the Roark Branch and IH-35W ROW, then continues west and south hugging the Roark Branch, and diverging to the southeast to avoid an existing gas well and earthen dam and pond. The alignment then continues southwest and south crossing existing DME overhead transmission mains and turns directly south until it's upstream extents approximately 1,900 LF east of Robson Ranch, and 2,900 LF north of Robson Ranch Road. This segment includes discussion of the following properties: Cole and Hillwood.

COLE RANCH COMPANY LP

The approach to these properties was to minimize impact to developable non-floodplain land. Proposed ESA crossings will be accomplished by other than open cut.

HR 3200, LP (HILLWOOD)

This alignment will cross a Roark Branch tributary following the northern end of the proposed Hunter Ranch land plan and cross existing DME easement at a 90 degree angle and hug the western side of the existing easement. Installation of the line on this side of the easement will require several reaches to be installed by other than open cut to avoid ESAs.

SANITARY SEWER FLOWS

Anticipated design flows (Qdes) are indicated on profile views of alignment exhibits and were obtained from the City provided wastewater model prepared by Freese and Nichols, Inc. in conjunction with the *Hunter-Cole Development Analysis*. Proposed pipe sizing is also shown on alignment exhibits along with full flow capacities at anticipated pipe slopes (Qcap).

Preparation of this alignment analysis has determined that given the very large vertical relief across the corridor project extents (~560' to 720'), there is ample flexibility to modify pipe sizing and/or slopes starting on the western end of the City of Denton property to accommodate greater flows than those currently anticipated. As final design progresses, actual development demands will be further refined, and pipeline capacities will be adjusted as needed. This additional analysis can be provided to the City as required.

RECOMMENDATION

Based upon the reasoning presented above, Kimley-Horn recommends the southern portions of Segment 1 and Segment 2 as indicated in the attached alignment exhibits.

Should the City concur with this alignment approach the following scope of work will begin:

- Topographic Survey
- Subsurface Utility Engineering (SUE)
- Geotechnical Investigations
- Tree Survey
- Archeological Investigations in accordance Texas Antiquities Code
- Final Design Drawings and Technical Specifications

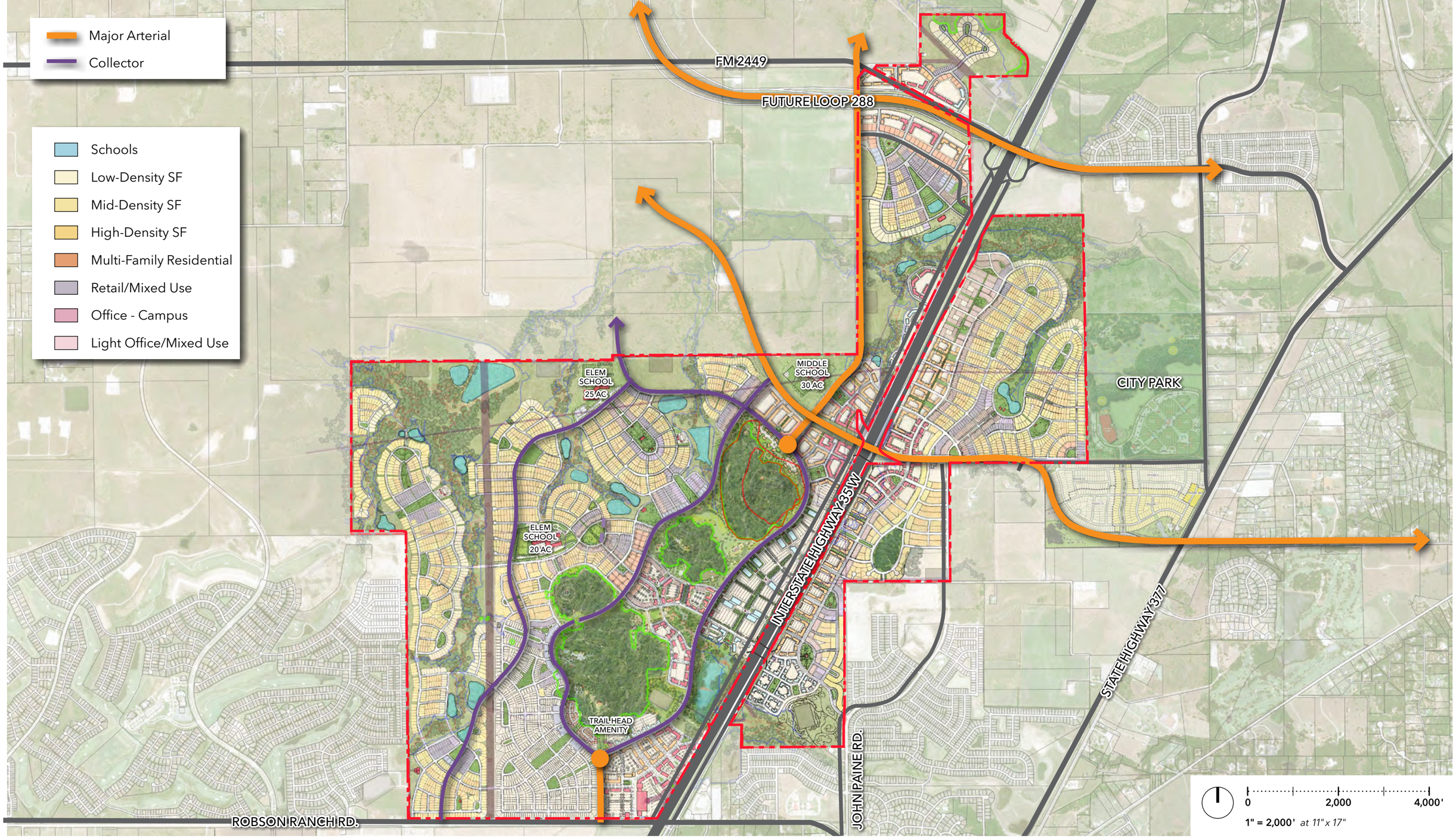
Please let us know if you have any questions or concerns.

Very truly yours,

KIMLEY-HORN AND ASSOCIATES, INC
TBPE Firm No. 928

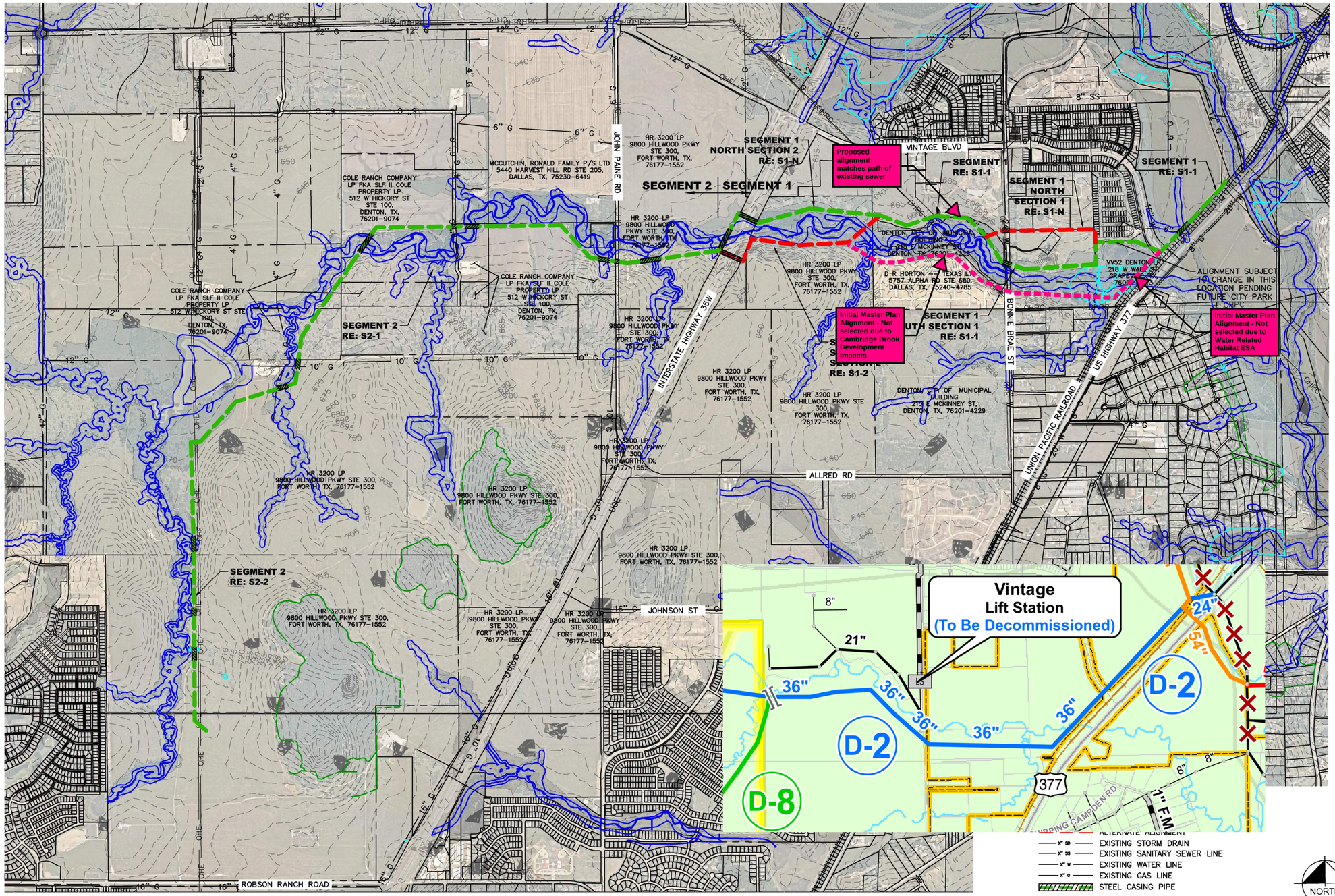
Kevin Kane, P.E.

KJK/pdm
Attachments "Hunter Ranch – Roark Branch Interceptor Alignment Exhibits"
"Hunter Ranch Land Plan"
Copy to: N/A



Hunter Illustrative Masterplan

HART HOWERTON



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Frisco, TX 75034

No.	Revision	By	Date

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Engineer: KEVIN J. KANE
P.E. No. 114828 Date: 12/21/2022

HUNTER RANCH
ROARK BRANCH OFFSITE
SANITARY SEWER

OVERALL SANITARY SEWER ALIGNMENT ALTERNATIVES

DATE:	DECEMBER 2022
DESIGN:	KHA
DRAWN:	KHA
CHECKED:	KHA
KHA NO.:	061324500

EXHIBIT

A

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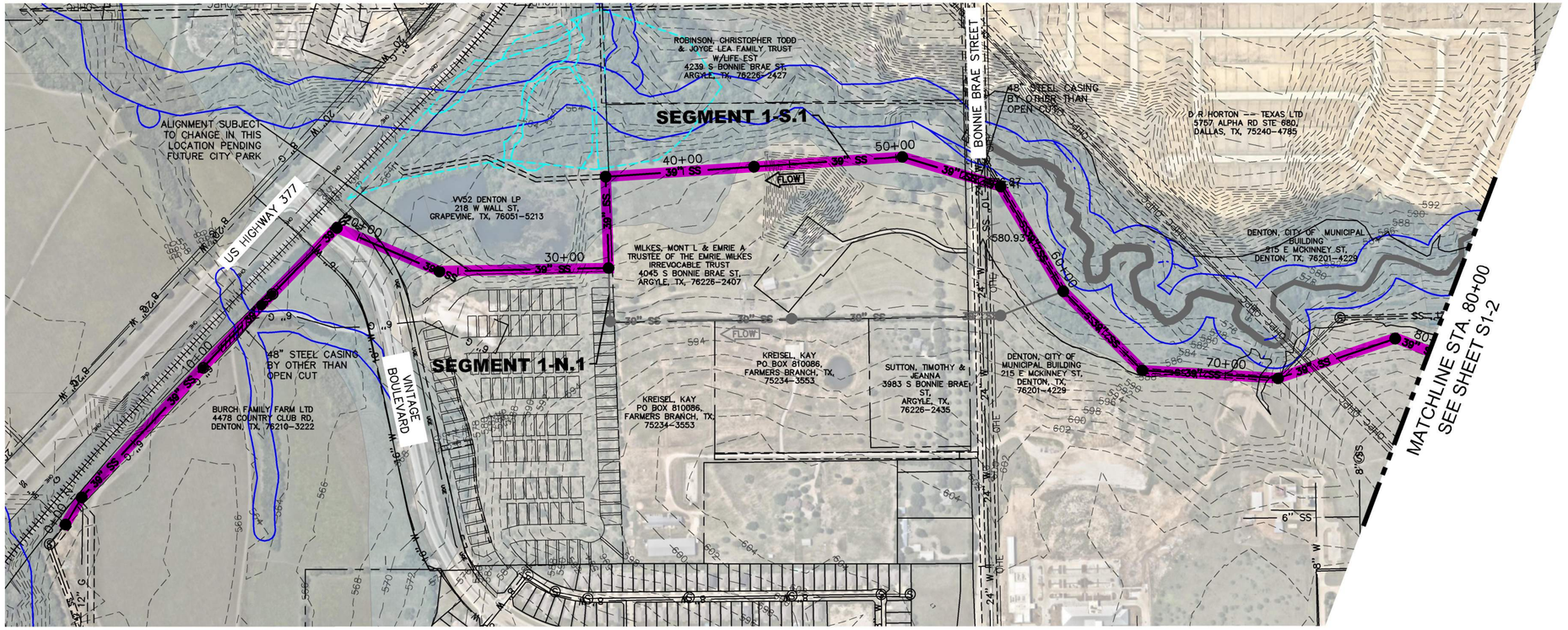

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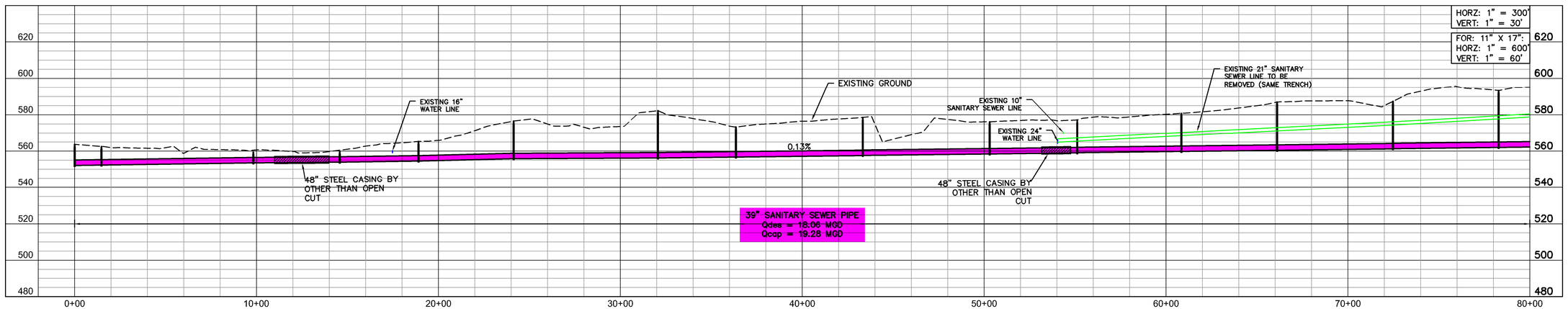

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HUNTER RANCH
ROARK BRANCH OFFSITE SANITARY SEWER

SEGMENT 1 SOUTH ALIGNMENT
BEGIN TO STA 80+00

DATE:	DECEMBER 2022
DESIGN:	KHA
DRAWN:	KHA
CHECKED:	KHA
KHA NO.:	061324500

EXHIBIT

S1-1

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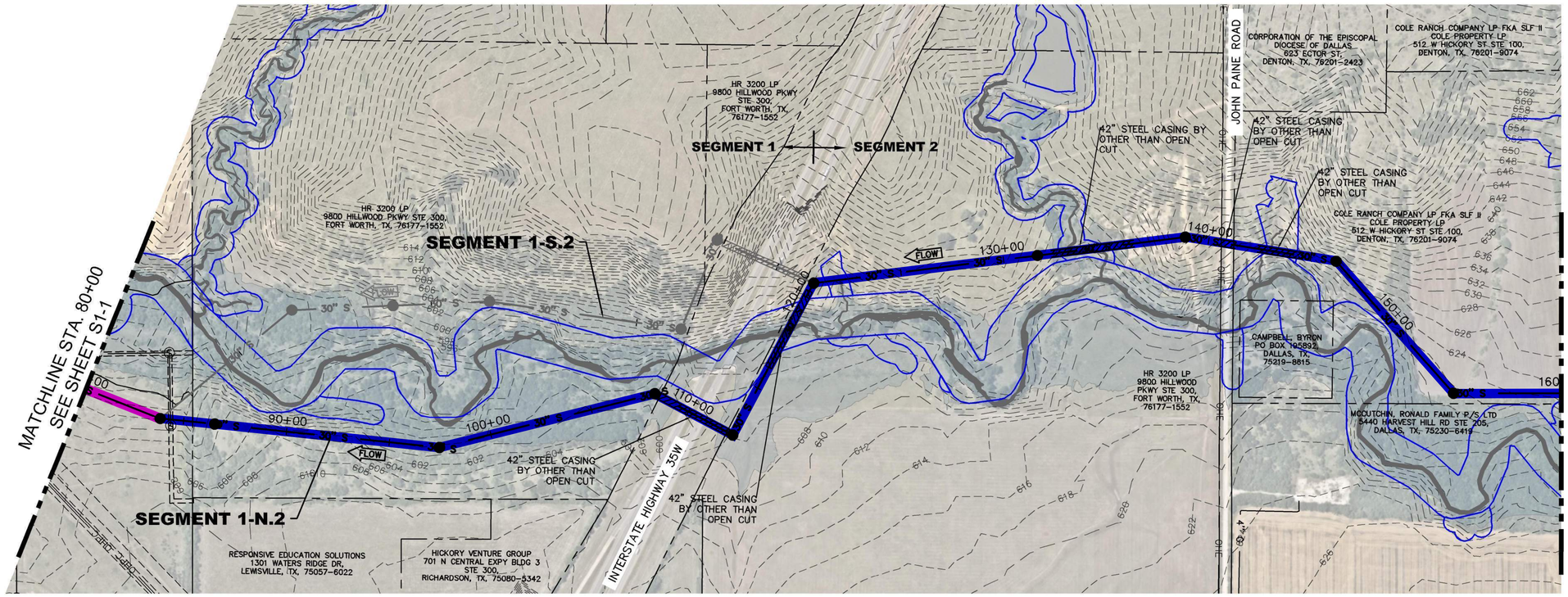

GRAPHIC SCALE IN FEET
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FOR 11"X17" 1"=600'

LEGEND:
- 30-INCH SANITARY SEWER PIPE
- 39-INCH SANITARY SEWER PIPE
- PROPOSED MANHOLE
- EXISTING STORM DRAIN
- EXISTING SANITARY SEWER LINE
- EXISTING WATER LINE
- EXISTING GAS LINE
- EXISTING UNDERGROUND ELECTRIC
- EXISTING OVERHEAD ELECTRIC
- EXISTING 100 YEAR FLOODPLAIN
- RIPARIAN BUFFER ESA

SEGMENT 1 NORTH ALIGNMENT
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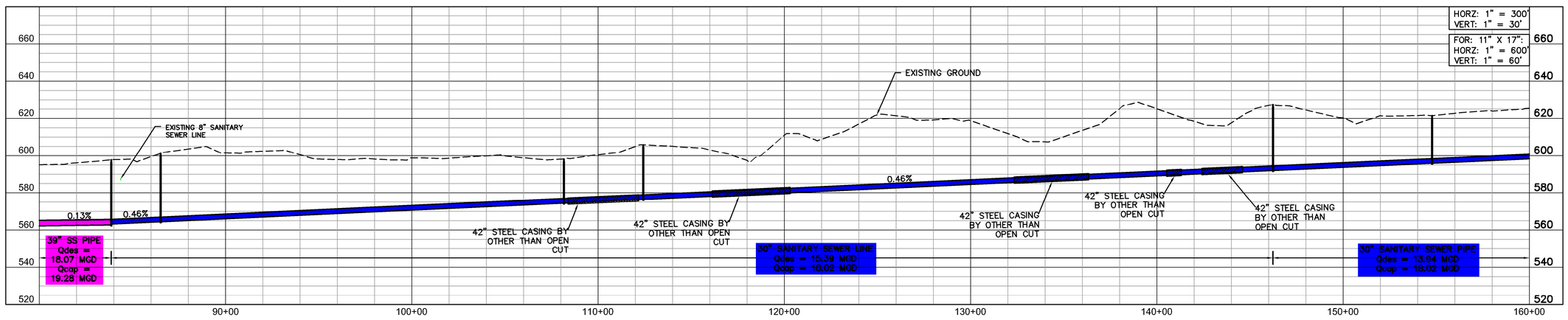

SEGMENT 1 SOUTH ALIGNMENT
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EXHIBIT
S1-2

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HUNTER RANCH
ROARK BRANCH OFFSITE
SANITARY SEWER

DATE:	DECEMBER 2022
DESIGN:	KHA
DRAWN:	KHA
CHECKED:	KHA
KHA NO.:	061324500

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LEGEND:

- 39-INCH SANITARY SEWER PIPE
- 30-INCH SANITARY SEWER PIPE
- PROPOSED MANHOLE
- X" SD — EXISTING STORM DRAIN
- X" SS — EXISTING SANITARY SEWER LINE
- X" W — EXISTING WATER LINE
- X" G — EXISTING GAS LINE
- UGE — EXISTING UNDERGROUND ELECTRIC
- OHE — EXISTING OVERHEAD ELECTRIC
- EXISTING 100 YEAR FLOODPLAIN
- RIPARIAN BUFFER ESA
- WATER RELATED HABITAT ESA

NORTH

GRAPHIC SCALE IN FEET
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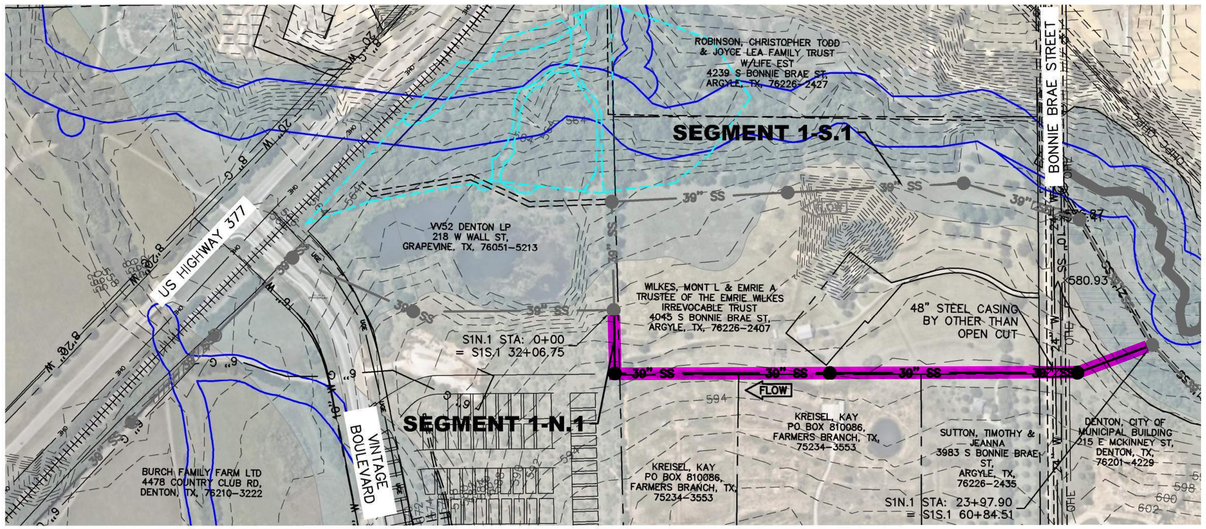
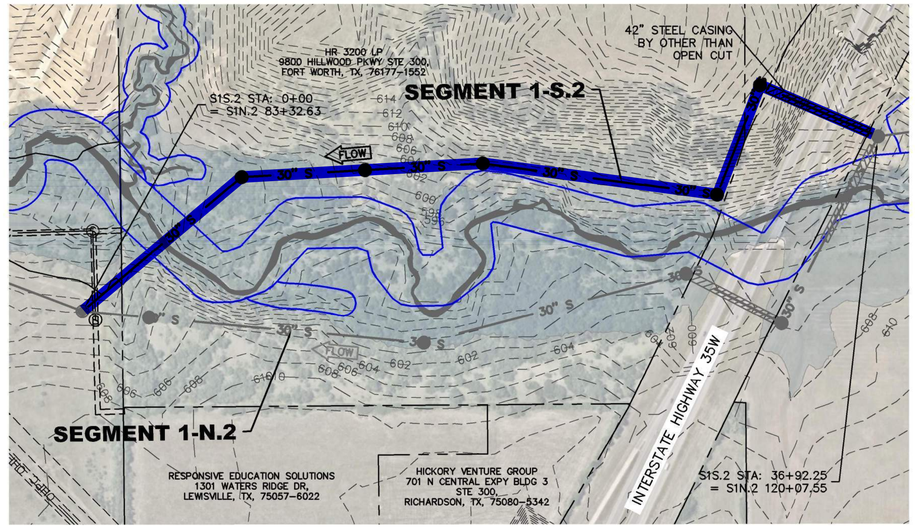
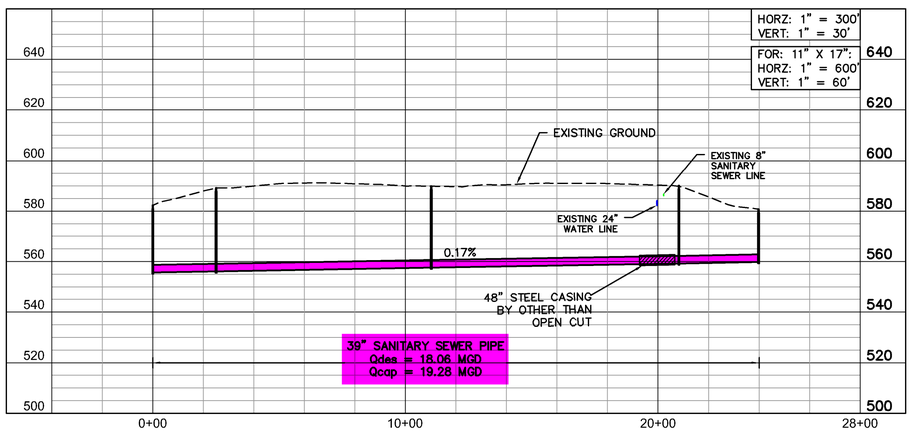
FOR 11"X17" 1"=600'





SEGMENT 1 ALTERNATE ALIGNMENTS

SEGMENT 1 NORTH ALIGNMENT
SECTION 1



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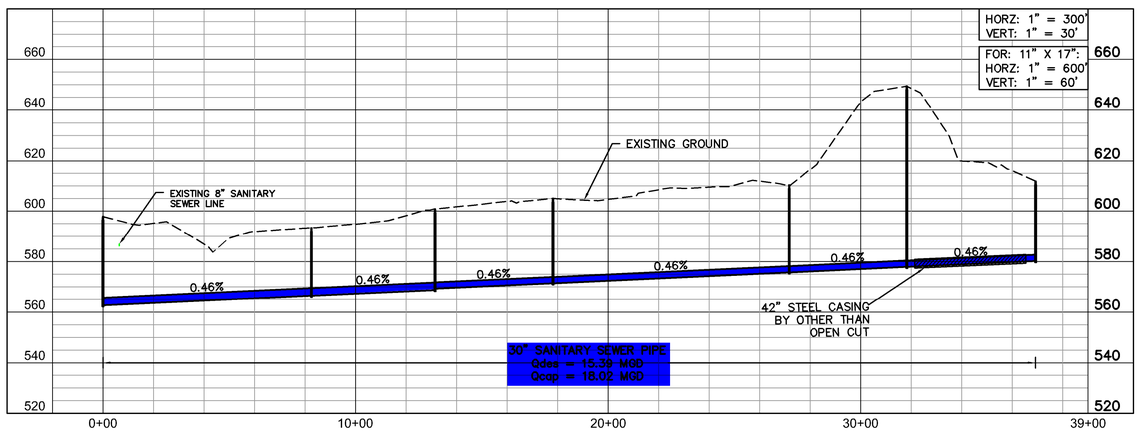

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ROARK BRANCH OFFSITE
SANITARY SEWER

SEGMENT 1 ALTERNATE ALIGNMENTS

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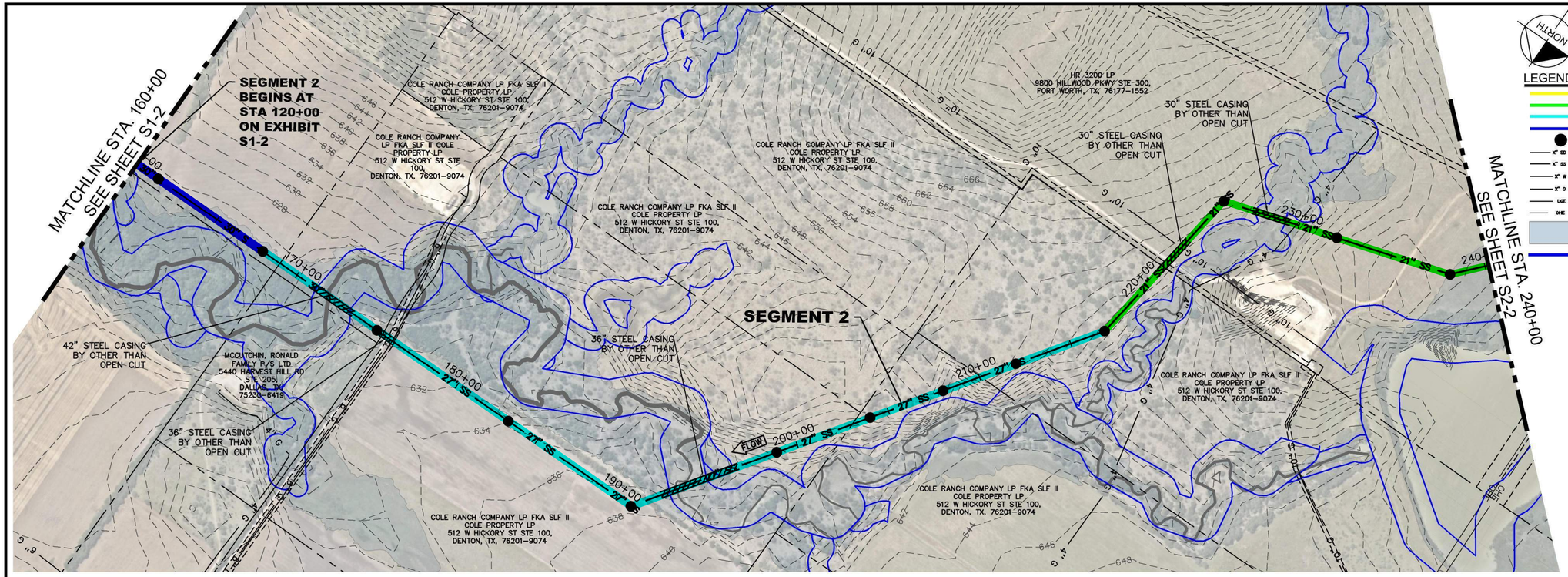
KHA NO.:	061324500	

EXHIBIT

S1-3



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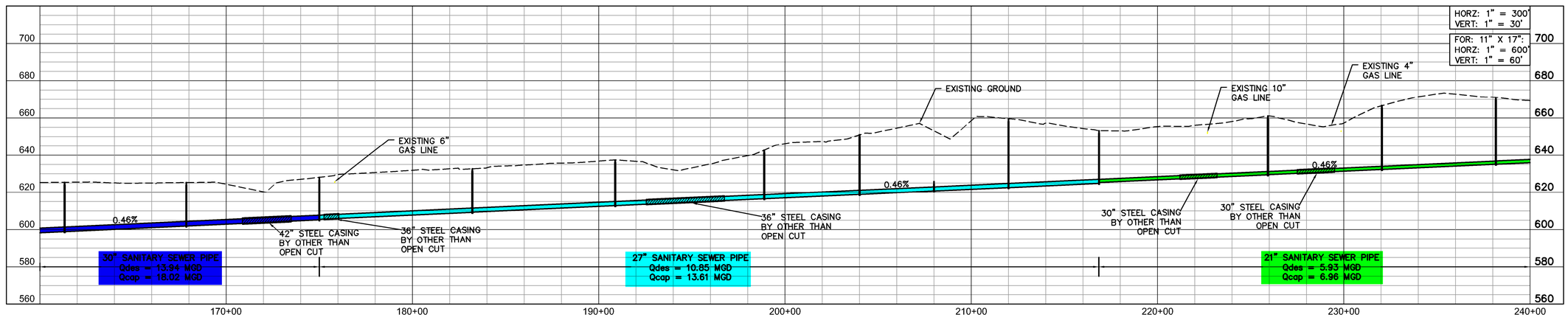

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SEGMENT 2 ALIGNMENT
STA 160+00 TO STA 240+00

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EXHIBIT

S2-1

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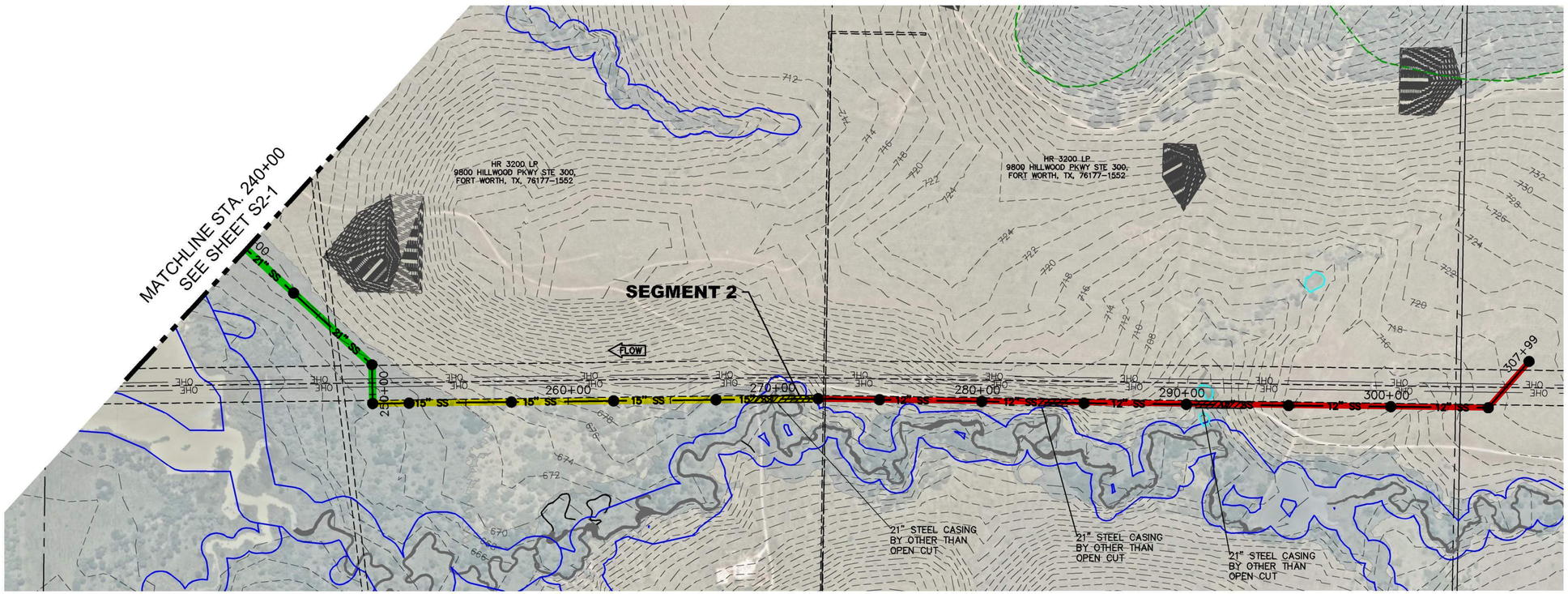

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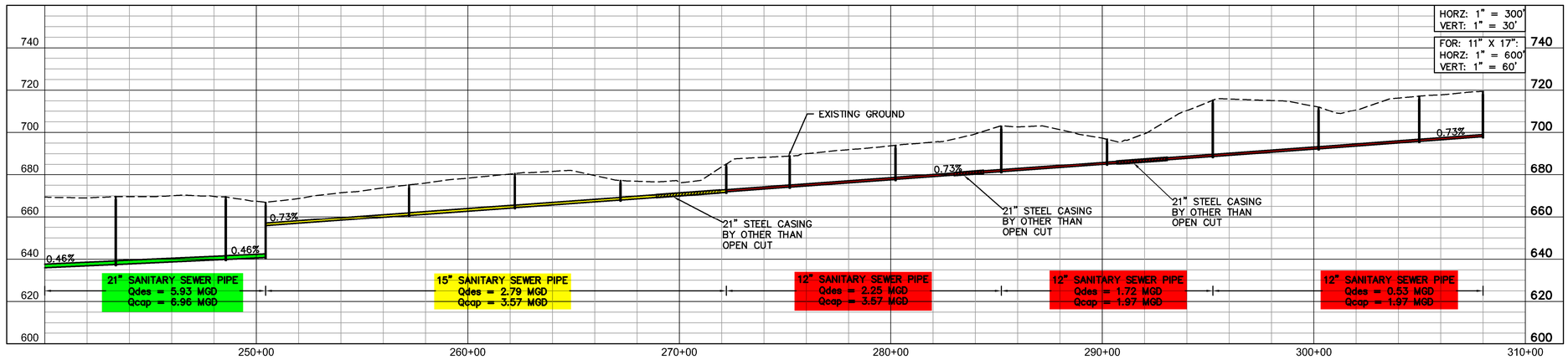

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EXHIBIT

S2-2

Roark Plan and Profile Exhibits.dwg 12/21/22 12:11pm