Bettis Blvd. & Vale St. - Drainage Memorandum

To: Alun Thomas, City Administrator

From: Darren Siegmund, PE, CFM
Selina Brandon, PE

Date: June 9, 2026

Re: **Bettis Blvd. & Vale St.** – Drainage Analysis

The purpose of this memo is to summarize the proposed roadway and drainage improvements via hydrologic and hydraulic (H&H) analyses for the intersection of Bettis Blvd. and Vale St. in the City of Rollingwood, Texas. Under existing conditions, stormwater runoff from the contributing drainage area generally flows southeast toward Dry Creek 2, locally known as Eanes Creek, located within Zilker Nature Preserve to the East of the neighborhood. However, due to existing grades and the lack of formal drainage infrastructure, a portion of runoff from Bettis Blvd. and the northern segment of Vale St. accumulates. This ponded water eventually overtops the roadway crown and southern curb, resulting in impacts to the residential property highlighted orange, as shown in **Figure 1** below. To help mitigate the flooding from smaller storm events, such as the 2-year design storm, WSB proposes the following improvements:

- Installing a valley gutter along Bettis Blvd. crossing Vale St. to help redirect flows from the existing ponding located in front of the property at 304 Vale St.
- Raising the curb height 6 inches along the southeast side of Vale St. that currently overtops and impacts the residential property at 305 Vale St., Rollingwood TX 78746
- Grade adjustments to the road to help with the valley gutter and curb transitions

WSB developed a 2-Dimensional Rain-On-Grid HEC-RAS model (version 6.3.1) to simulate both the existing and proposed conditions. OpenRoads Designer was used to develop a proposed terrain which was then incorporated into the HEC-RAS model. The following files were collected and used for drainage design and analysis:

- City of Rollingwood's Drainage Criteria Manual (DCM)
- City of Austin's Drainage Criteria Manual (DCM)
- Impervious shapefile via the City of Austin's GIS hub
- 2021 Bexar & Travis Counties Lidar – 1ft x 1ft (TxGIO)
- Survey collected by WSB on 4/24/2026
- HSG Data via SSURGO
- FEMA FIRM Panel 48453C0445K (Effective 01/22/2020)

1221 S MOPAC EXPRESSWAY | SUITE 355 | AUSTIN, TX | 78746 | 512.358.9174 | WSBENG.COM

The feasibility study shows that the proposed improvements do benefit the subject property for 2-year storm events and smaller without negatively impacting neighboring properties along Bettis Blvd. and Vale St.

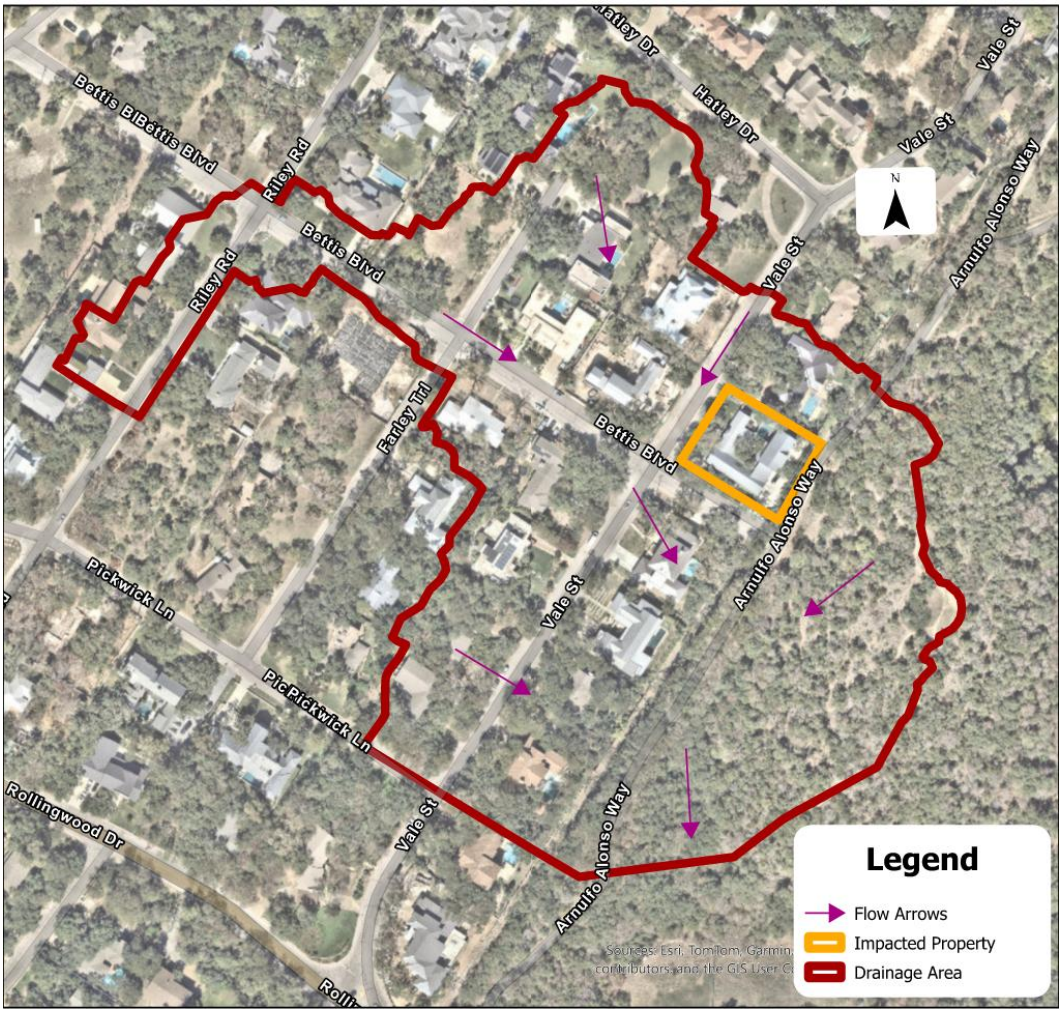


Figure 1: Project Area

Floodplain Impact Analysis

Referencing FEMA FIRM Panel 48453C0445K (Effective 01/22/2020), the proposed improvements at the intersection of Bettis Blvd. and Vale St. are not located within any mapped FEMA floodplain.

Drainage Analysis

A drainage analysis was performed to evaluate the existing and proposed surface drainage conditions. The analysis was completed in accordance with the City of Rollingwood Drainage Criteria Manual (DCM), which also utilizes the referenced City of

Austin DCM sections 2-8. The analysis also utilizes a combined HEC-HMS and HEC-RAS Rain-on-Grid modeling approach. The results of the analysis are intended to assess existing conditions and the effectiveness of proposed drainage improvements.

Hydrology

The contributing drainage area was delineated based on available topographic mapping (2021 LiDAR) and site survey information collected on 4/24/2026. A hydrologic analysis was then performed for the 15.54-acre contributing drainage area. HEC-HMS version 4.11 was used to develop design storm hyetographs for the 2-, 25- and 100-year frequency storm events.

Design rainfall inputs were obtained from the City of Austin DCM using the published Depth-Duration-Frequency rainfall data. Since the project site is located within City of Austin's Rainfall Zone 1 (see **Figure 13** in **Appendix A**), the rainfall depths and intensities were selected accordingly. Rainfall was input in HEC-HMS as frequency-based storm events, consistent with City of Rollingwood and City of Austin criteria. The Depth-Duration values used for Zone 1 are provided in **Table 1** below.

Table 1: Depth-Duration-Frequencies

Duration	Precipitation Depth (ft)		
	2-yr	25-yr	100-yr
5-min	0.53	0.98	1.28
10-min	0.88	1.57	2.04
15-min	1.06	1.96	2.54
30-min	1.49	2.75	3.54
1-hr	1.96	3.66	4.77
2-hr	2.42	4.81	6.57
3-hr	2.7	5.55	7.81
6-hr	3.17	6.78	9.79
12-hr	3.64	7.85	11.37
24-hr	4.14	8.9	12.8

The resulting hyetographs were then exported from HEC-HMS and applied within HEC-RAS as part of a Rain-On-Grid analysis. Infiltration was modeled directly in HEC-RAS using the SCS Curve Number method, in accordance with City of Rollingwood and City of Austin requirements.

Hydraulics

Existing

Hydraulic modeling for the 2-, 25- and 100-yr storm events was performed using HEC-RAS version 6.3.1 utilizing a 2D Rain-On-Grid analysis. Design storm hyetographs developed in HEC-HMS were applied directly to the 2D HEC-RAS model as precipitation boundary conditions. Infiltration losses were modeled using the SCS Curve Number method, with curve numbers assigned based on land use and hydrologic soil group (HSG) data. Land use and soil classifications used within the model are shown in **Figure 2** and **Figure 3** below, respectively.

The 2D computational mesh was developed using a 25-foot grid. A refinement region consisting of 2.5-foot cells was applied at the intersection of Bettis Blvd. and Vale St. to provide more detail in the area of the topographic survey captured by WSB. Break lines (with a cell spacing of 10-feet) were incorporated to preserve high points, such as roadway crowns and curb lines, to allow accurate representation of overland flow behavior. The model was simulated using an adjusted time step based (based on the Courant number).

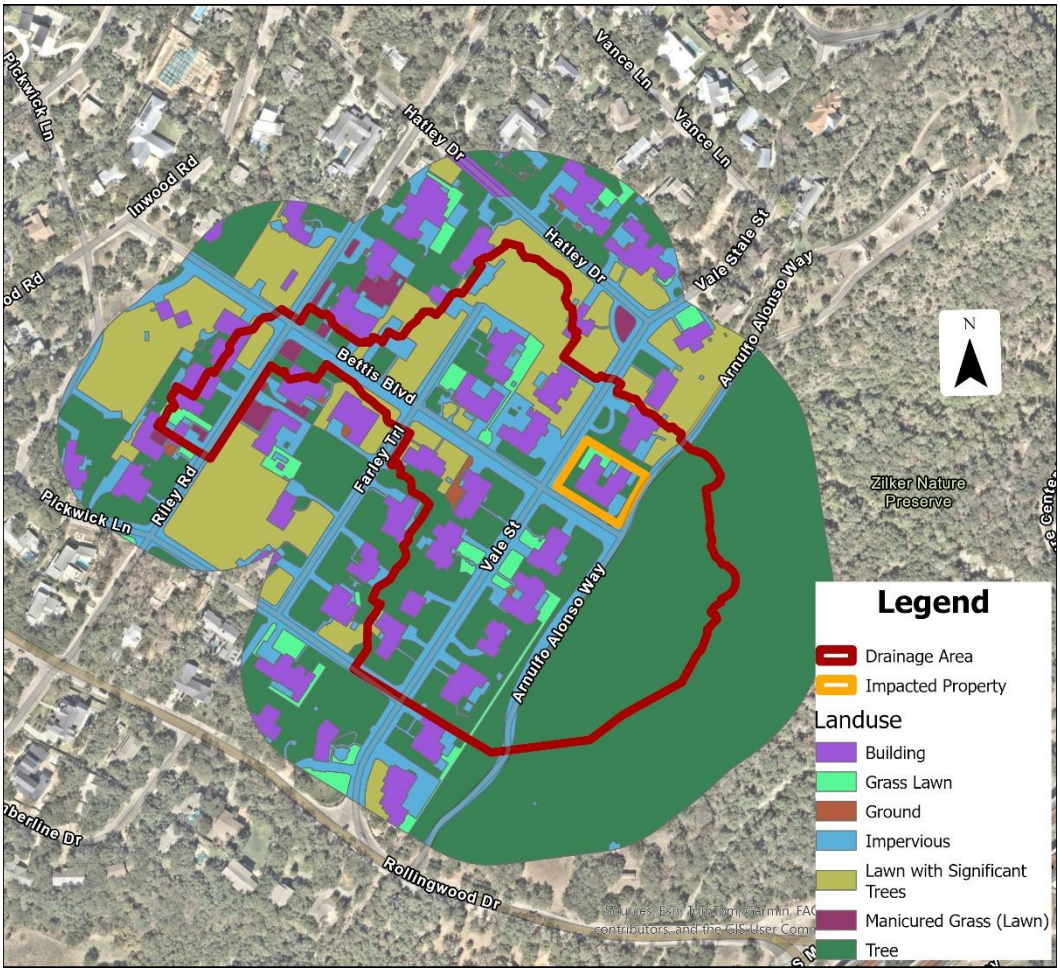


Figure 2: Existing Land Use

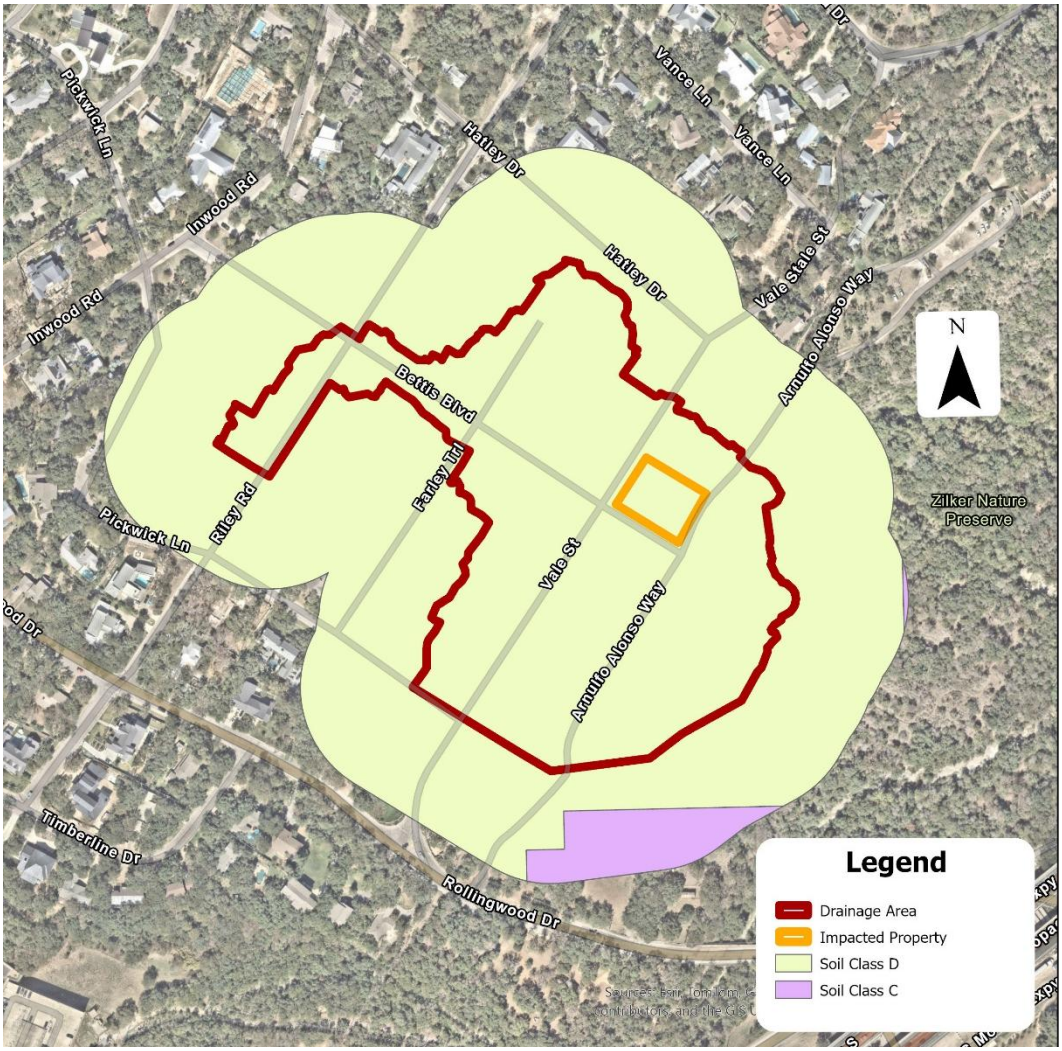


Figure 3: Existing Soil Conditions

Proposed

Using OpenRoads Designer software and HEC-RAS terrain modifications, a proposed terrain was developed to include:

- A valley gutter (City of Austin - *Standard 436S-2 (**Appendix A**)*) along Vale St. to help redirect flows from the north side of Bettis Blvd.
- A raised curb height of 6 inches along the south side of Vale St. that currently overtops and impacts the residential property at 305 Vale St., Rollingwood TX 78746
- Grading adjustments along the road to help with the valley gutter and curb transitions

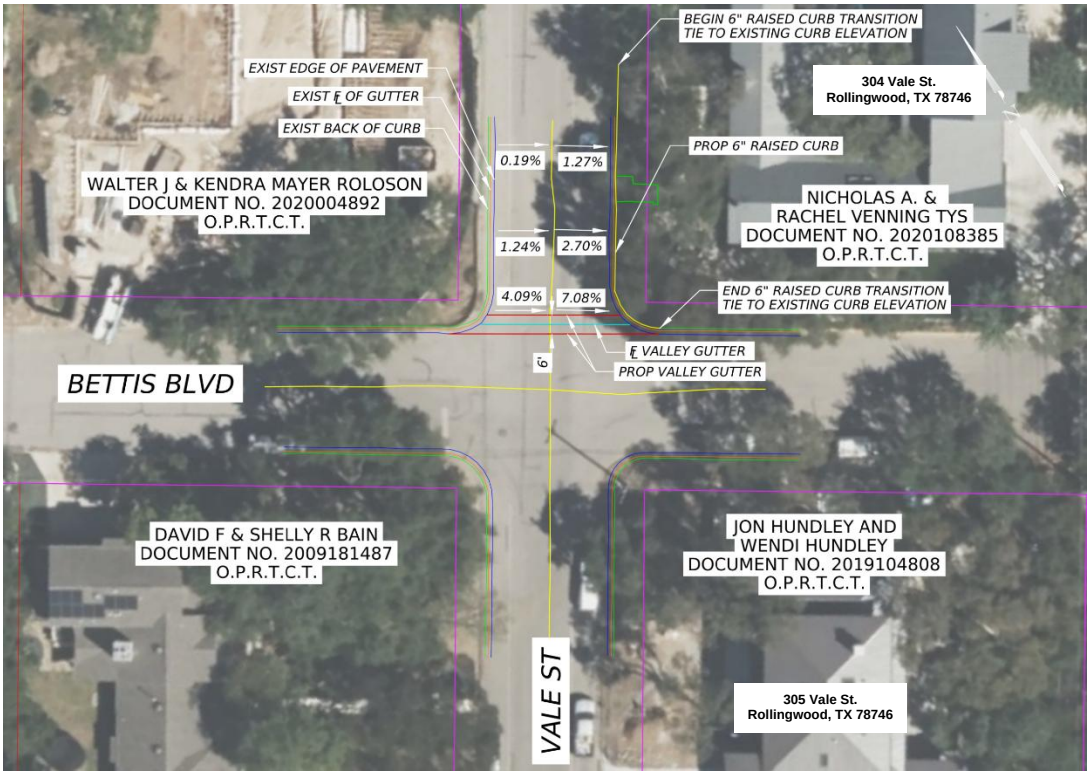


Figure 4: Proposed Improvement Extents

Figure 4 above exhibits the proposed improvement extents. To provide controls for result comparison, all other modeling parameters were maintained between existing and proposed conditions; only the surface/terrain was updated within HEC-RAS to fully assess the impacts of the proposed improvements.

Results

Profile lines were added to the model at key locations to help assess impacts and peak flows to ensure there were non-negative impacts to the residential property or adjacent properties, as shown in **Figure 5**. See the figures within **Appendix B** for profile line placement.

Profile lines 1 and 2 were used to assess the peak flow of each storm event to verify that peak flows were not increased as a result of the improvements. Profiles lines 3, 4, 5, 6, 7, 8 and 9 were used to assess the resulting water surface elevations to verify that there are no adverse impacts.

Table 2 below summarizes the HEC-RAS model results between existing and proposed conditions for peak flows at profile lines 1 and 2. **Figures 6 – 12** exhibit the water surface elevation (WSE) comparisons and terrain adjustments between existing and proposed conditions for profile lines 3 - 9. **Table 3** summarizes WSE comparison in HEC-RAS between the existing and proposed conditions for profile lines 3 - 9.

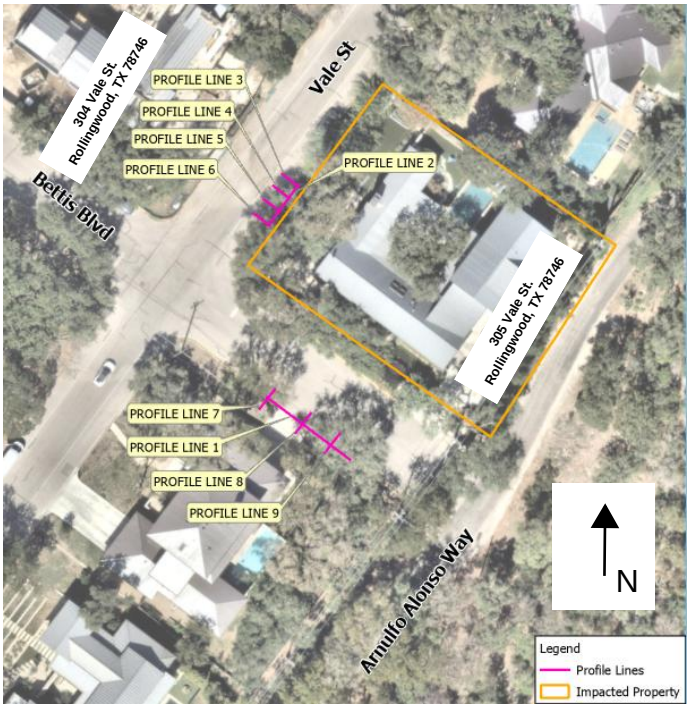


Figure 5: Profile Line Locations

Table 2: Peak Flow Comparison (Proposed vs. Existing)

Event	Peak Flow (cubic feet per second)					
	Profile Line 1			Profile Line 2		
	Existing (Ex)	Proposed (Pr)	Pr vs Ex	Existing (Ex)	Proposed (Pr)	Pr vs Ex
2-Year	0.9	0.9	0.0	1.2	0.0	-1.2
25-Year	3.2	3.3	0.1	5.1	0.2	-4.9
100-Year	4.6	4.7	0.1	8.1	1.2	-6.8

Table 3: Water Surface Elevation Comparison (Proposed vs. Existing)

Water Surface Elevation (ft)									
Profile Line ID	2-Year Storm Event			25-Year Storm Event			100-Year Storm Event		
	Ex	Pr	Pr vs Ex	Ex	Pr	Pr vs Ex	Ex	Pr	Pr vs Ex
Profile Line 3	552.7	552.7	0.0	552.9	552.9	0.0	553.0	553.0	0.0
Profile Line 4	552.7	552.7	0.0	552.9	552.9	0.0	553.0	553.0	0.0
Profile Line 5	552.7	552.7	0.0	552.9	552.9	0.0	553.0	553.0	0.0
Profile Line 6	552.7	552.7	0.0	552.9	552.9	0.0	552.9	553.0	0.1
Profile Line 7	548.2	548.2	0.0	548.2	548.2	0.0	548.3	548.3	0.0
Profile Line 8	546.2	546.2	0.0	546.3	546.3	0.0	546.3	546.3	0.0
Profile Line 9	545.3	545.3	0.0	545.4	545.4	0.0	545.4	545.4	0.0

Although **Table 2** above shows limited peak-flow benefit, **Figures 6 – 12** show the storm events to be contained within the gutter and raised curb. These storm events include the 2-, 25-, and 100-year design storms. **Table 3** also indicates that there are no adverse impacts at the neighboring residence adjacent to profile lines 7 - 9, as a result of the drainage improvements from a WSE elevation and flood impact perspective. Additional figures in **Appendix B** indicate that the valley gutter and curb support containing stormwater within the roadway.

Conclusion

The feasibility study illustrates that the proposed improvements during 2-year storm events and smaller can be contained within the roadway without overtopping the curb. The proposed improvements also do not create any adverse impacts to neighboring properties, specifically the property at 401 Vale St., Rollingwood TX 78746.

It is recommended that the transition point where the curb improvements tie back into existing elevations along Vale St. be reviewed and evaluated during design to confirm that no additional low points exist along the curb line that may not have been captured by the survey.

From these results, WSB proposes installing a valley gutter along the northern edge of Bettis Blvd. crossing Vale St., raising the curb height 6 inches along the southeast side of Vale St. in front of the 305 Vale St. property, and providing additional grade adjustment to Bettis Blvd. and Vale St.

Appendix A

Figure 6 - 12 – WSE Comparisons

Figure 13 – City of Austin: Rainfall Zoning

Figure 14 – FIRMette

COA Standard 436S-2

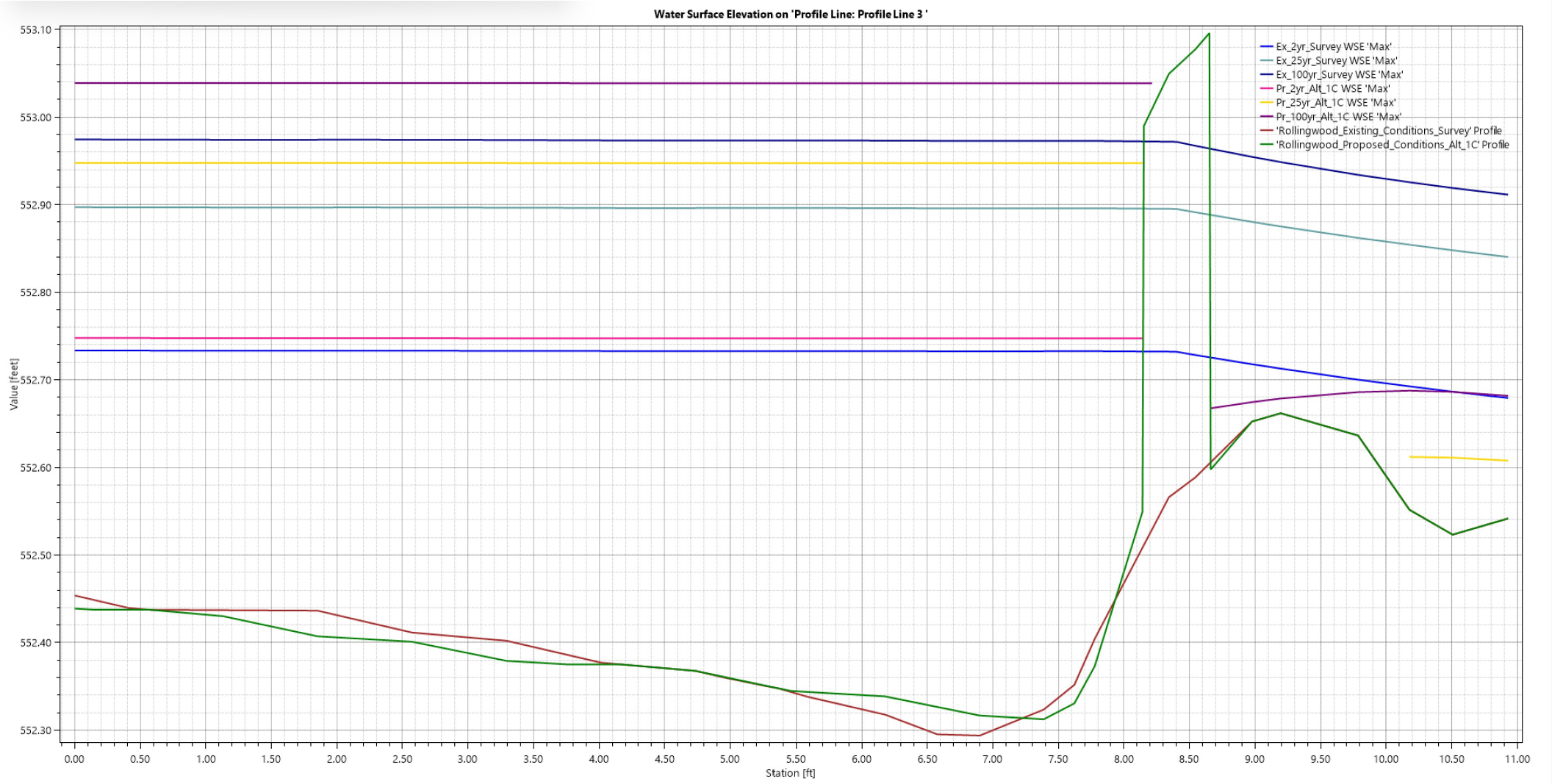


Figure 6 - Water Surface Elevation Comparison (Profile Line 3)

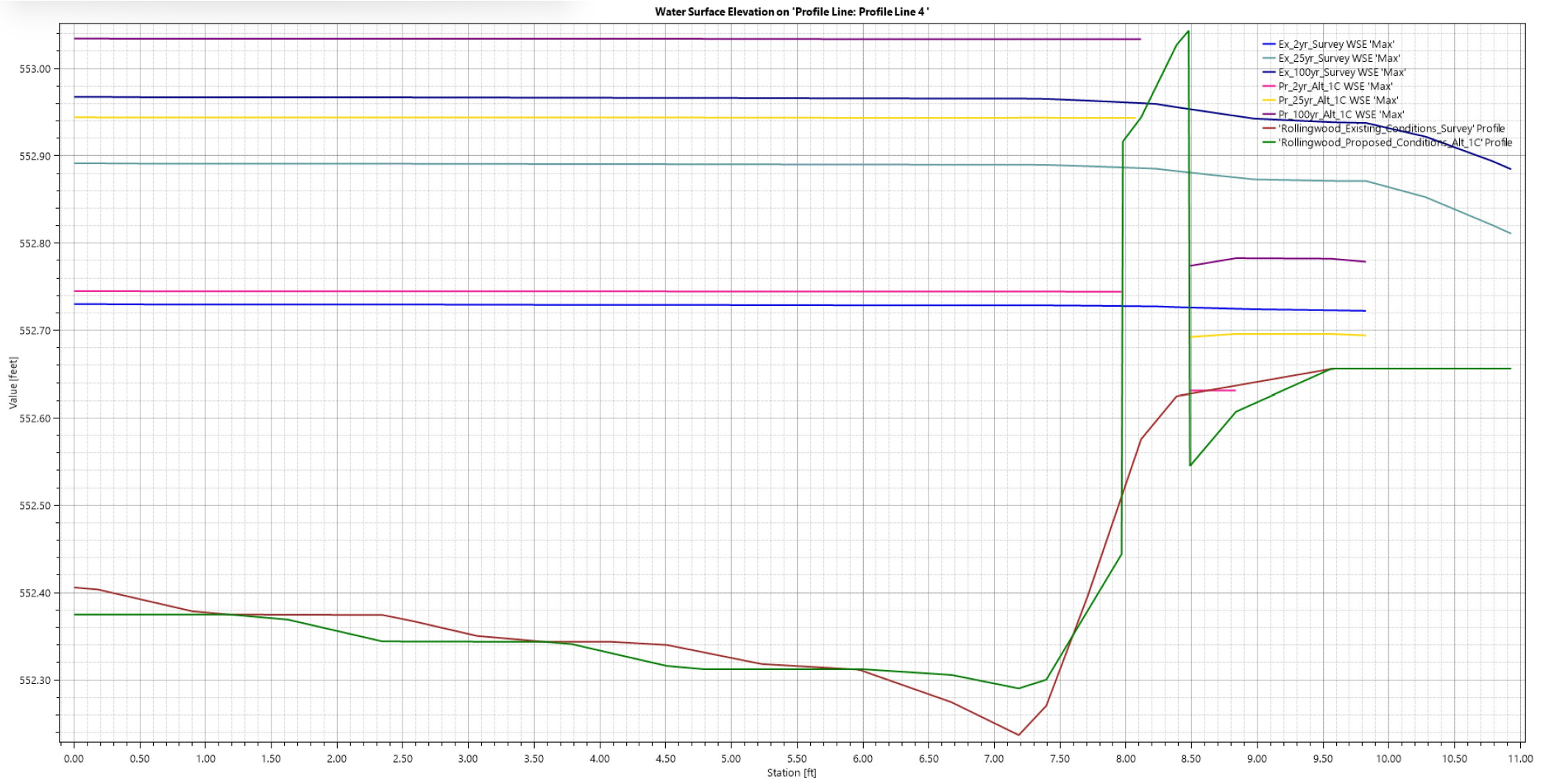


Figure 7 - Water Surface Elevation Comparison (Profile Line 4)

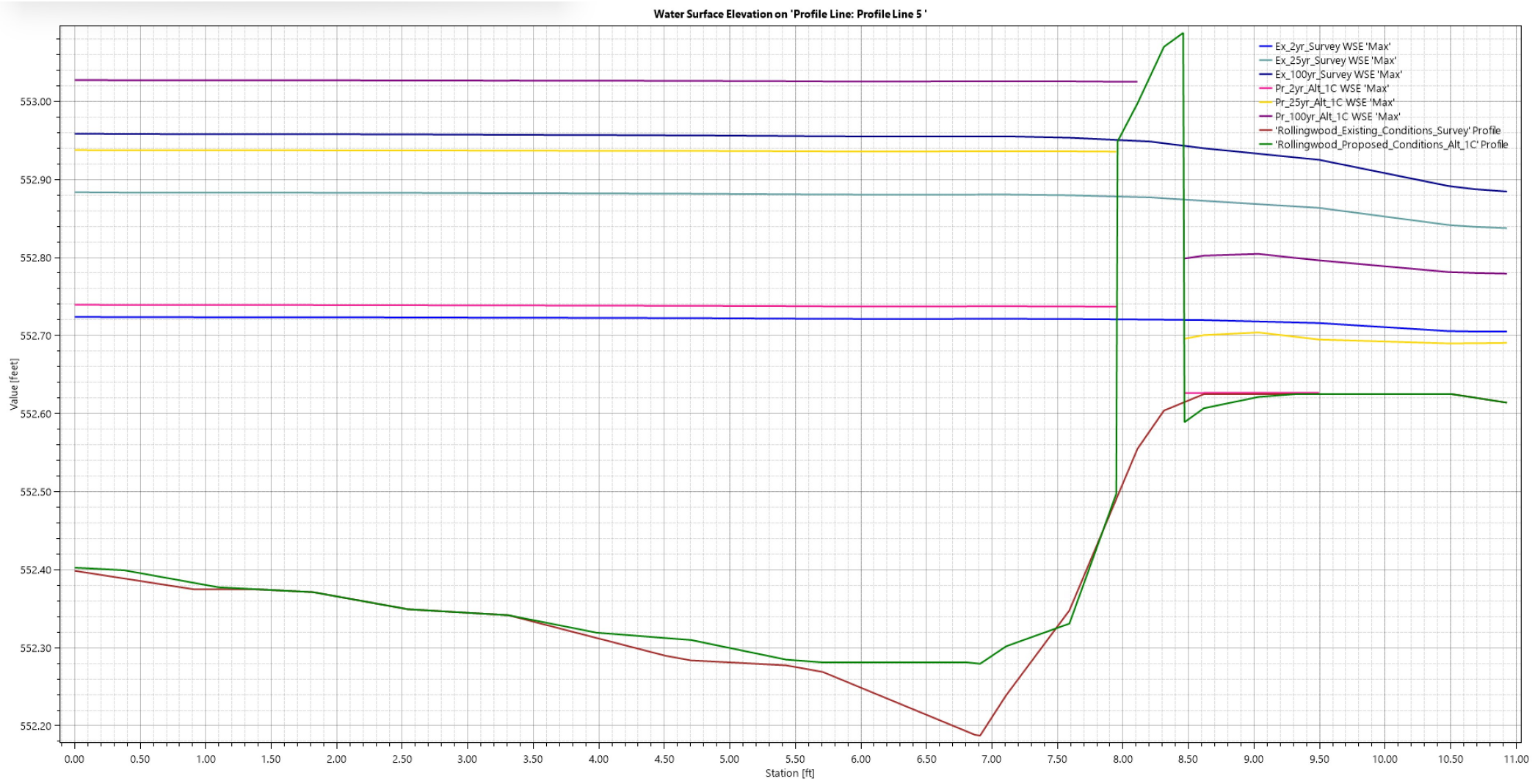


Figure 8 - Water Surface Elevation Comparison (Profile Line 5)

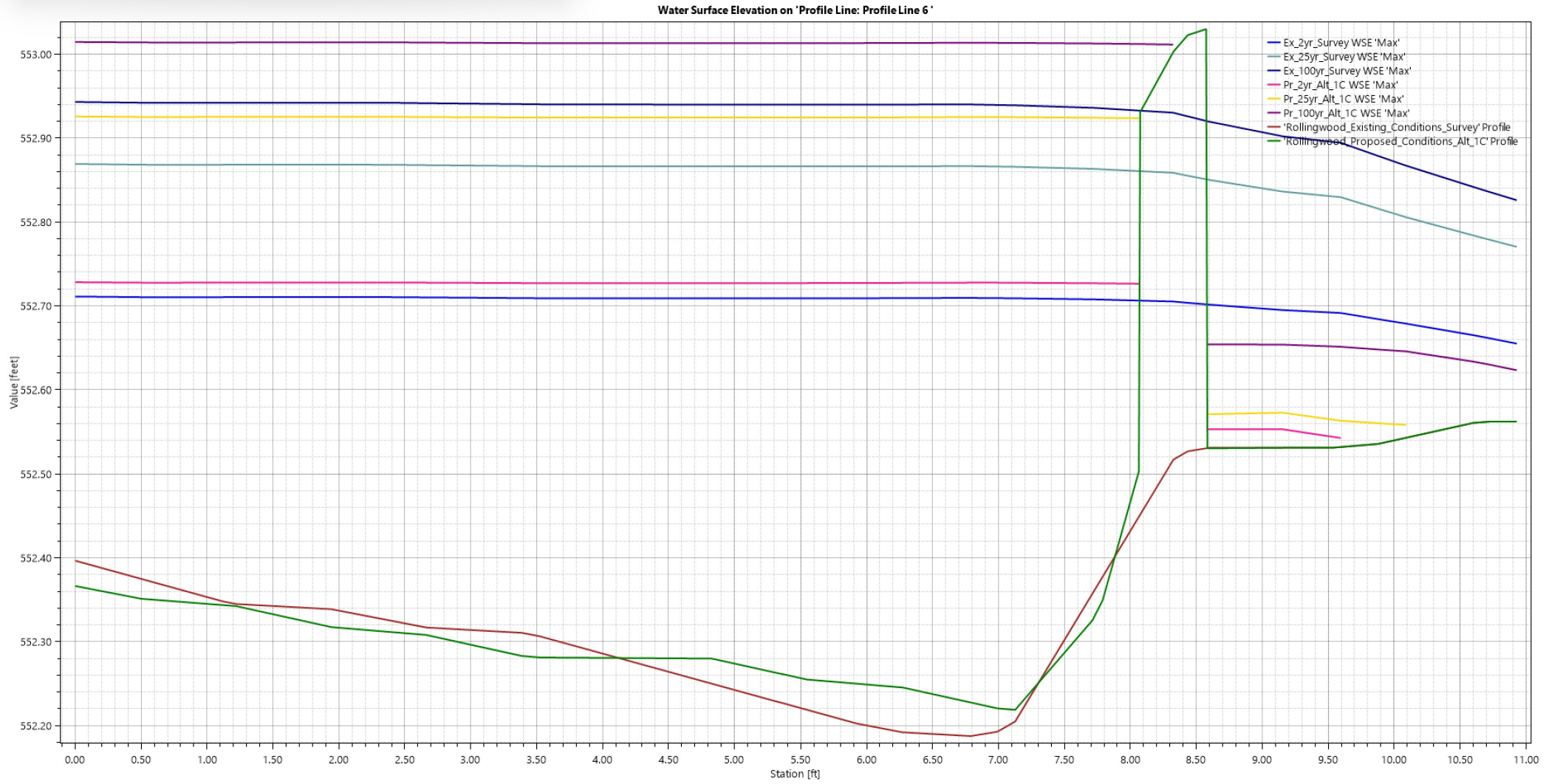


Figure 9 - Water Surface Elevation Comparison (Profile Line 6)

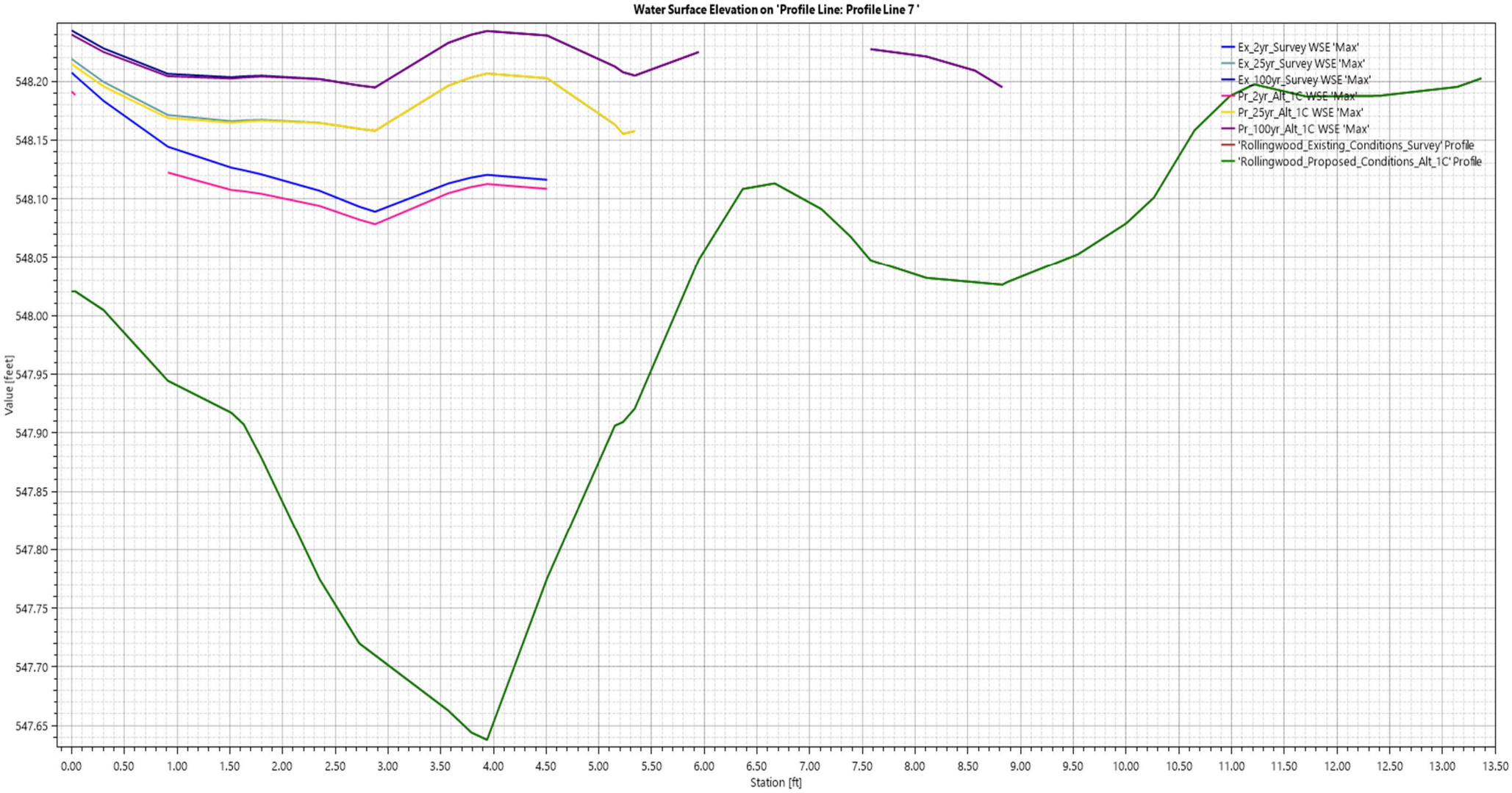


Figure 10 – Water Surface Elevation Comparison (Profile Line 7)

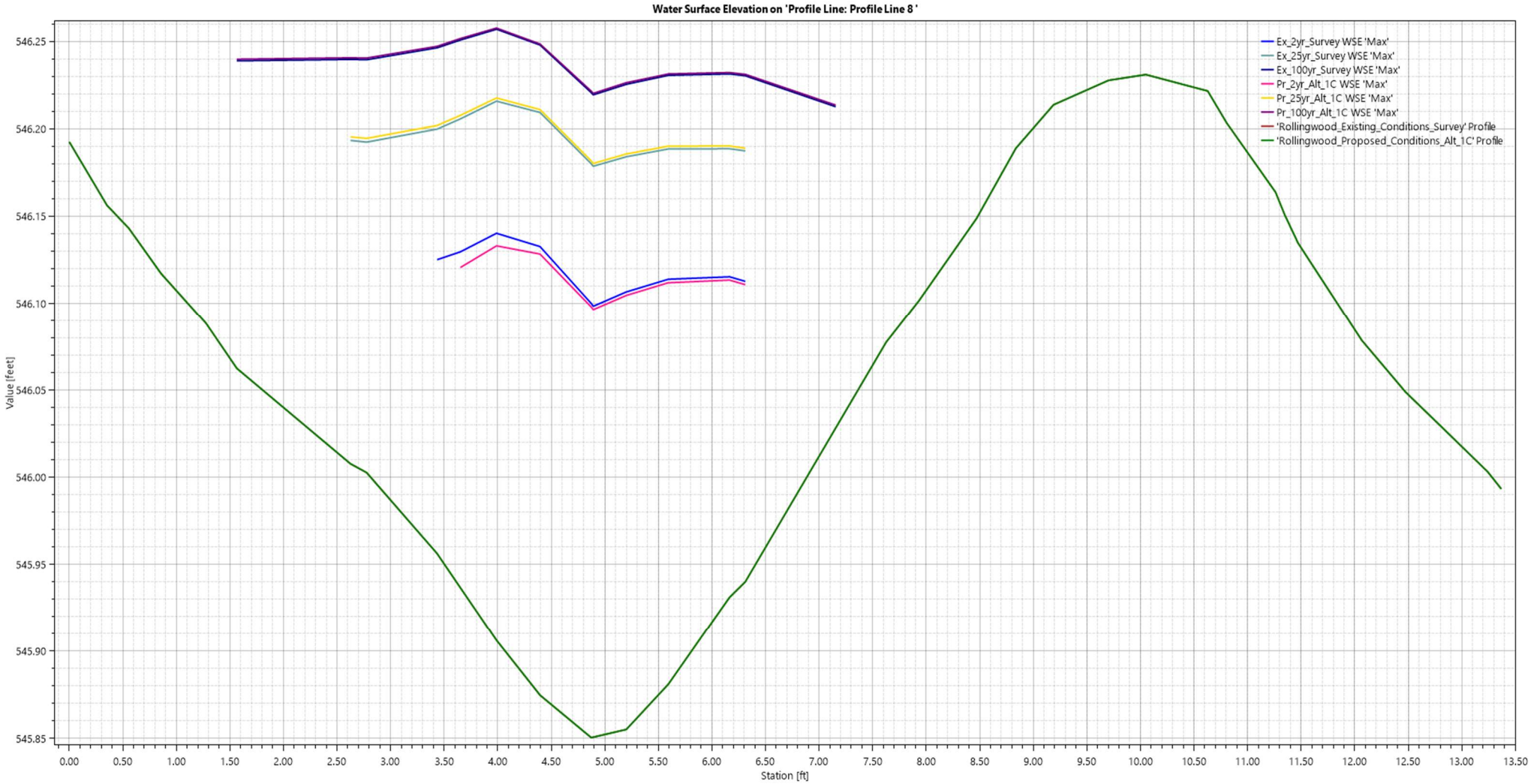


Figure 11 – Water Surface Elevation Comparison (Profile Line 8)

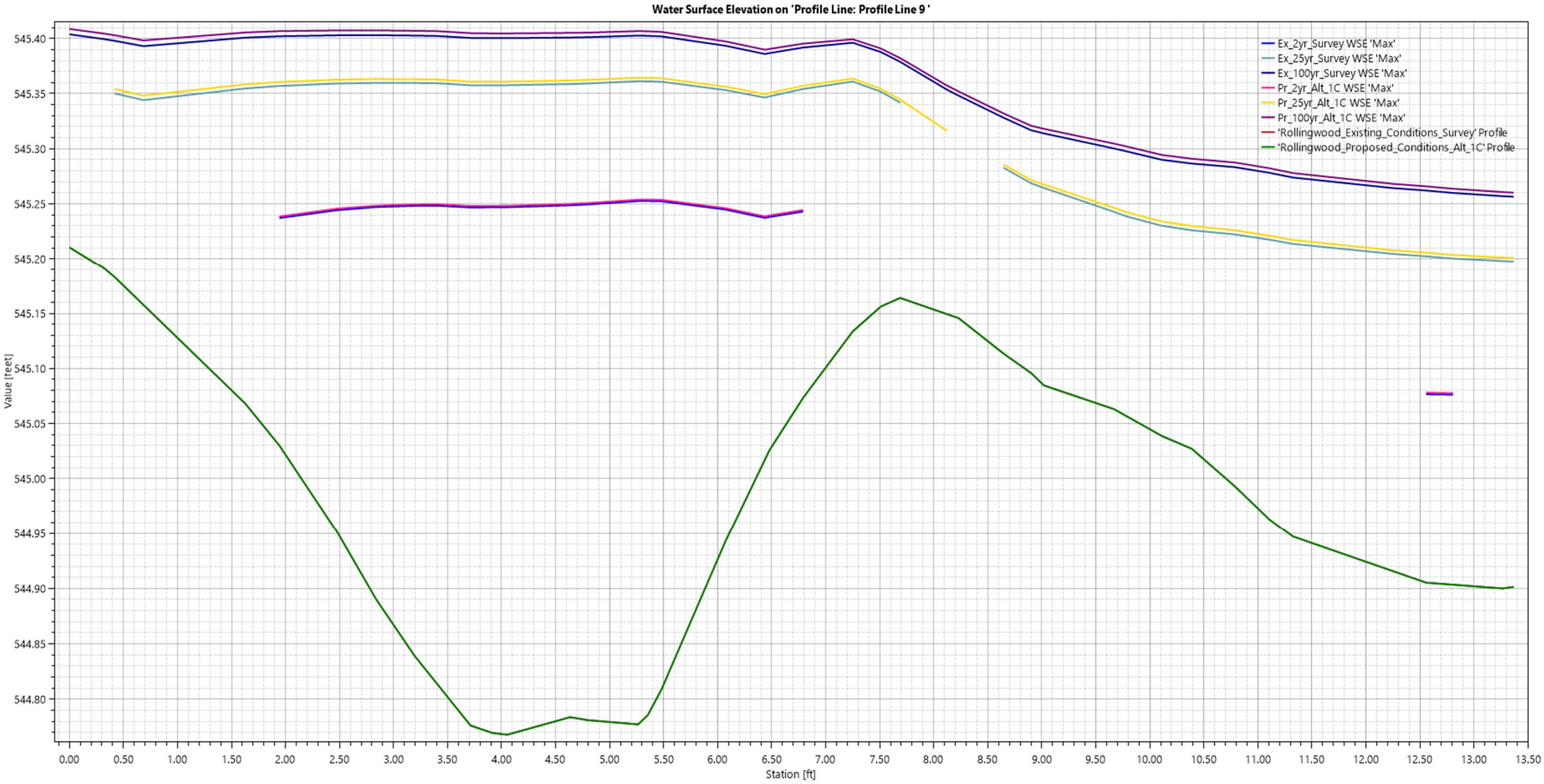


Figure 12 – Water Surface Elevation Comparison (Profile Line 9)

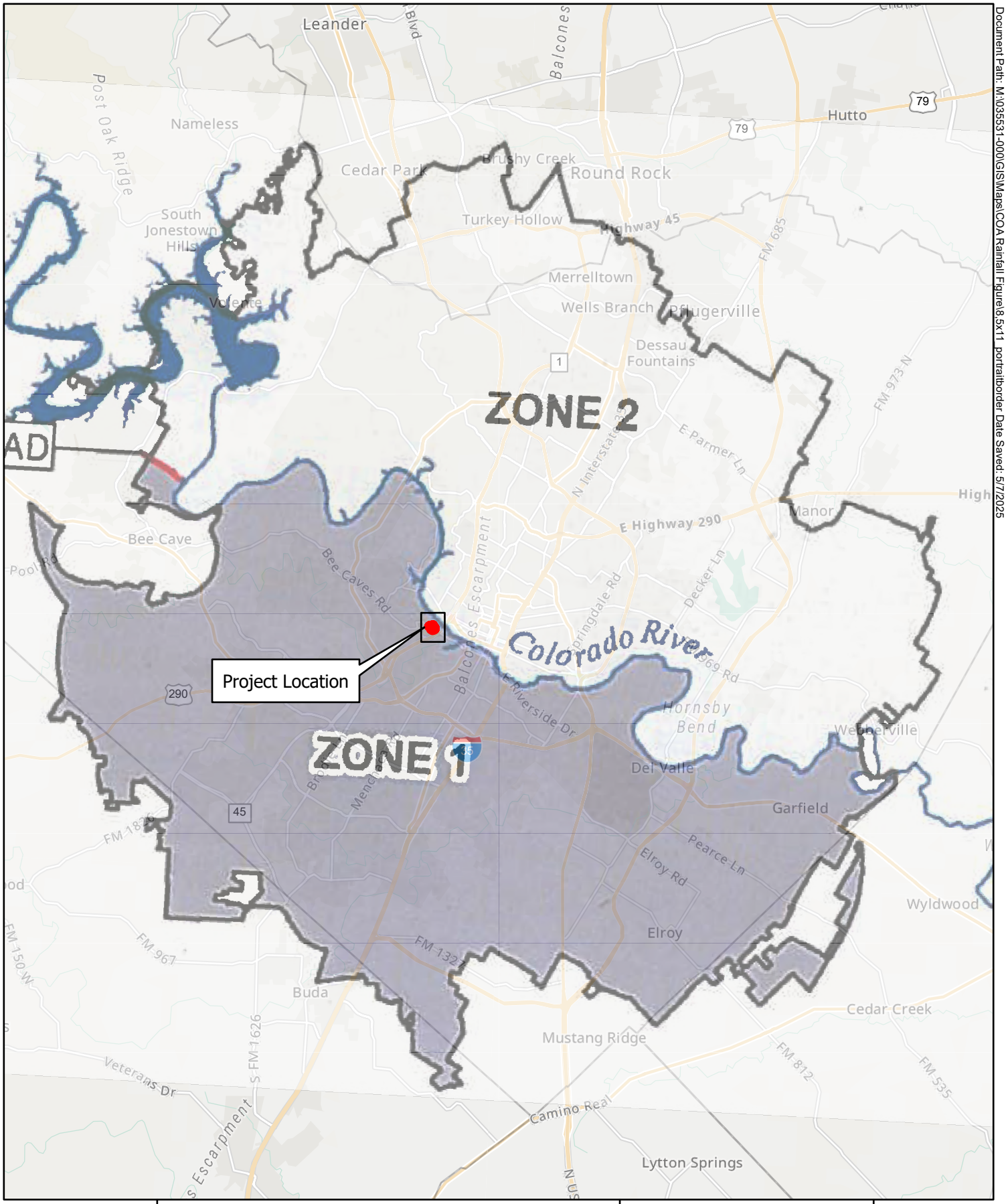


Figure 13 - City of Austin: Rainfall Zoning

Bettis and Vale
City of Rollingwood

N

0 24,000 Feet

1 inch = 24,000 feet

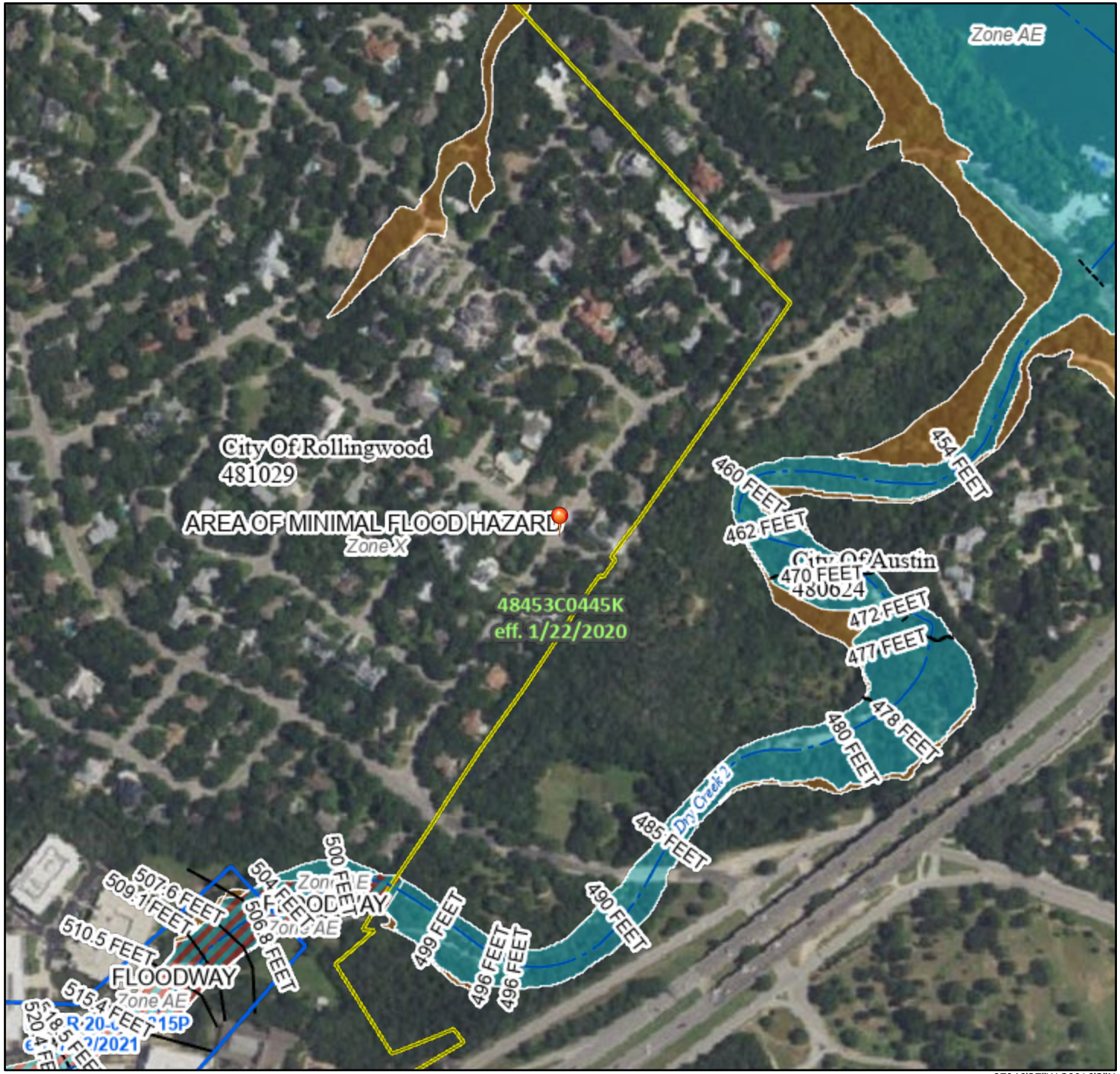
wsb

Figure 14

National Flood Hazard Layer FIRMette

FEMA

97°47'4"W 30°16'34"N



97°46'27"W 30°16'3"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

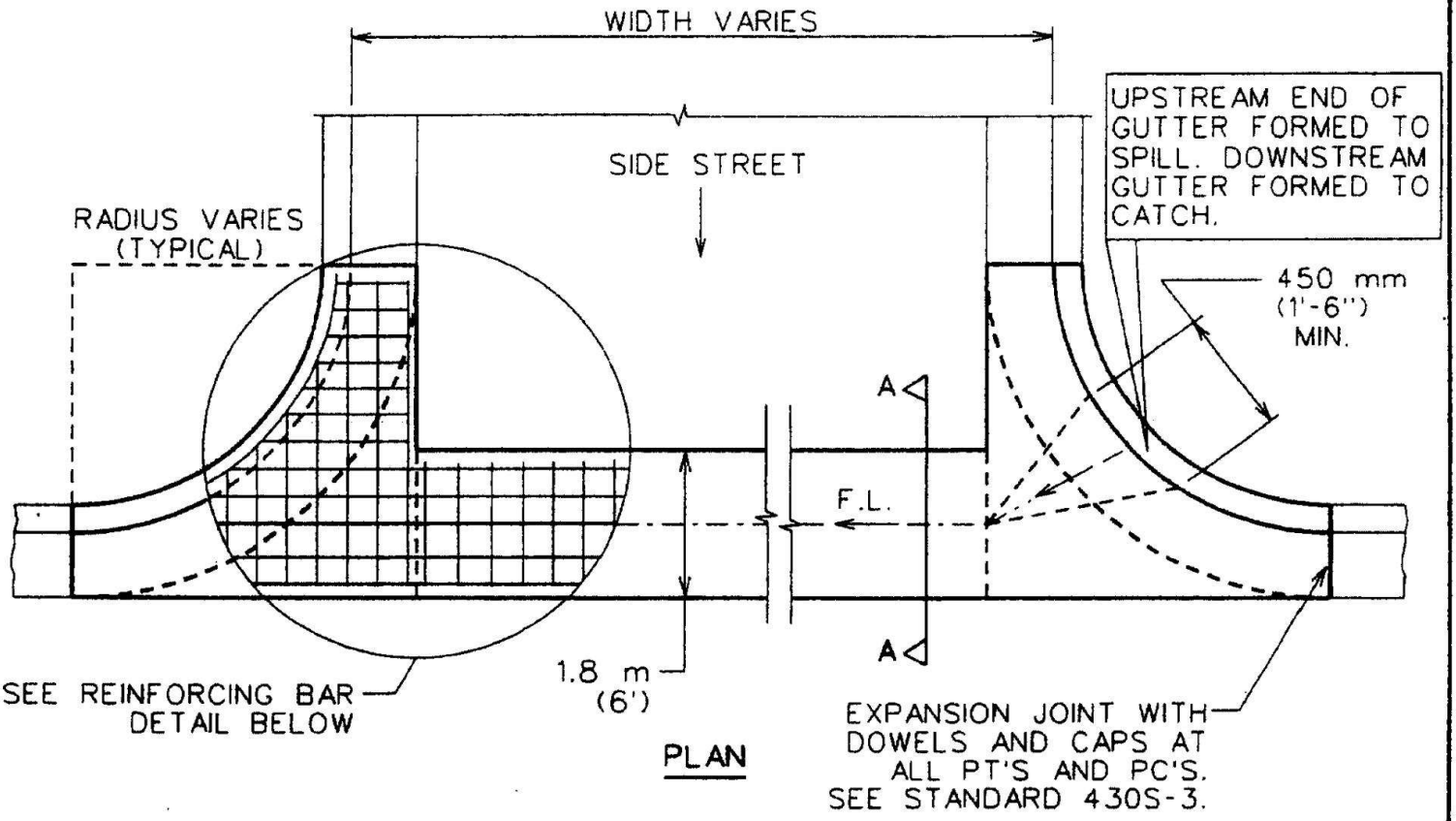
N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

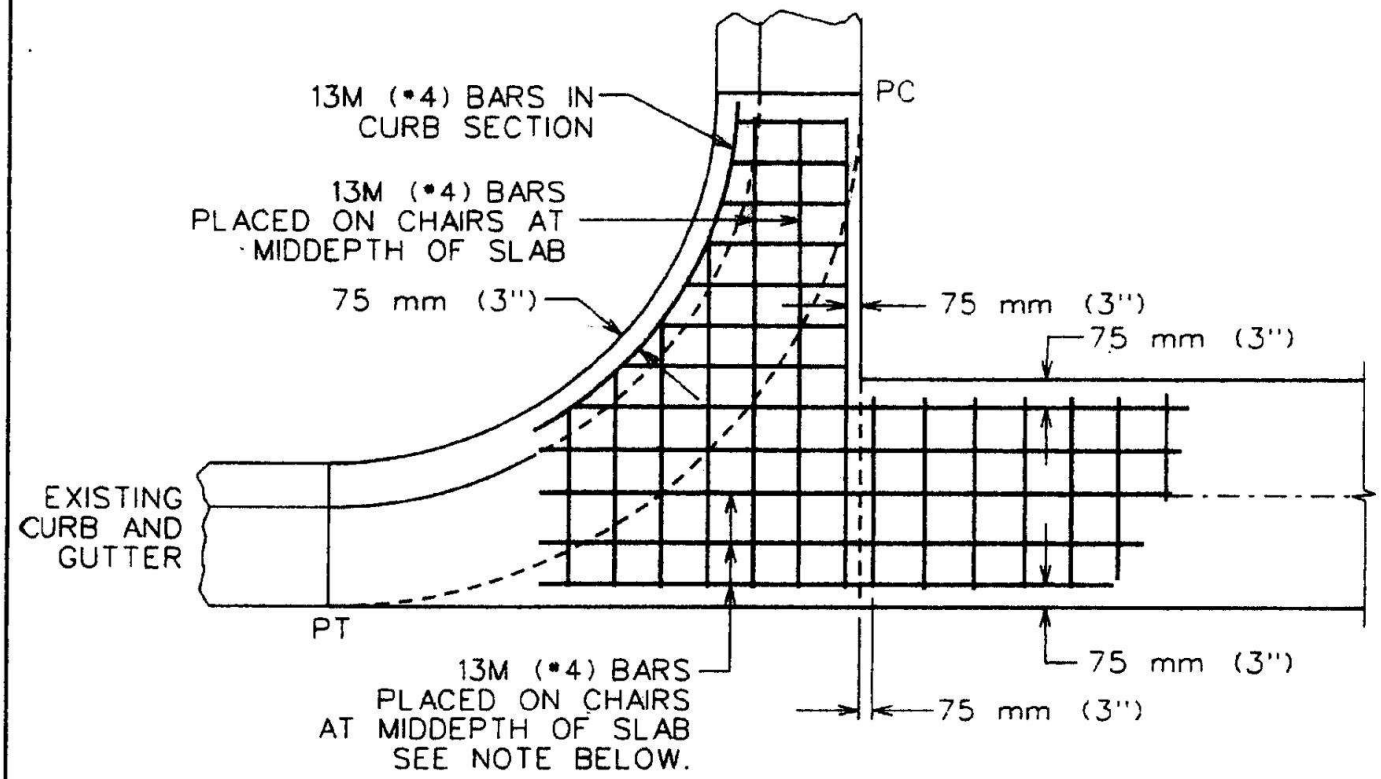
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/18/2026 at 7:49 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



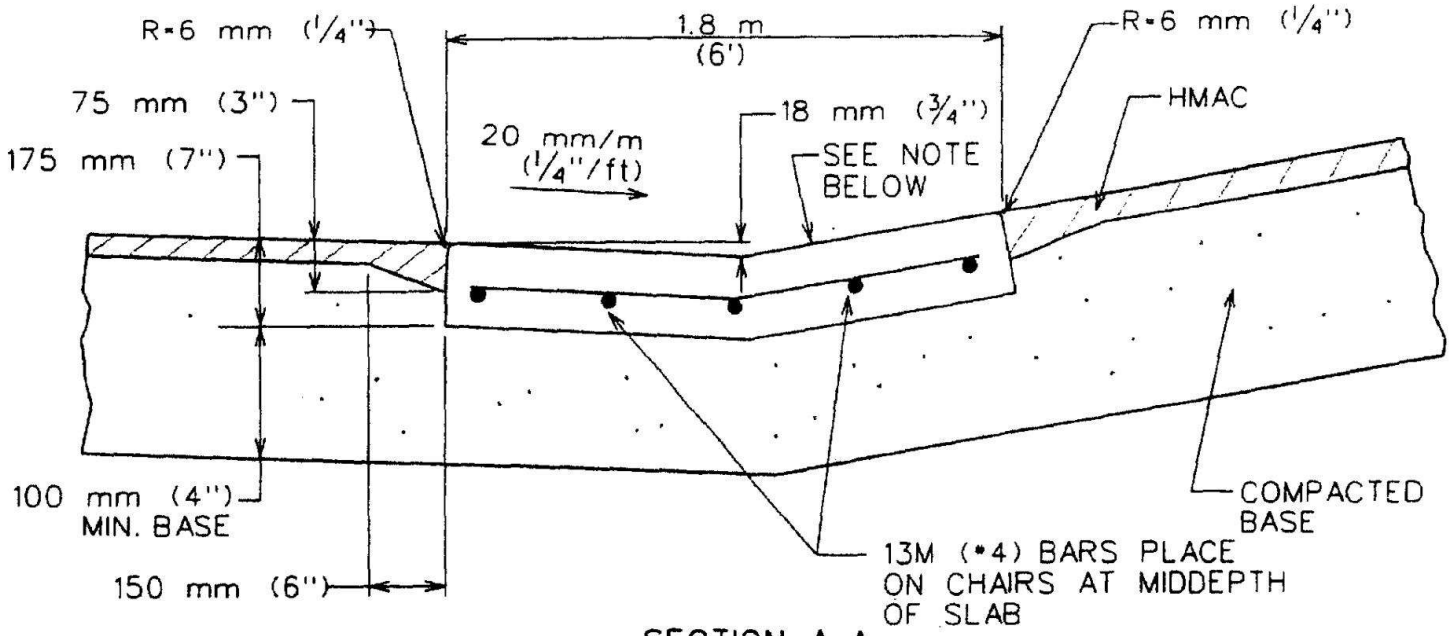
PLAN



REINFORCING BAR DETAIL

NOTE:
ALTERNATE 13M (#4) BARS PLACED ON CHAIRS AT MIDDEPTH OF SLAB TO BE CONTINUOUS ACROSS EXPANSION JOINT. BREAK BOND 150 mm (6") ON EACH SIDE OF EXPANSION JOINT.

CITY OF AUSTIN DEPARTMENT OF PUBLIC WORKS	CONCRETE VALLEY GUTTER	
Bill Gardner 6/12/06 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	STANDARD NO. 436S-2 1 OF 2



SECTION A-A

NOTE:
ADJUST SLOPE FROM 20 mm/m (1/4"/ft) MINIMUM TO THE SLOPE OF THE SIDE STREET.

NOTES:

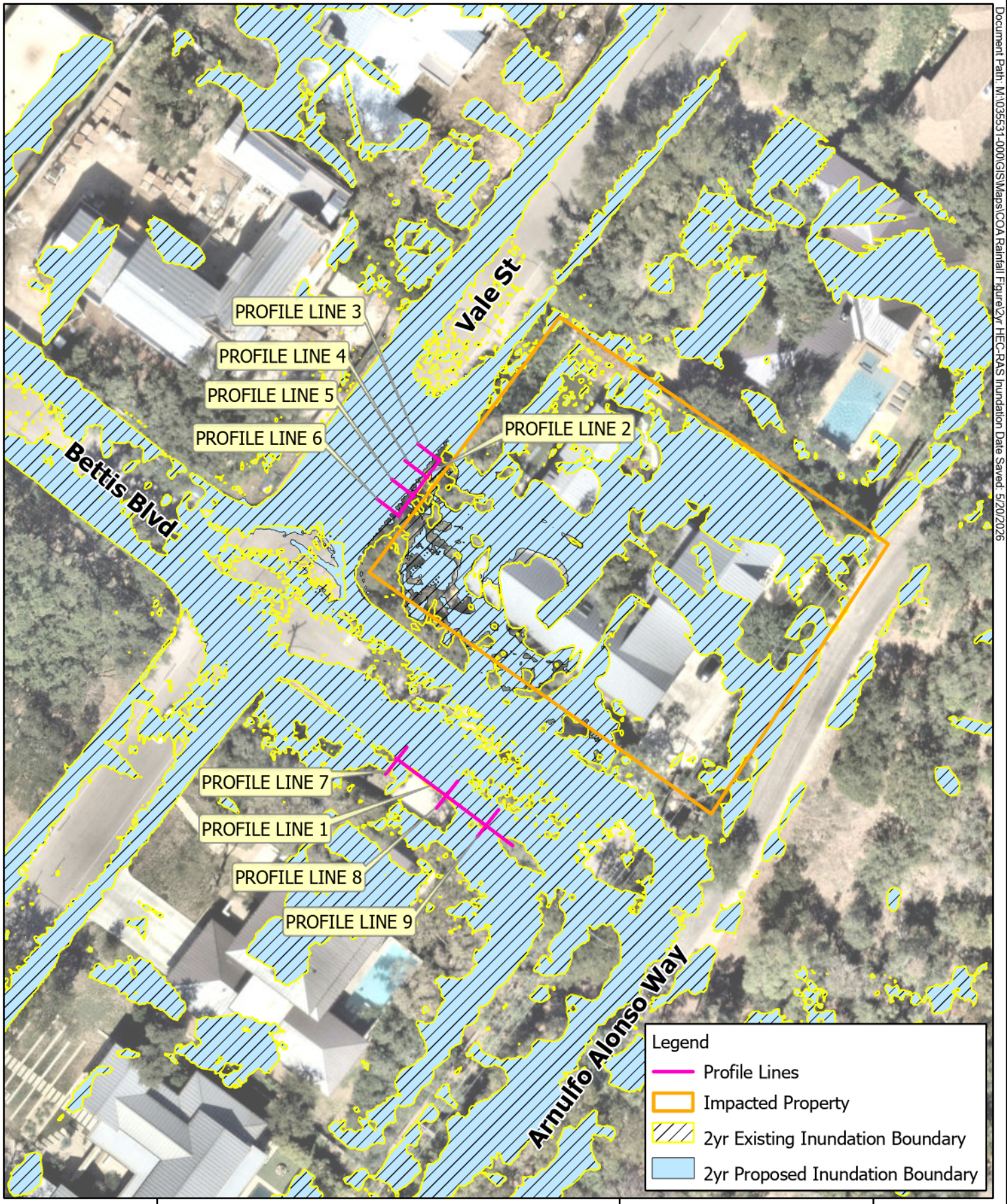
1. MATERIALS AND CONSTRUCTION METHODS SHALL CONFORM TO THE CITY OF AUSTIN STANDARD SPECIFICATIONS.
2. CONCRETE FOR THE VALLEY GUTTER SHALL BE CLASS A, ITEM 403S, "CONCRETE FOR STRUCTURES".
3. MONOLITHIC CURB AND GUTTER SHALL BE MEASURED BY PLAN QUANTITY PER SQUARE FEET AND PAID AS VALLEY GUTTER.
4. THE UPSTREAM CURB MID POINT MUST BE AT OR LOWER THAN THE BEGINNING P.C. AND 0.5% MINIMUM HIGHER THAN THE OPPOSING MID POINT.
5. ALLOWABLE CONSTRUCTION JOINT AT THE CENTER LINE WHEN TRAFFIC FLOW MUST BE MAINTAINED, CONSTRUCTED AS A CONTROL JOINT.

CITY OF AUSTIN DEPARTMENT OF PUBLIC WORKS	CONCRETE VALLEY GUTTER	
Bill Gardner 6/12/06 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	STANDARD NO. 436S-2 2 OF 2

Appendix B

HEC-RAS Results:

- *Inundation Boundaries – Existing vs. Proposed*



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2-yr Inundation (Proposed vs. Existing)

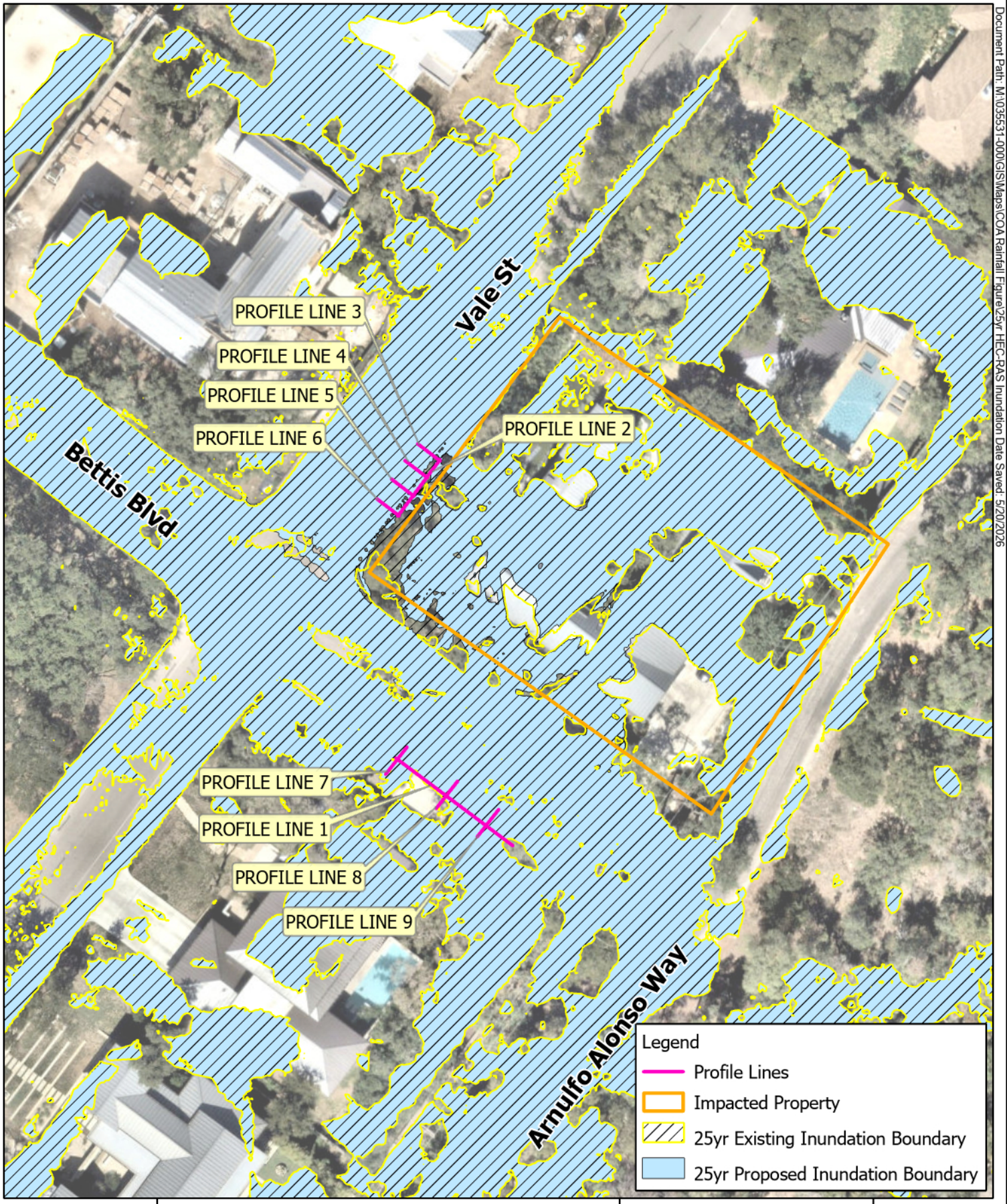
Bettis and Vale
City of Rollingwood

N

0 50 Feet

1 inch = 50 feet

wsb



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25-yr Inundation (Proposed vs. Existing)

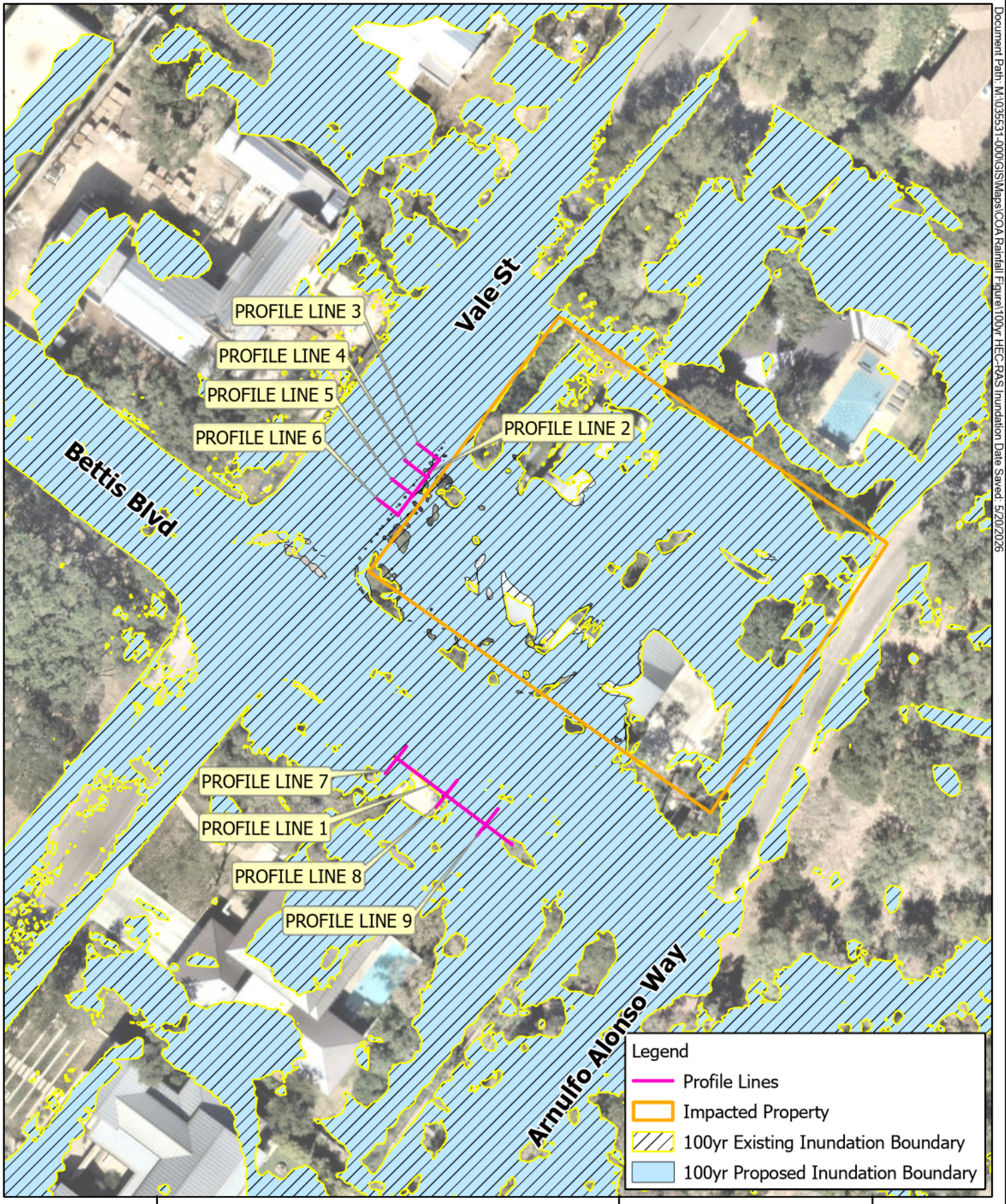
Bettis and Vale
City of Rollingwood

N

0 50 Feet

1 inch = 50 feet

wsb



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100-yr Inundation (Proposed vs. Existing)

Bettis and Vale
City of Rollingwood

N

0 50 Feet

1 inch = 50 feet

wsb