

NEPA/404 MERGER CONCURRENCE POINT 3

TIP PROJECT NO. U-4700

IMPROVEMENTS TO US 321 FROM HICKORY TO LENOIR IN CATAWBA, BURKE, AND CALDWELL COUNTIES

SUMMARY INFORMATION

Meeting Purpose

The purpose of this meeting is to select the Least Environmentally Damaging Practicable Alternative (LEDPA) for Project U-4700.

Project Description

The proposed improvements include the widening of US 321 from just north of the US 70 interchange in Hickory (Catawba County) to the Southwest Boulevard (SR 1933) interchange in Lenoir (Caldwell County). The proposed improvements involve approximately 13.5 miles of existing US 321 with a majority of the roadway located in Catawba and Caldwell Counties and 0.3 miles in Burke County. The purpose of the project is to reduce congestion on US 321 in order to achieve level of service D or better in the design year (2040). The Environmental Assessment (EA) was approved in February 2016, and a Finding of No Significant Impact (FONSI) will be prepared for the project. The project study area map (Figure 17) is attached.

Project Activity since the Previous Merger Meeting (October 2015)

Environmental Documentation

- The Environmental Assessment (EA) was signed in February 2016.

Public Involvement – A list of alternatives presented at each public meeting is in the attached Alternatives Memo. Changing feedback from the public affected designs between July 2016 and October 2017. More detail is provided at each location, and is summarized on page 20. The following meetings have been held since October 2015:

- Public hearings were held on July 11-12, 2016 to present the location and design of the detailed study alternatives as presented in the EA.
- A public meeting was held on July 27, 2017 to present updated designs at several locations on Section A. These design revisions were based on public input following the public hearing.
- A public meeting was held on October 12, 2017 to present additional changes at Grace Chapel Road and Alex Lee Boulevard. The same maps were presented at a Caldwell County Commissioners meeting on October 16, 2017. These design revisions were based on public input following the July 2017 public meeting.

Traffic Forecast – The traffic forecast was updated in January 2017. The previous forecast update had been in 2011. Since that time, the road network and funded project list had changed. The previous and updated forecast figures are attached for reference. The updated forecast resulted in the following design changes:

- Clement Boulevard – An interchange is no longer warranted on US 321 at Clement Boulevard.
- Grace Chapel Road – An interchange is no longer warranted on US 321 at Grace Chapel Road. However, because of current and anticipated future development along Grace Chapel Road, a flyover from Grace Chapel Road to south on US 321 was still evaluated.

Recommended Alternative Process – The following bullets summarize the timeline of NCDOT’s recommended alternative. A full description of NCDOT’s recommended alternative begins on page 5 of this packet.

- Sept 2016/Oct 2016: Post-hearing meetings were held on September 12, 2016 and October 12, 2016. At these meetings, NCDOT recommended the Tight Diamond Interchange Alternative at the Falls Avenue intersection. No other recommendations were made at these meetings. The Post Combined Public Hearing Meeting Summary (November 15, 2016) is included as an attachment to this informational packet.
- Sept 2017: A post-public meeting was held on September 22, 2017. At this meeting, in addition to the previous recommendation, NCDOT recommended the Flyover Alternative at Grace Chapel Road, the Tight Diamond Interchange Alternative at Alex Lee Boulevard, the Superstreet intersection at Clement Boulevard, and the Interchange Alternative at 2nd Avenue SW. The Post-Public Meeting Meeting Summary (September 28, 2017) is included as an attachment to this informational packet.
- Nov 2017: A post-public meeting was held on November 13, 2017. At this meeting, in addition to the previous recommendations, NCDOT recommended the inclusion of a new connector from Lake Shore Drive to Grace Chapel Road with the Grace Chapel Road Flyover, and a new pedestrian connector as part of the 2nd Avenue SW interchange. The Post-Public Meeting Meeting Summary (November 17, 2017) is included as an attachment to this informational packet.

Merger History of Project

On October 14, 2015, the Merger team met to consider changing the project termini. At that meeting, the Merger team agreed to remove the US 64 intersection and the northern 3.3 miles of the original project corridor. The new northern terminus of the project is Southwestern Boulevard. Concurrence Points 1, 2, and 2A were revised to the following:

- Concurrence Point 1 – The purpose of the project is to reduce congestion on US 321 in order to achieve a LOS of D or better in the Design Year (2040).
- Concurrence Point 2 – Throughout the project, if intersection spacing permits, the Typical Superstreet Intersection (directional crossover with median U-turns) is utilized. One best fit alternative is being analyzed along US 321 with various typical sections throughout. Three typical section alternatives were identified for detailed study.

- Concurrence Point 2A – Major hydraulic structures were agreed upon in February 2014. Those that were outside of the new study limits were removed during the October 2015 Merger meeting.

Project Status/Schedule

Planning: In progress

- Finding of No Significant Impact – Spring 2018
- Final Design – Summer 2018

Right-of-way and Construction:

Section A: US 70 to US 321A

Right of way – Summer 2018

Construction – Summer 2021

Section B: US 321A to Mission Road

Unfunded

Section C: Mission Road to Southwest Boulevard

Unfunded

Section CA: US 321/Mount Herman Road intersection

Right of way – FY 2018

Construction – FY 2019

Section CB: US 321/Pine Mountain Road (SR 1809/1952) intersection

Right of way – FY 2018

Construction – FY 2019

Section CC: US 321/Mission Road (SR 1108) intersection

Right of way – FY 2018

Construction – FY 2019

Concurrence Point 1 Revisions

The C.P. 1 agreement included the purpose and need, but did not include the study area. NCDOT proposes resigning the C.P. 1 form to include the study area as shown on Figure 1. There has been no change to the purpose and need statement.

Concurrence Point 2A Revisions

Since C.P. 2A concurrence in October 2015, changes to the recommended major drainage structures are proposed based on modifications to the design.

- Removal: At Clement Boulevard, the extension of the existing structure at site 16 is no longer needed.
- Change: Design changes on Grace Chapel Road affect the proposed hydraulic structure at site 17, requiring a longer extension.
- Addition: The alternative interchange design recommended by NCDOT at Grace Chapel Road requires an additional structure to cross a stream at site 17A.
- Addition: An added connection to Wolfe Road for all Grace Chapel Road alternatives requires a hydraulic structure at site 17B.

With these changes, the updated list of major hydraulic structures is below, and details about each structure are in Appendix A.

Table 1: C.P. 2A Revised Proposed Hydraulic Structure Summary

Site No.	Proposed Hydraulic Structure
1	Extend 2 – 10' x 10' RCBC (26' LT & 15' RT)
2	2 – New Bridges (1 @ 825' & 1 @ 944')
3	Extend 1 – 6' x 7' RCBC (73' LT & 89' RT)
4	Extend 2 – 6' x 7' RCBC (56' LT & 49' RT)
5	Extend 1 – 38' x 18' RC Arch (20' LT & 22.5' RT)
6	2 – Widen Bridges (1 @ 158' & 1 @ 173')
7	Extend 3 – 9' x 9' RCBC (31' LT & 15' RT)
8	Extend 1 – 7' x 7' RCBC (41' LT & 23' RT)
16	Extend 3 – 10' x 8' RCBC (60' LT & 59' RT)
17	Extend 1 – 72" CMP (38' RT)
17A	New 135' bridge
17B	New 8' X 8' RCBC – 187'

Concurrence Point 3 – Least Environmentally Damaging Practicable Alternative

Three typical sections were agreed to by the Merger Team in October 2015. No changes are proposed to the typical sections, listed below.

NCDOT recommends the typical sections:

Typical Section Alternatives

Typical Section 1: Six-lane divided with 22-foot raised median with a concrete barrier with curb and gutter in outside lanes

Typical Section 2: Six-lane divided with 30-foot raised grassed median with curb and gutter in median and shoulder

Typical Section 3: Six-lane divided with 30-foot raised grassed median with curb and gutter in median and grassed shoulder

Table 2: Recommended Typical Section

U-4700 Segments*	Typical Section Alternatives for Detailed Study
Segment A: North of US 70 to 800 feet north of 2nd Avenue NW in Hickory (0.95 miles)	Typical Section 1/2 (combination)
Segment B: 800 feet north of 2nd Ave. NW to 1300 feet north of Clement Blvd (0.95 miles)	Typical Section 3
Segment C: 1300 feet north of Clement Blvd to just south of Grace Chapel Rd (1.12 miles)	Replace bridges over Catawba River and grade-separate RR crossing
Segment D: Just south of Grace Chapel Rd. to 400 feet south of Gunpowder Creek (8.10 miles)	Typical Section 3
Segment E: 400 feet south of Gunpowder Creek to Southwest Blvd (2.04 miles)	Typical Section 3

* These segments are for C.P.2 purposes – these are not the STIP sections

Proposed Interchange / Intersection Alternatives

Most of the U-4700 corridor was designed using a Best Fit Alignment following the typical sections described above.

Multiple options were considered at several intersection and interchange locations, listed in the table below. NCDOT recommendations are in ***bold italics***.

Table 3: Interchange Alternative Locations

Location	Alternatives Considered
13 th Street SW	July 2016: Interchange at 13 th Street SW presented July 2017 / October 2017 (revised January 2018): <i>Interchange design shifted to 2nd Avenue SW</i>
Clement Boulevard	July 2016: Interchange design presented July 2017 / October 2017: <i>Superstreet design proposed</i>
Grace Chapel Road	July 2016: Three alternatives presented – flyover, trumpet interchange, reverse Superstreet intersection July 2017: The Superstreet design is modified October 2017 (revised January 2018): <i>Flyover design proposed</i>
Alex Lee Boulevard	July 2016: Superstreet intersection presented July 2017: Trumpet interchange presented October 2017 (revised January 2018): <i>Tight diamond interchange proposed</i>
Falls Avenue	July 2016 / July 2017: Three alternatives presented – tight diamond interchange, partial clover interchange, and superstreet intersection. October 2017 (revised January 2018): <i>Tight diamond interchange proposed</i>

NOTE: Alternatives ***bolded and italicized*** are recommended by NCDOT

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13th Street SW & 2nd Avenue SW

Table 4: 13th Street SW & 2nd Avenue SW Alternatives Considered

Location	Alternatives Considered	Figure
13 th Street SW	July 2016: Interchange at 13 th Street SW presented	1
2 nd Ave SW	July 2017 / October 2017 (revised January 2018): Interchange design shifted to 2nd Avenue SW	2

NOTE: Alternative **bolded and italicized** is recommended by NCDOT



Figure 1: 13th Street SW interchange design



Figure 2: (Recommended) 2nd Avenue SW interchange design

Table 5: 13th Street SW & 2nd Avenue SW Alternatives Stream and Wetland Impacts

Alternative	Stream Impacts (lf)	Wetland Impacts (ac)	Notes
13th St SW Interchange	0	0	Shifting the interchange improves access to downtown Hickory, providing a more direct connection from US 321 to 1 st and 2 nd Avenues SW, which are primary routes through downtown Hickory. A section of 1 st and 2 nd Avenues SW will be converted from one-way to two-way, consistent with Hickory's long-term plan for the pair. Residential and business impacts are anticipated to be slightly higher. NCDOT proposes additional pedestrian connectivity to address potential EJ concerns.
2nd Ave SW Interchange	0	0	

Clement Boulevard

Table 6: Clement Boulevard Alternatives Considered

Location	Alternatives Considered	Figure
Clement Boulevard	July 2016: Half clover interchange design presented	3
	July 2017 / October 2017: <i>Superstreet design proposed</i>	4

NOTE: Alternative ***bolded and italicized*** is recommended by NCDOT



Figure 3: Half clover interchange design



Figure 4: (Recommended) Superstreet intersection design

Table 7: Clement Boulevard Alternatives Stream Impacts

Alternative	Stream Impacts (lf)	Wetland Impacts (ac)	Notes
Interchange	1,110	0.1	A superstreet intersection was determined to be sufficient following the traffic forecast update. The recommended superstreet intersection reduces relocations to approximately 30 businesses and eliminates a proposed culvert extension.
Superstreet	860	0.1	

NOTE: Impacts are calculated using a 25-foot buffer on slope stakes of the preliminary designs unless otherwise noted

Table 8: Clement Boulevard Stream Impacts (LF) by Alternative

Stream Impact (lf) by Alternative			
Map ID	Interchange	Superstreet	Figure Number
Frye Creek	375	125	14A and 14B
SB	735	735	14C

Table 9: Clement Boulevard Stream Impacts (LF) by Stream for Recommended Alternative

Detailed Stream Information for Recommended Alternative							
Map ID	Stream Name	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Classification	Impacts (lf)	Figure Number
Frye Creek	Frye Creek	12	12-15	12	Perennial	735	14A
SB	UT to Catawba River	7-9	5	24	Perennial	125	14C

Grace Chapel Road

Table 10: Grace Chapel Road Alternatives Considered

Location	Alternatives Considered	Figure
Grace Chapel Road	July 2016: Trumpet interchange presented	5
	July 2016 (revised July 2017): A Superstreet intersection is presented	6
	July 2016 (revised October 2017 and January 2018): <i>Flyover design proposed with additional Wolfe Road connector*</i>	7

NOTE: Alternative ***bolded and italicized*** is recommended by NCDOT

* NCDOT recommends adding the Wolfe Road connector to any alternative selected. Therefore, the Wolfe Road connector has been added to the graphics and calculations for all alternatives considered at this location.



Figure 5: Trumpet interchange design



Figure 6: Superstreet intersection design

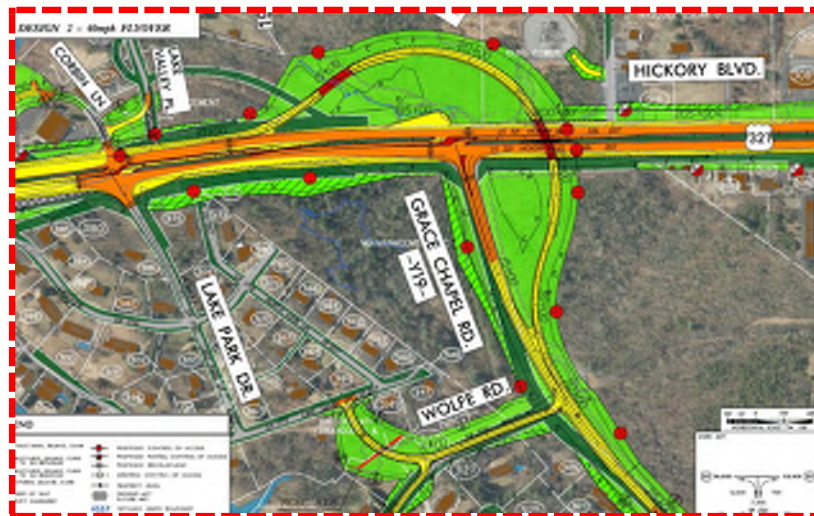


Figure 7: (Recommended) Flyover design

Table 11: Grace Chapel Road Alternatives Stream Impacts (LF)

Alternative	Stream Impacts (lf)	Wetland Impacts (ac)	Notes
Superstreet	950	0	NCDOT recommends the flyover because of substantial public opposition to the other options. The revised design improves access to properties west of US 321.
Trumpet	1,100	0	
Flyover	930	0	

NOTE: Impacts are calculated using a 25-foot buffer on slope stakes of the preliminary designs unless otherwise noted

Table 12: Grace Chapel Road Alternatives Stream Impacts (LF) by Quadrant

Stream Impact (lf) by Quadrant			
Alternative	West of US 321	North of Grace Chapel Road	Wolfe Road Connection
Superstreet	320	80	550
Trumpet	500	50	550
Flyover	300 (SC)	80 (SQQ and SRR)	550 (SRR)

Table 13: Grace Chapel Road Alternatives Stream Impacts (LF) by Stream

Stream Impact (lf) by Alternative				
Map ID	Trumpet	Superstreet/ Reverse Superstreet	Flyover	Figure Number
SC	500	310	300	14D
SQQ	30	50	40	14D
SRR	570	590	590	14D

Table 14: Grace Chapel Road Detailed Stream Impacts for Recommended Alternative

Detailed Stream Information for Recommended Alternative							
Map ID	Stream Name	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Classification	Impacts (lf)	Figure Number
SC	UT to Catawba River	5	5	0.5	Perennial	300	14D
SQQ	UT to Catawba River	5	5	0.5	Intermittent	40	14D
SRR	UT to Catawba River	10	10	2	Perennial	590	14D

NOTE: Stream SRR details will be updated with 2017 NRTR Addendum

Alex Lee Boulevard

Table 15: Alex Lee Boulevard Alternatives Considered

Location	Alternatives Considered	Figure
Alex Lee Boulevard	July 2016: Superstreet intersection presented	8
	July 2017: Trumpet interchange presented	9
	October 2017 (revised January 2018): <i>Tight diamond interchange proposed</i>	10

NOTE: Alternative ***bolded and italicized*** is recommended by NCDOT



Figure 8: Superstreet design



Figure 9: Trumpet interchange design



Figure 10: (Recommended) Tight diamond interchange design

Table 16: Alex Lee Boulevard Alternatives Stream Impacts (LF)

Alternative	Stream Impacts (lf)	Wetland Impacts (ac)	Notes
Superstreet	0	0	An interchange was proposed to address public concerns and improve access from MDI and adjacent neighborhoods. The tight diamond interchange provides better access to adjacent neighborhoods and reduced impacts to businesses compared with the trumpet interchange. In addition, a new road was added to connect Sage Meadow Circle, Midway Sand Road, and the new interchange.
Trumpet	305	0	
Tight Diamond	0	0	

NOTE: Impacts are calculated using a 25-foot buffer on slope stakes of the preliminary designs unless otherwise noted

Table 17: Alex Lee Boulevard Alternatives Impacts (LF) by Stream

Stream Impact (lf) by Alternative				
Map ID	Superstreet	Trumpet	Tight Diamond	Figure Number
SD	0	305	0	14E

Falls Avenue

Table 18: Falls Avenue Alternatives Considered

Location	Alternatives Considered	Figure
Falls Avenue	July 2016: Partial clover interchange presented	11
	July 2016: Superstreet intersection presented	12
	July 2016 (revised January 2018): <i>Tight diamond interchange</i>	13

NOTE: Alternative ***bolded and italicized*** is recommended by NCDOT



Figure 11: Partial cloverleaf interchange design



Figure 12: Superstreet intersection design

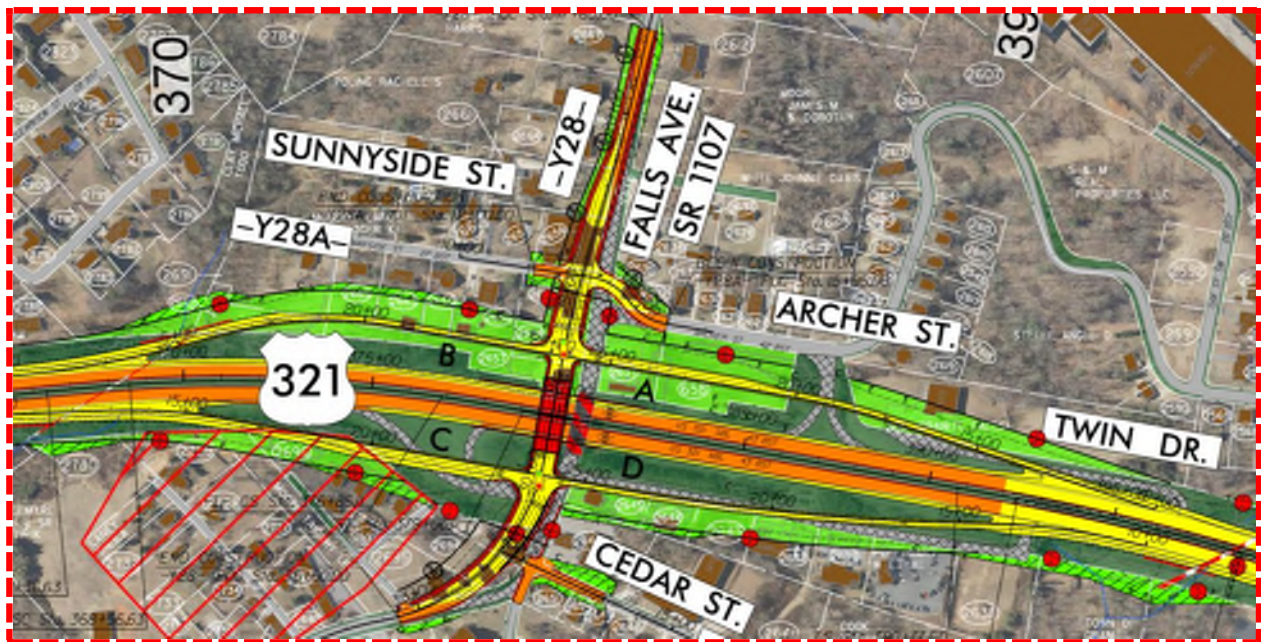


Figure 13: (Recommended) Tight diamond interchange design

Table 19: Falls Avenue Alternatives Impacts by Stream (LF)

Alternative	Stream Impacts (lf)	Wetland Impacts (ac)	Notes
Superstreet	970	0	The superstreet intersection has notable concerns regarding EMS response, community cohesion, and pedestrian connectivity. NCDOT recommends the tight diamond interchange because of access and connectivity benefits for residents and emergency vehicles.
Partial Clover	1,080	0	
Tight Diamond	845	0	

NOTE: Impacts are calculated using a 25-foot buffer on slope stakes of the preliminary designs unless otherwise noted

Table 20: Falls Avenue Alternatives Impacts by Quadrant (LF)

Stream Impact by Quadrant				
Alternative	West of US 321, North of Falls Ave	East of US 321, North of Falls Ave	West of US 321, South of Falls Ave	East of US 321, South of Falls Ave
Superstreet	205	295	100	370
Partial Clover	225	305	180	370
Tight Diamond	225 (Billy Branch)	255 (SP and Billy Branch)	90 (SO)	275 (SO)

Table 21: Falls Avenue Alternatives Impacts by Stream (LF)

Stream Impact (lf) by Alternative				
Map ID	Superstreet	Partial Clover	Tight Diamond	Figure Number
SO	550	470	365	14G
SP	165	160	180	14H
Billy Branch	365	340	300	14H

Table 22: Falls Avenue Recommended Alternative Impacts by Stream (LF)

Detailed Stream Information for Recommended Alternative							
Map ID	Stream Name	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Classification	Impacts (lf)	Figure Number
SO	UT to Gunpowder Creek	7-8	10-15	6	Perennial	365	14G
SP	UT to Billy Branch	3	5	3	Perennial	180	14H
Billy Branch	Billy Branch	7	6-7	6	Perennial	300	14H

Detailed Stream Information for Sections Between Interchange Areas

Table 23: Impacts between Alex Lee Boulevard and Falls Avenue by Stream (LF)

Between Alex Lee Boulevard and Falls Avenue							
Map ID	Stream Name	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Classification	Impacts (lf)	Figure Number
SF	UT to Gunpowder Creek	10-12	5	12	Perennial	230	14F
SJ	UT to Gunpowder Creek	3	3	6	Intermittent	40	14F
SK	UT to Gunpowder Creek	3	3	6	Perennial	120	14F
SM	UT to Gunpowder Creek	3	4	4	Perennial	100	14F
SN	UT to Gunpowder Creek	1	1	4	Perennial	280	14G
Billy Branch	Billy Branch	7	6-7	6	Perennial	360	14H

NOTE: Billy Branch stream details will be updated with 2017 NRTR Addendum

Table 24: Impacts between Falls Avenue and Southwest Boulevard by Stream (LF)

Between Falls Avenue and Southwest Boulevard							
Map ID	Stream Name	Bank Height (ft)	Bankful Width (ft)	Water Depth (in)	Classification	Impacts (lf)	Figure Number
SQ	UT to Little Gunpowder Creek	2	3	3	Perennial	130	14I
SR	UT to Little Gunpowder Creek	2	3	3	Perennial	170	14I
SS	UT to Little Gunpowder Creek	4	5	3	Intermittent	65	14I
Little Gunpowder Creek	Little Gunpowder Creek	6	20	24	Perennial	150	14I, 14J
ST	UT to Little Gunpowder Creek	2	6	2	Intermittent	30	14J
STA	UT to Little Gunpowder Creek	3	10	3	Perennial	85	14J
SU	UT to Little Gunpowder Creek	4	7	6	Intermittent	65	14J
SV	UT to Little Gunpowder Creek	1	3	3	Intermittent	110	14J
SW	UT to Little Gunpowder Creek	1-2	5-8	6	Perennial	540	14J
SX	UT to Little Gunpowder Creek	1	3-4	6	Intermittent	50	14J
SY	UT to Little Gunpowder Creek	1	2	3	Intermittent	45	14J
SZ	UT to Gunpowder Creek	5	3	3	Perennial	85	14K
SAA	UT to Gunpowder Creek	3	5	6	Perennial	115	14K
SBB	UT to Gunpowder Creek	3	3	6	Intermittent	70	14K
Gunpowder Creek	Gunpowder Creek	10	15	24	Perennial	55	14K
SDD	UT to Gunpowder Creek	2	4	6	Intermittent	20	14L
SEE	UT to Gunpowder Creek	3	6	6	Intermittent	150	14L
SLL	UT to Gunpowder Creek	1	6	6	Perennial	185	14L
Brushy Creek	Brushy Creek	10	25	24	Perennial	120	14M
Angley Creek	Angley Creek	5	12-18	18	Perennial	200	14M

Public Comments Summary

The Public Hearings were held July 11-12, 2016. Written comments were received from a total of 54 citizens at the hearing and following the public hearing. Three alternatives were presented at the public hearings located at both Falls Avenue and Grace Chapel Road. Elsewhere along the corridor, one typical section and roadway alignment was carried presented at the public hearing. There was very little preference or opposition expressed for any of the interchange alternatives at Grace Chapel Road. At Falls Avenue, there was a preference for the tight diamond alternative by both citizens and the Town of Granite Falls. There was a desire to add a new interchange at Alex Lee Boulevard, and to shift the interchange from 13th Street SW to 2nd Avenue SW. The Post Combined Public Hearing Meeting Summary (November 15, 2016) is included as an attachment to this informational packet.

A Public Meeting was held on July 27, 2017. Design revisions (listed in the Appendix) were presented. These were based on public input from the 2016 Public Hearing as well as an updated traffic forecast. Written comments were received from a total of 203 citizens at the meeting and following the public meeting. Most citizens who provided written comments expressed concerns about the Grace Chapel Road Superstreet intersection. The Post-Public Meeting Meeting Summary (September 28, 2017) is included as an attachment to this informational packet.

A Public Meeting was held on October 12, 2017. Design revisions (listed in the Appendix), based on public input from the July 2017 public meeting, were presented. Written comments were received from a total of 19 citizens at the meeting and following the public meeting. An additional 8 verbal comments were received at the Caldwell County Commissioners meeting. Generally, citizens supported the revised design. The Post-Public Meeting Meeting Summary (November 17, 2017) is included as an attachment to this informational packet.

Minimization Measures (To Be Discussed and Finalized in C.P. 4A)

The following minimization measures have been incorporated into the preliminary design:

- Selected 30-foot median rather than 46-foot median
- Added expressway gutter on the NB side of US 321 from 49+00 to 63+00 to minimize impacts to property
- Added expressway gutter on the SB side of US 321 from 60+00 to 63+00 to minimize impacts to Duke Energy Substation
- Added bridge and increased slopes on Grace Chapel Flyover at 14+98 to minimize stream impacts
- Added a retaining wall on the northbound side of US 321 at 365+00 (northbound off-ramp at Falls Avenue) to minimize impacts to streams and a dwarf-flowered heartleaf boundary
- Added a retaining wall on the southbound side of US 321 at 370+00 (southbound on-ramp at Falls Avenue) to minimize stream impacts
- Added a retaining wall on the northbound side of US 321 at 397+00 (northbound on-ramp at Falls Avenue) to minimize stream impacts

Impact Summary

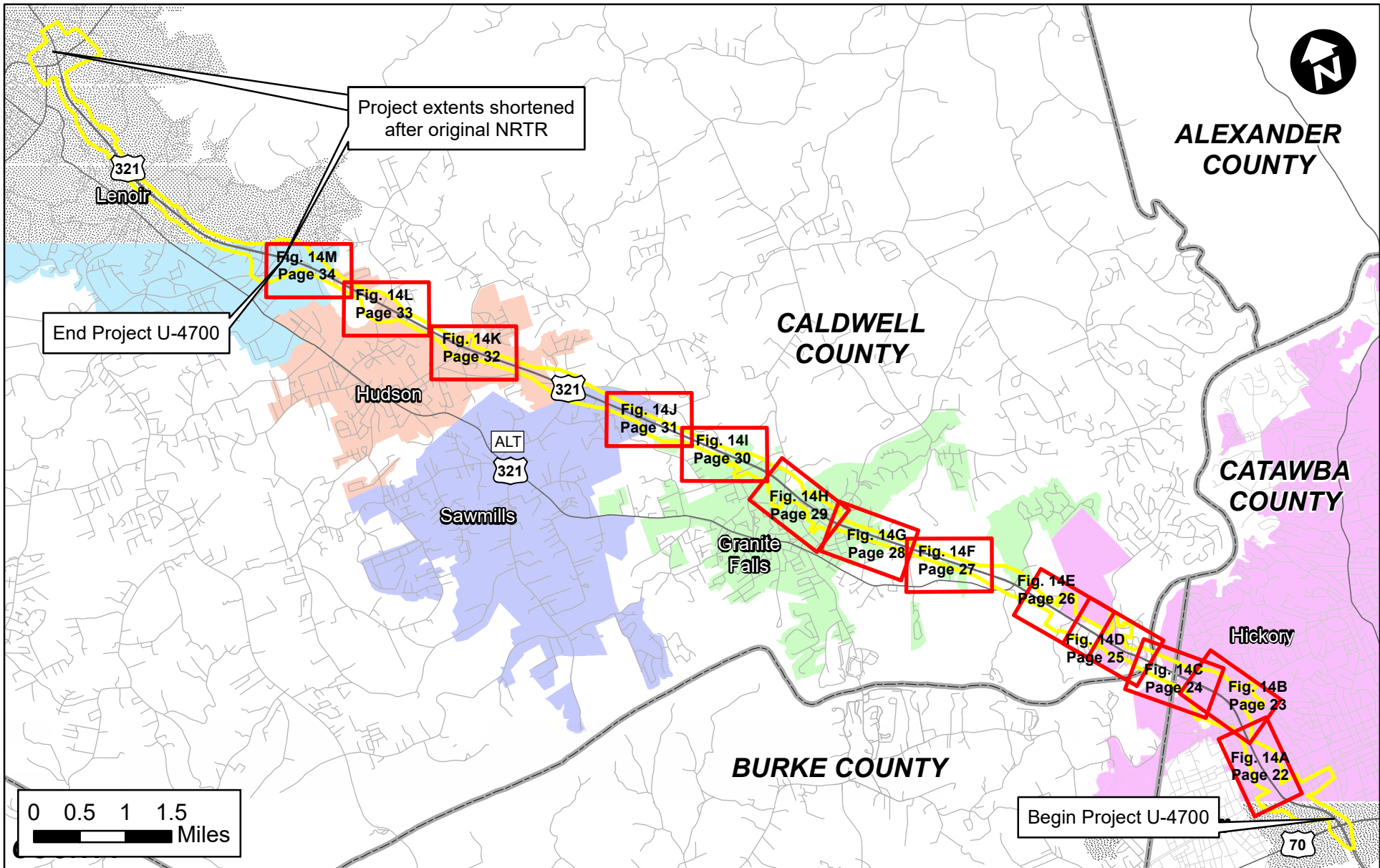
The table below summarizes anticipated stream and wetland impacts for the alternatives considered. NCDOT recommendations are in **bold italics**.

Table 25: Summary of Potential Impacts for Studied Alternatives

Section	Alternative	Stream Impacts (lf) ²	Wetland Impacts (ac) ²	Dwarf-flowered heartleaf Occurrence (ac) ²	Notes
13th St SW and 2nd Ave SW	13th St SW Interchange	0	0	0	Shifting the interchange improves access to downtown Hickory, providing a more direct connection from US 321 to 1 st and 2 nd Avenues SW, which are primary routes through downtown Hickory. A section of 1 st and 2 nd Avenues SW will be converted from one-way to two-way, consistent with Hickory’s long-term plan for the pair. Residential and business impacts are anticipated to be slightly higher. NCDOT proposes additional pedestrian connectivity to address potential EJ concerns.
	<i>2nd Ave SW Interchange</i>	<i>0</i>	<i>0</i>	<i>0</i>	
Clement Blvd ¹	Interchange	1,110	0.1	<0.1	A superstreet intersection was determined to be sufficient following the traffic forecast update. The recommended superstreet intersection reduces relocations to approximately 30 businesses and eliminates a proposed culvert extension.
	<i>Superstreet</i>	<i>860</i>	<i>0.1</i>	<i><0.1</i>	
Grace Chapel Rd ¹	Superstreet	950	0	0	NCDOT recommends the flyover because of substantial public opposition to the other options. The revised design improves access to properties west of US 321.
	Trumpet	1,100	0	1.5	
	<i>Flyover</i>	<i>930</i>	<i>0</i>	<i>0</i>	
Alex Lee Blvd	Trumpet	305	0	0	An interchange was proposed to address public concerns and improve access from MDI and adjacent neighborhoods. The tight diamond interchange provides better access to adjacent neighborhoods and reduced impacts to businesses compared with the trumpet interchange. In addition, a new road was added to connect Sage Meadow Circle, Midway Sand Road, and the new interchange.
	Superstreet	0	0	0	
	<i>Tight Diamond</i>	<i>140</i>	<i>0</i>	<i>0</i>	
<i>Between Alex Lee Blvd and Falls Ave</i>		<i>1,130</i>	<i>0</i>	<i>0.3</i>	
Falls Ave	<i>Superstreet</i>	970	0	<0.1	The superstreet intersection has notable concerns regarding EMS response, community cohesion, and pedestrian connectivity. NCDOT recommends the tight diamond interchange because of access and connectivity benefits for residents and emergency vehicles.
	Partial Clover	1,080	0	1.1	
	<i>Tight Diamond</i>	<i>845</i>	<i>0</i>	<i><0.1</i>	
<i>Between Falls Ave and Southwest Blvd</i>		<i>2,440</i>	<i>0.6</i>	<i>1.0</i>	
<i>Recommended Alternative Total</i>		<i>6,345</i>	<i>0.7</i>	<i>1.4</i>	

¹Impacts to the banks of the Catawba River (Lake Hickory) are not anticipated since it will be spanned with new bridges.

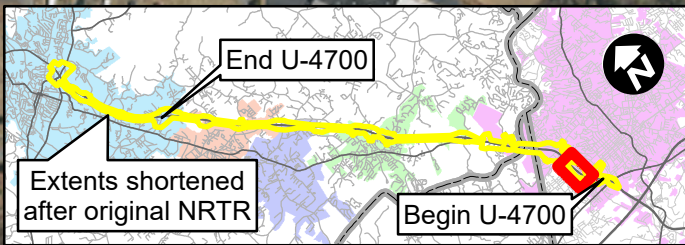
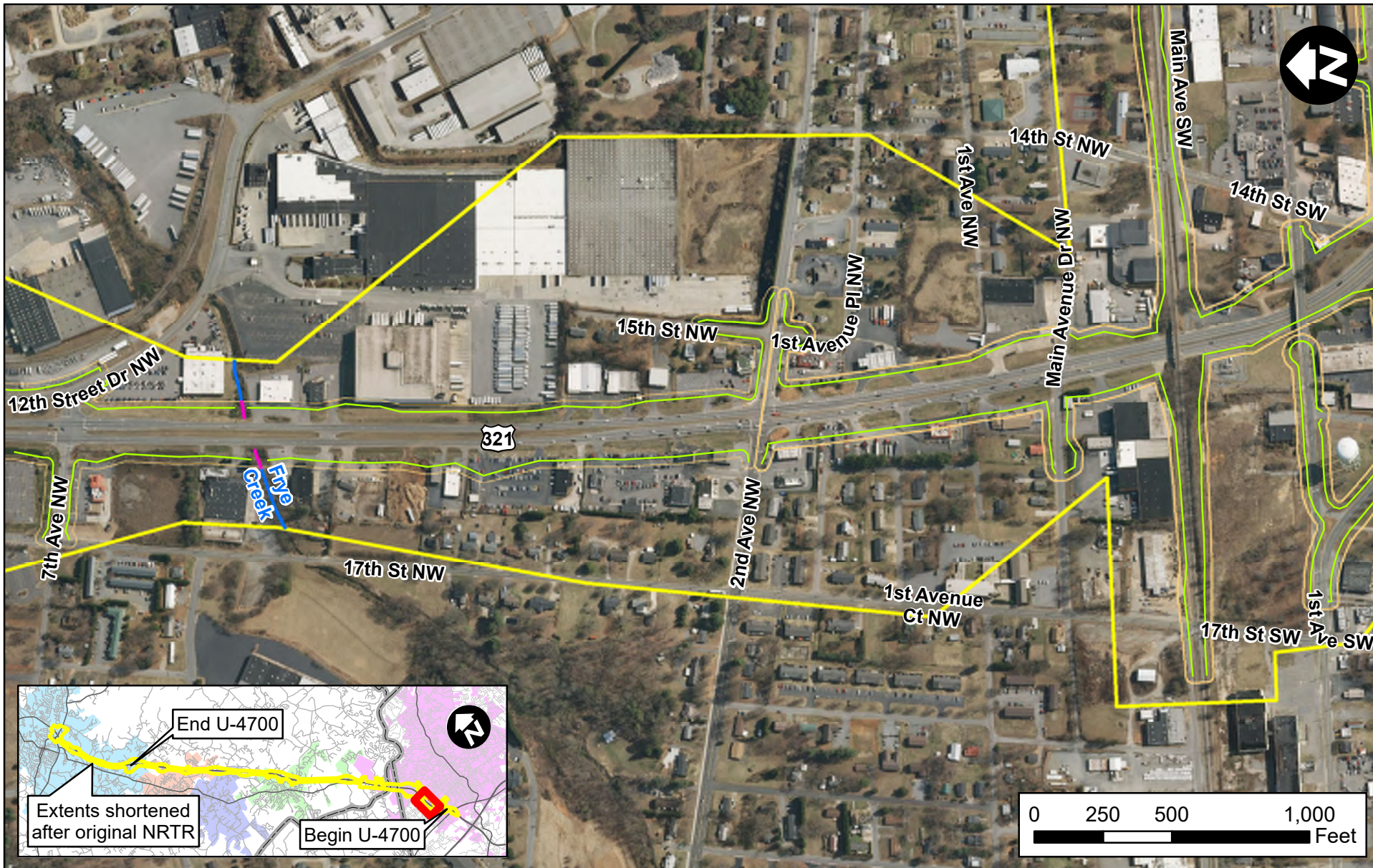
²Shown impacts include 25-foot clearing limits outside slope stake lines



- Granite Falls
- Hickory
- Hudson
- Lenoir
- Sawmills
- County Boundaries
- Detailed Map Extents
- NRTR study area boundary

U-4700 - U.S. 321 Widening

Figure 14: Impacts to Streams and Wetlands



- Slope Stakes
- Delineated Streams
- Recom. Alternative Stream Impacts
- Other Alternative Stream Impacts
- NRTR study area boundary
- 25 Ft. Buffer
- Delineated Wetlands
- Recom. Alternative Wetland Impacts
- Other Alternative Wetland Impacts
- Existing Endangered Plant Boundary (EPB)
- Recom. Alternative EPB Impacts
- Other Alternative EPB Impacts

U-4700 - U.S. 321 Widening

Figure 14A: Impacts to Streams and Wetlands Between 7th Avenue NW and 1st Avenue SW

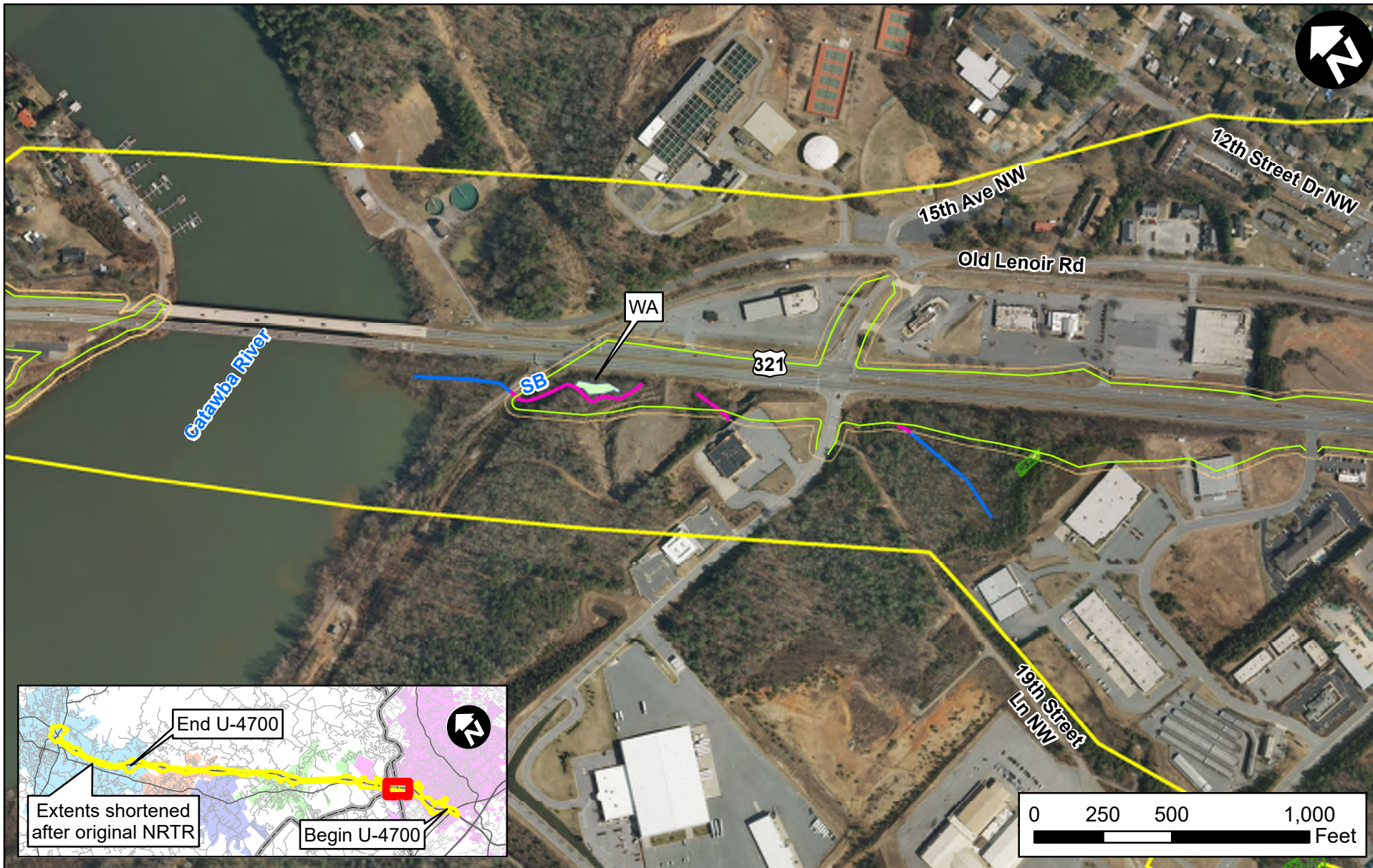


- Slope Stakes
- Delineated Streams
- Recom. Alternative Stream Impacts
- Other Alternative Stream Impacts
- NRTR study area boundary
- 25 Ft. Buffer
- Delineated Wetlands
- Recom. Alternative Wetland Impacts
- Other Alternative Wetland Impacts
- Existing Endangered Plant Boundary (EPB)
- Recom. Alternative EPB Impacts
- Other Alternative EPB Impacts

U-4700 - U.S. 321 Widening

Figure 14B: Impacts to Streams and Wetlands At Clement Boulevard

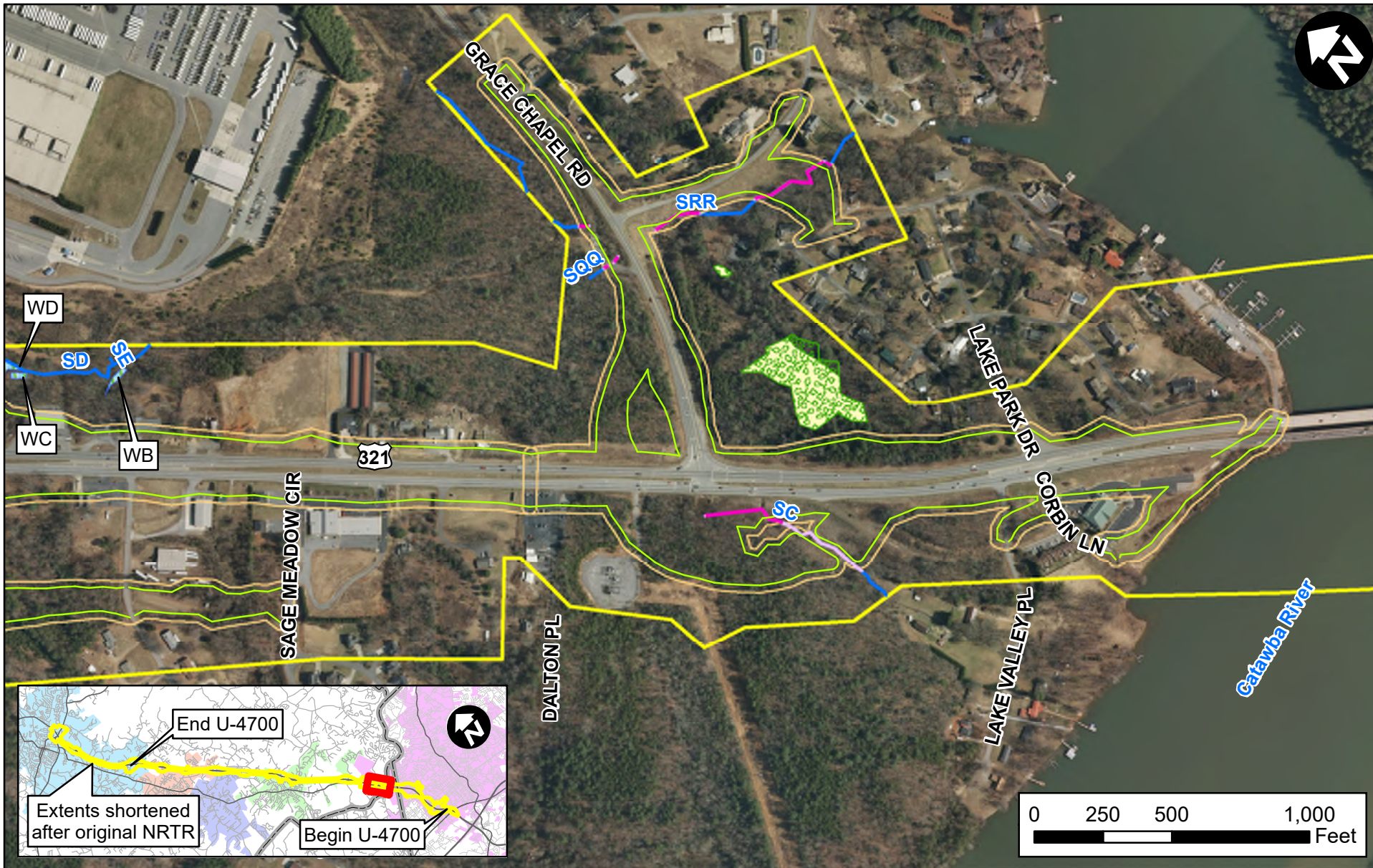
Catawba County



- Slope Stakes
- Delineated Streams
- Recom. Alternative Stream Impacts
- Other Alternative Stream Impacts
- NRTR study area boundary
- 25 Ft. Buffer
- Delineated Wetlands
- Recom. Alternative Wetland Impacts
- Other Alternative Wetland Impacts
- Existing Endangered Plant Boundary (EPB)
- Recom. Alternative EPB Impacts
- Other Alternative EPB Impacts

U-4700 - U.S. 321 Widening

Figure 14C: Impacts to Streams and Wetlands at 15th Avenue NW

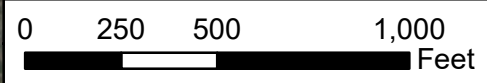
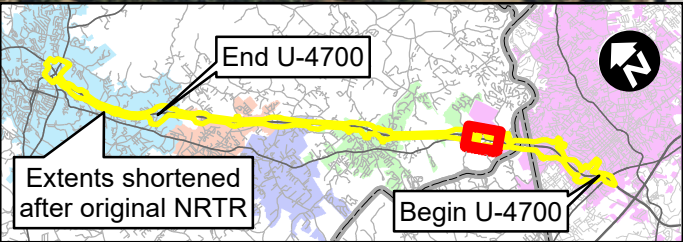
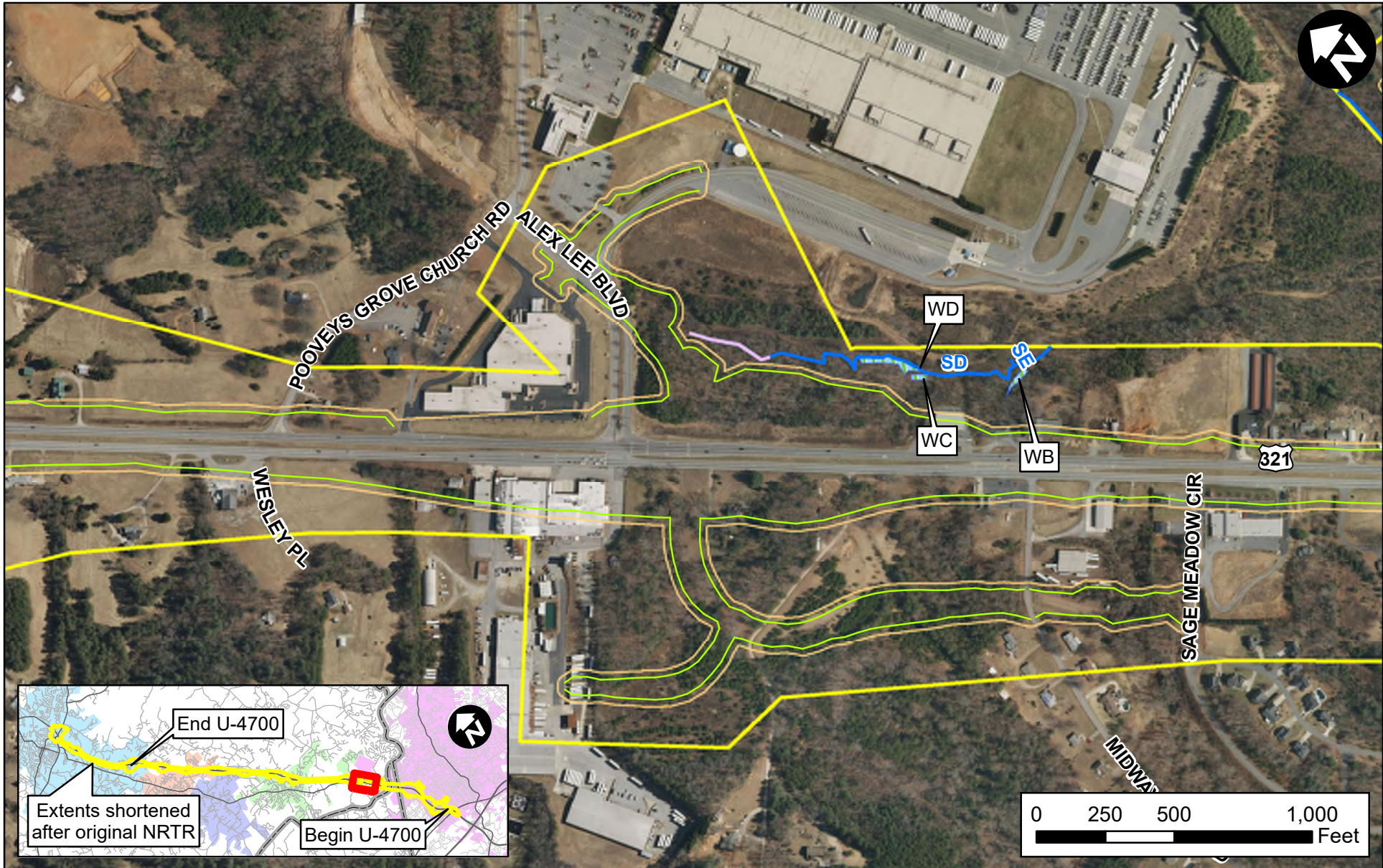


- Slope Stakes
- Delineated Streams
- Recom. Alternative Stream Impacts
- Other Alternative Stream Impacts
- NRTR study area boundary
- 25 Ft. Buffer
- Delineated Wetlands
- Recom. Alternative Wetland Impacts
- Other Alternative Wetland Impacts
- Existing Endangered Plant Boundary (EPB)
- Recom. Alternative EPB Impacts
- Other Alternative EPB Impacts

U-4700 - U.S. 321 Widening

Figure 14D: Impacts to Streams and Wetlands at Grace Chapel Road

Caldwell County



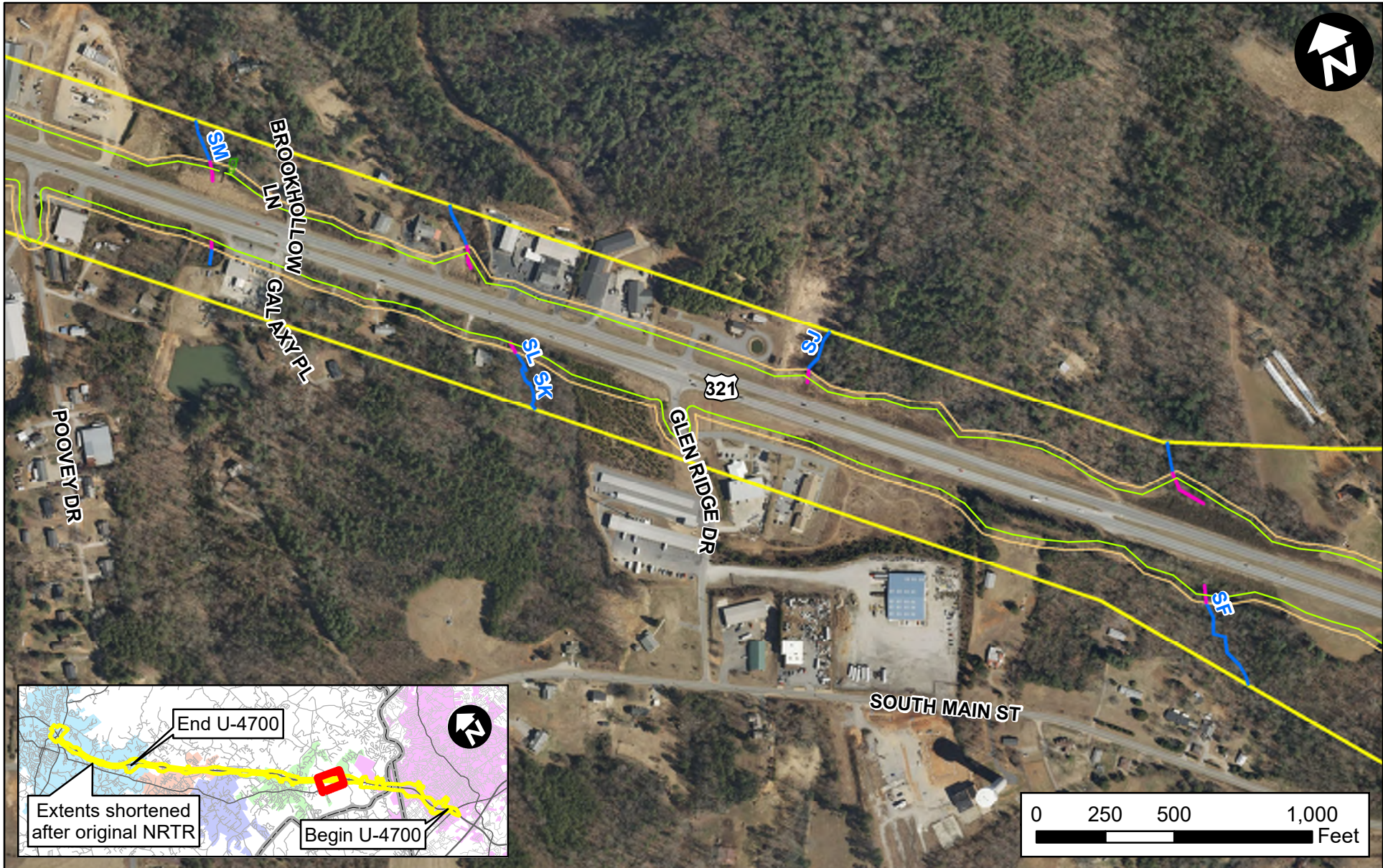
- | | |
|-----------------------------------|--|
| Slope Stakes | Delineated Wetlands |
| Delineated Streams | Recom. Alternative Wetland Impacts |
| Recom. Alternative Stream Impacts | Other Alternative Wetland Impacts |
| Other Alternative Stream Impacts | Existing Endangered Plant Boundary (EPB) |
| NRTR study area boundary | Recom. Alternative EPB Impacts |
| 25 Ft. Buffer | Other Alternative EPB Impacts |



U-4700 - U.S. 321 Widening

Figure 14E: Impacts to Streams and Wetlands at Alex Lee Boulevard

Caldwell County

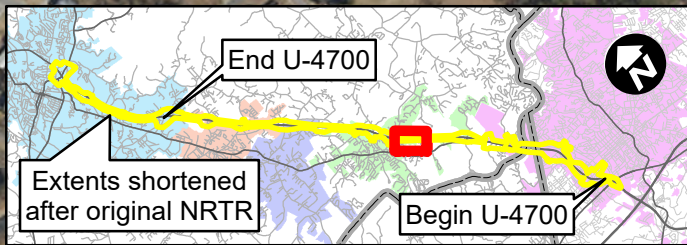
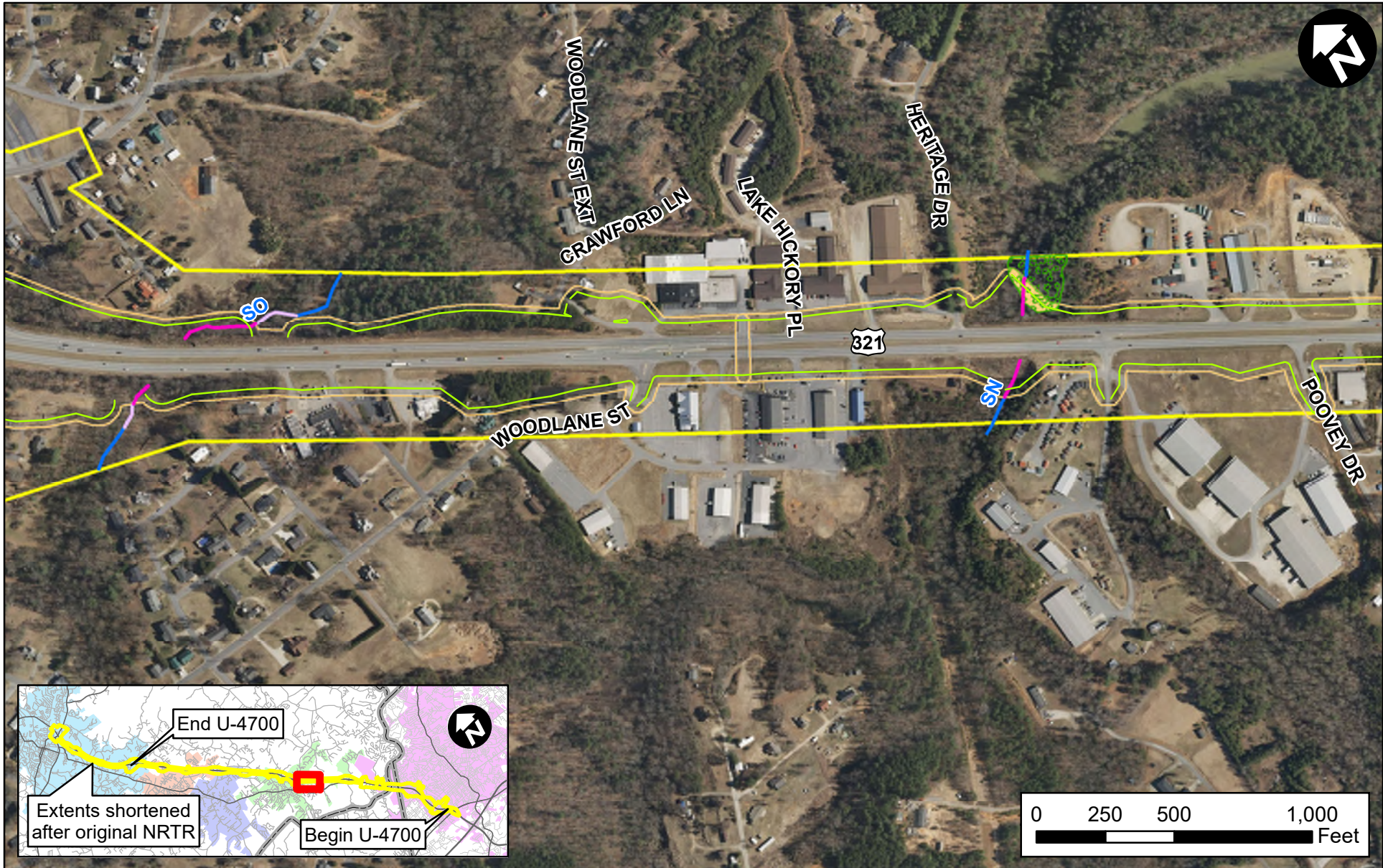


- Slope Stakes
- Delineated Streams
- Recom. Alternative Stream Impacts
- Other Alternative Stream Impacts
- NRTR study area boundary
- 25 Ft. Buffer
- Delineated Wetlands
- Recom. Alternative Wetland Impacts
- Other Alternative Wetland Impacts
- Existing Endangered Plant Boundary (EPB)
- Recom. Alternative EPB Impacts
- Other Alternative EPB Impacts

U-4700 - U.S. 321 Widening

Figure 14F: Impacts to Streams and Wetlands Between U.S. 321 Alt. and Poovey Drive

Caldwell County

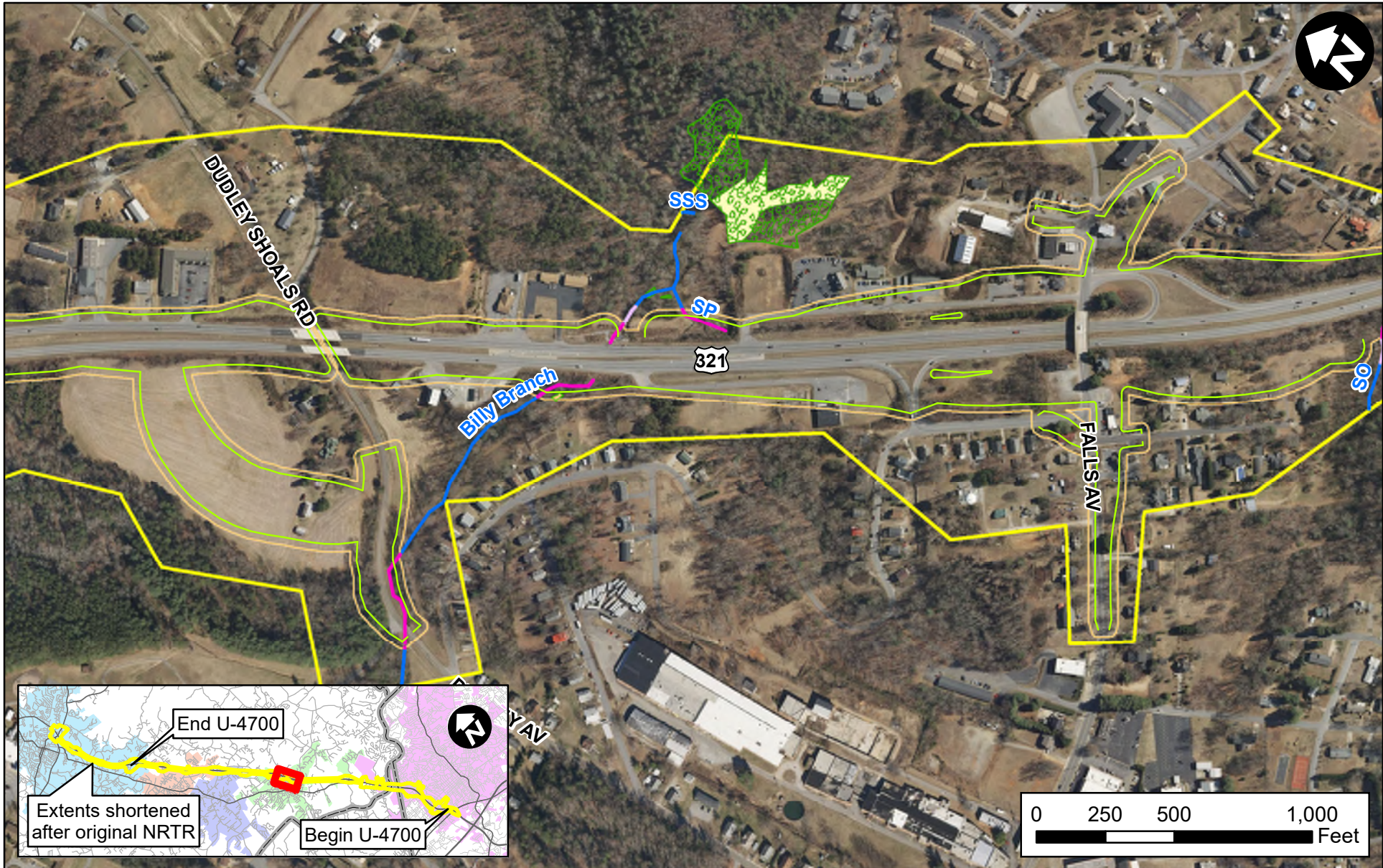


- Slope Stakes
- Delineated Streams
- Recom. Alternative Stream Impacts
- Other Alternative Stream Impacts
- NRTR study area boundary
- 25 Ft. Buffer
- Delineated Wetlands
- Recom. Alternative Wetland Impacts
- Other Alternative Wetland Impacts
- Existing Endangered Plant Boundary (EPB)
- Recom. Alternative EPB Impacts
- Other Alternative EPB Impacts

U-4700 - U.S. 321 Widening

Figure 14G: Impacts to Streams and Wetlands Between Poovey Drive and Falls Avenue

Caldwell County

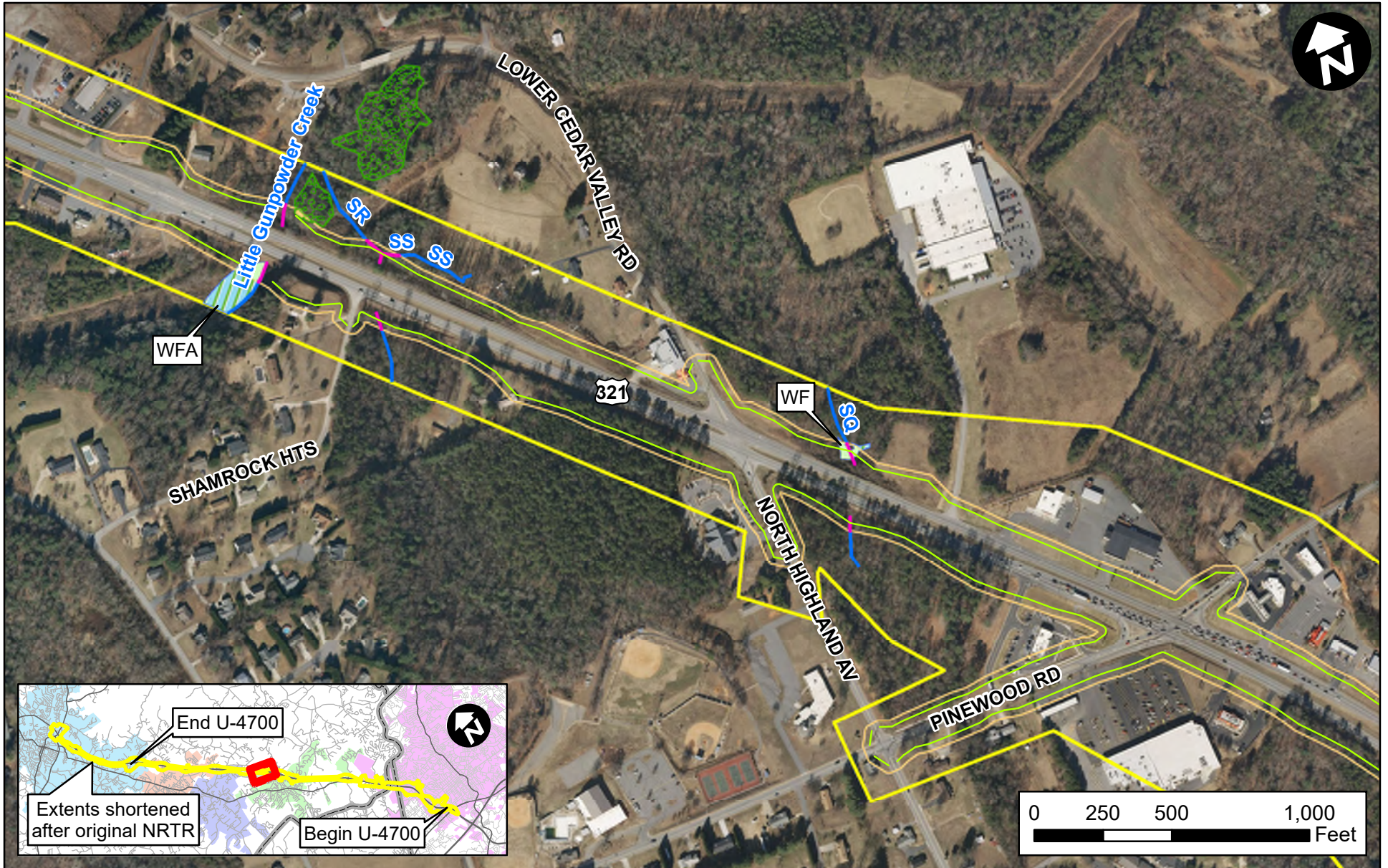


- Slope Stakes
- Delineated Streams
- Recom. Alternative Stream Impacts
- Other Alternative Stream Impacts
- NRTR study area boundary
- 25 Ft. Buffer
- Delineated Wetlands
- Recom. Alternative Wetland Impacts
- Other Alternative Wetland Impacts
- Existing Endangered Plant Boundary (EPB)
- Recom. Alternative EPB Impacts
- Other Alternative EPB Impacts

U-4700 - U.S. 321 Widening

Figure 14H: Impacts to Streams and Wetlands Between Falls Avenue and Dudley Shoals Road

Caldwell County

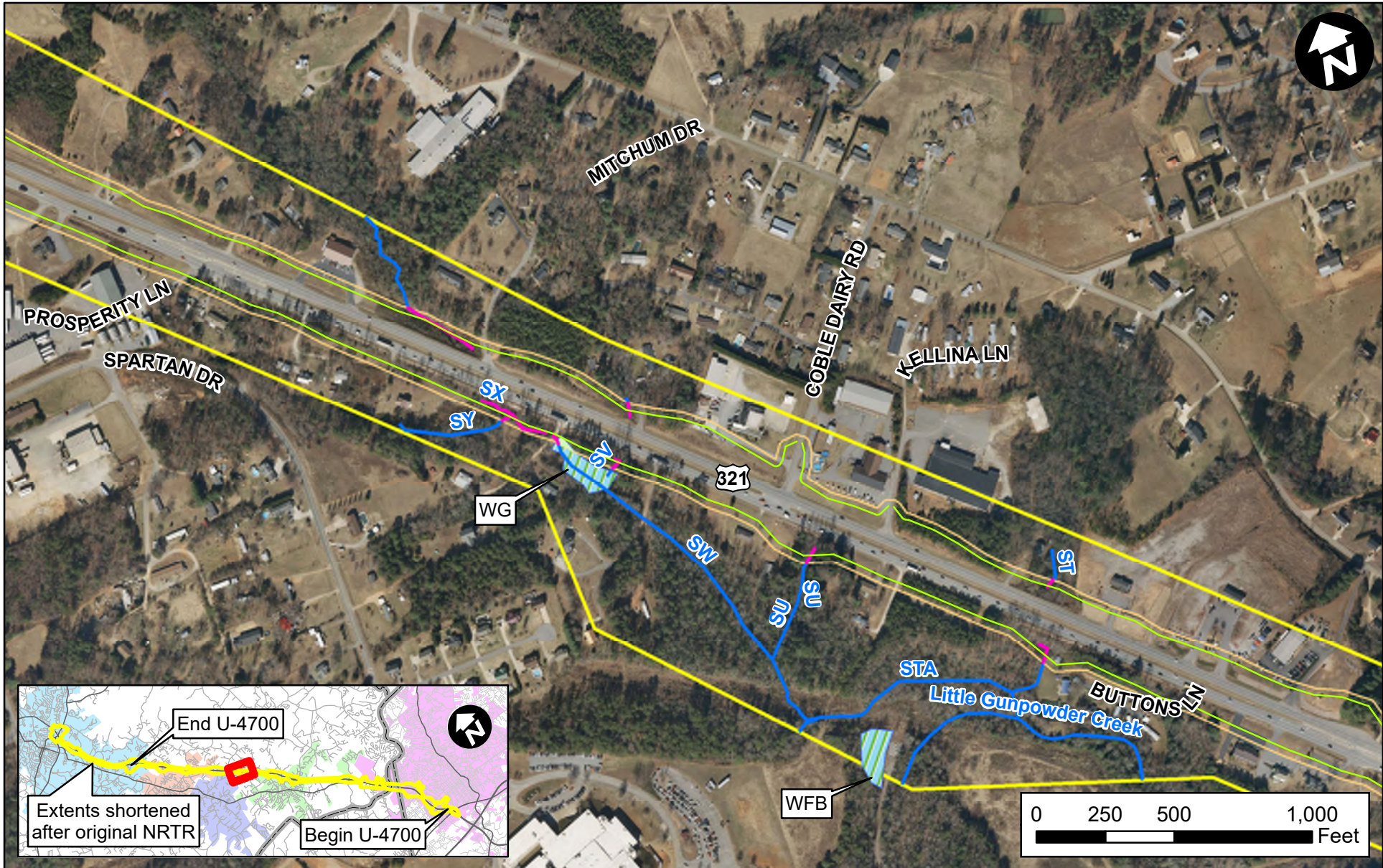


- Slope Stakes
- Delineated Streams
- Recom. Alternative Stream Impacts
- Other Alternative Stream Impacts
- NRTR study area boundary
- 25 Ft. Buffer
- Delineated Wetlands
- Recom. Alternative Wetland Impacts
- Other Alternative Wetland Impacts
- Existing Endangered Plant Boundary (EPB)
- Recom. Alternative EPB Impacts
- Other Alternative EPB Impacts

U-4700 - U.S. 321 Widening

Figure 14I: Impacts to Streams and Wetlands Between Pinewood Road and Shamrock Heights

Caldwell County

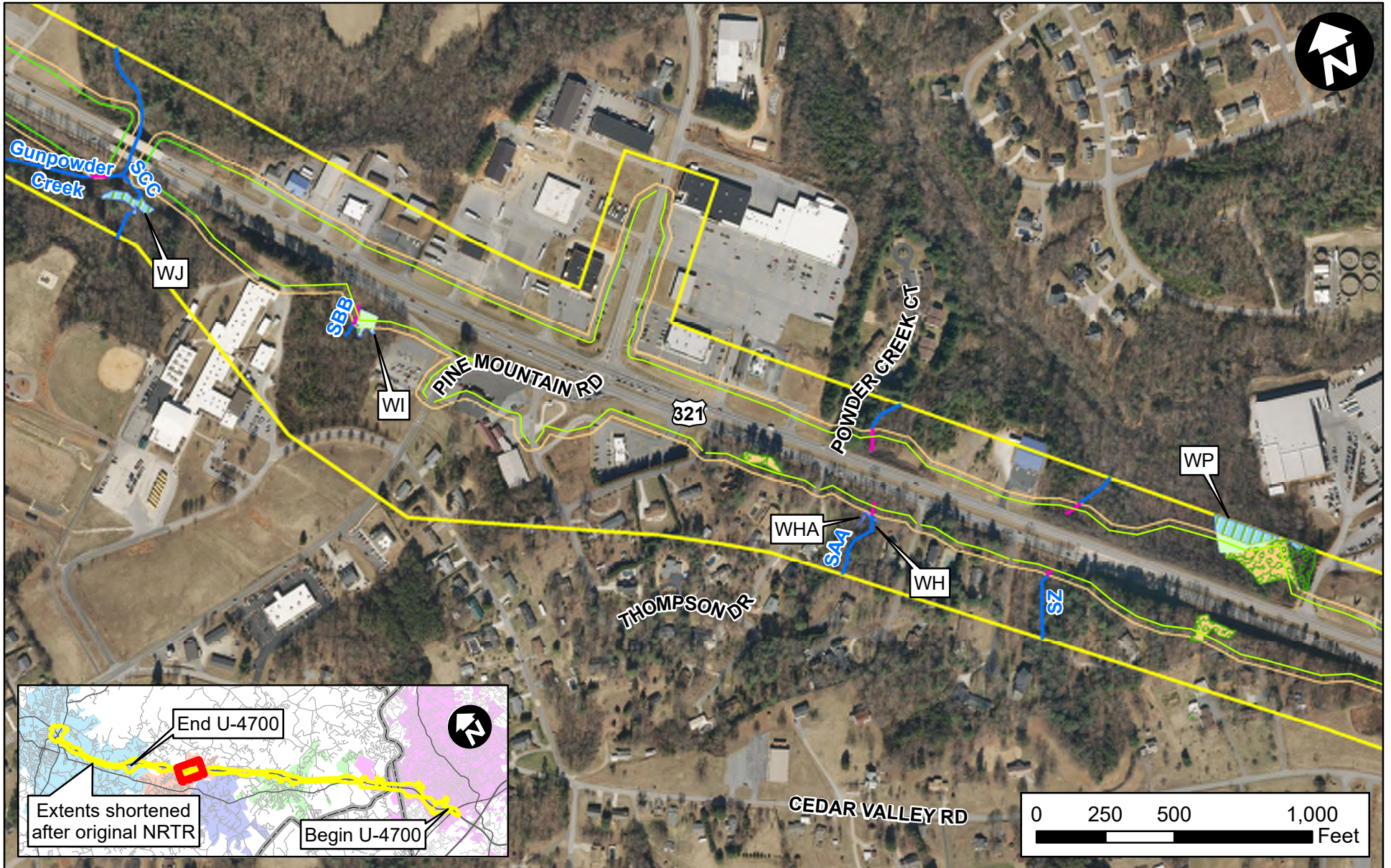


- Slope Stakes
- Delineated Streams
- Recom. Alternative Stream Impacts
- Other Alternative Stream Impacts
- NRTR study area boundary
- 25 Ft. Buffer
- Delineated Wetlands
- Recom. Alternative Wetland Impacts
- Other Alternative Wetland Impacts
- Existing Endangered Plant Boundary (EPB)
- Recom. Alternative EPB Impacts
- Other Alternative EPB Impacts

U-4700 - U.S. 321 Widening

Figure 14J: Impacts to Streams and Wetlands Between Buttons Lane and Little Gunpowder Creek

Caldwell County

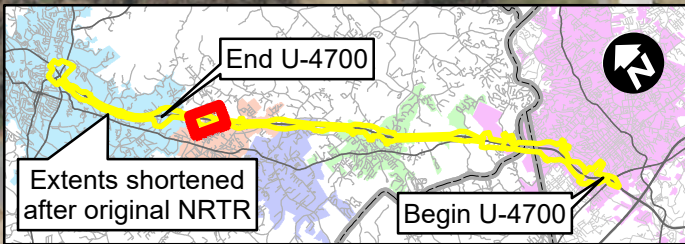
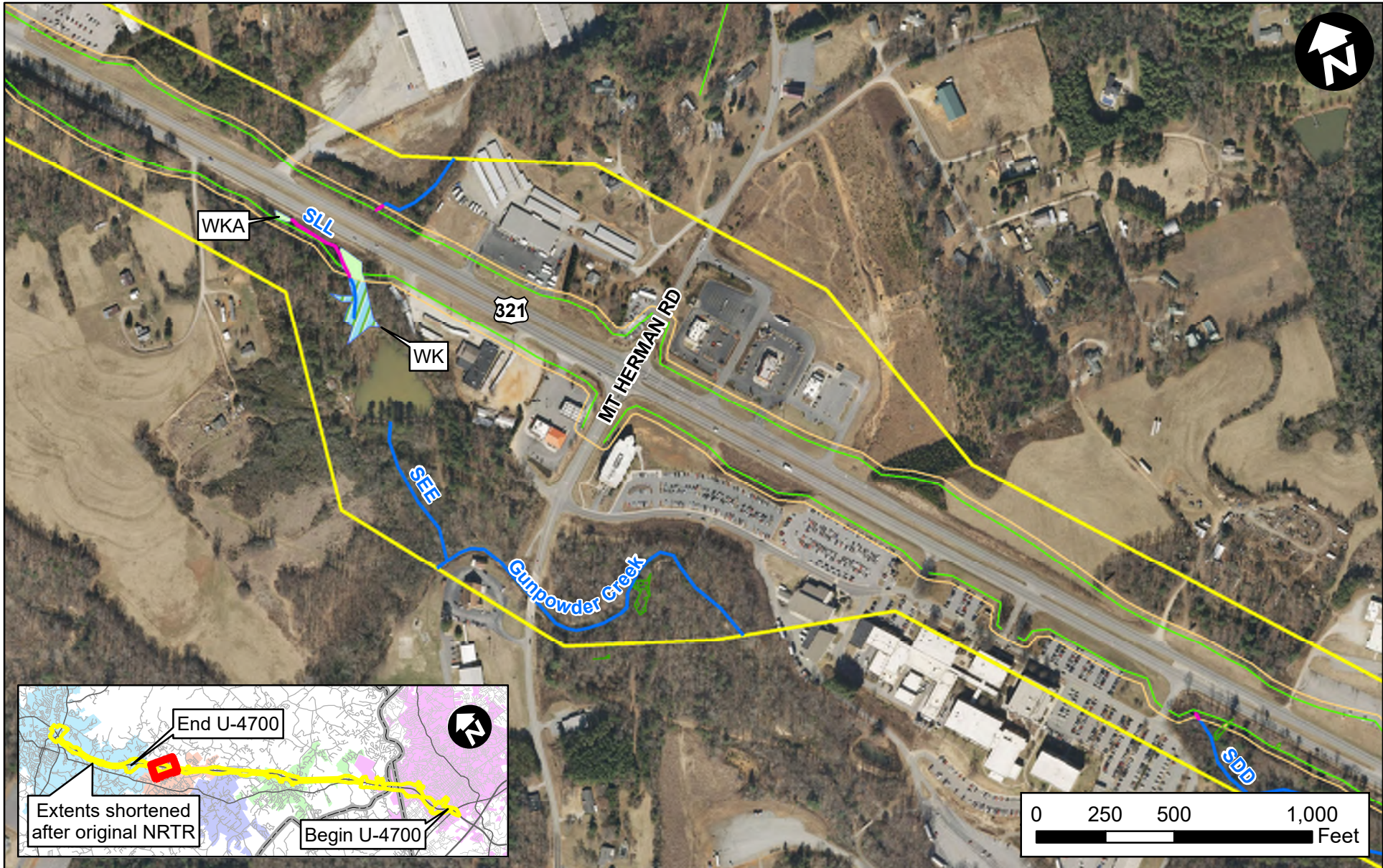


- Slope Stakes
- Delineated Streams
- Recom. Alternative Stream Impacts
- Other Alternative Stream Impacts
- NRTR study area boundary
- 25 Ft. Buffer
- Delineated Wetlands
- Recom. Alternative Wetland Impacts
- Other Alternative Wetland Impacts
- Existing Endangered Plant Boundary (EPB)
- Recom. Alternative EPB Impacts
- Other Alternative EPB Impacts

U-4700 - U.S. 321 Widening

Figure 14K: Impacts to Streams and Wetlands At Pine Mountain Road

Caldwell County

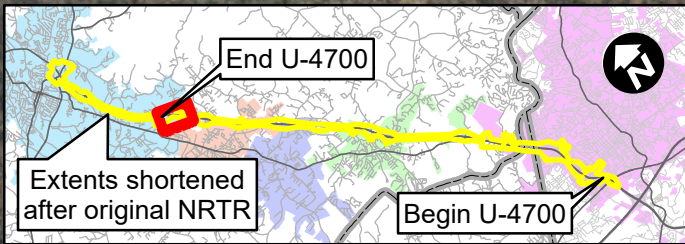
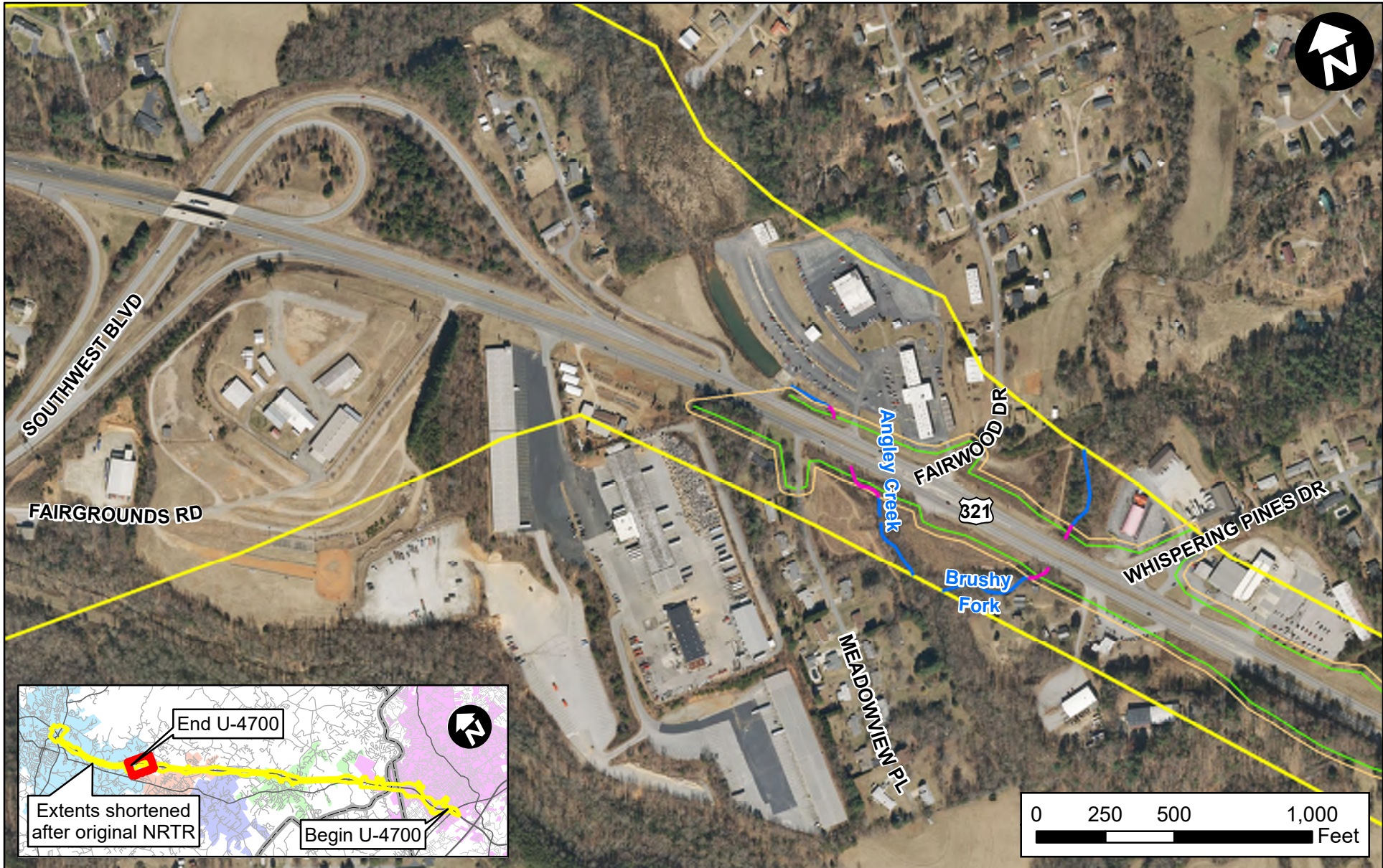


- Slope Stakes
- Delineated Streams
- Recom. Alternative Stream Impacts
- Other Alternative Stream Impacts
- NRTR study area boundary
- 25 Ft. Buffer
- Delineated Wetlands
- Recom. Alternative Wetland Impacts
- Other Alternative Wetland Impacts
- Existing Endangered Plant Boundary (EPB)
- Recom. Alternative EPB Impacts
- Other Alternative EPB Impacts

U-4700 - U.S. 321 Widening

Figure 14L: Impacts to Streams and Wetlands at Mount Herman Road

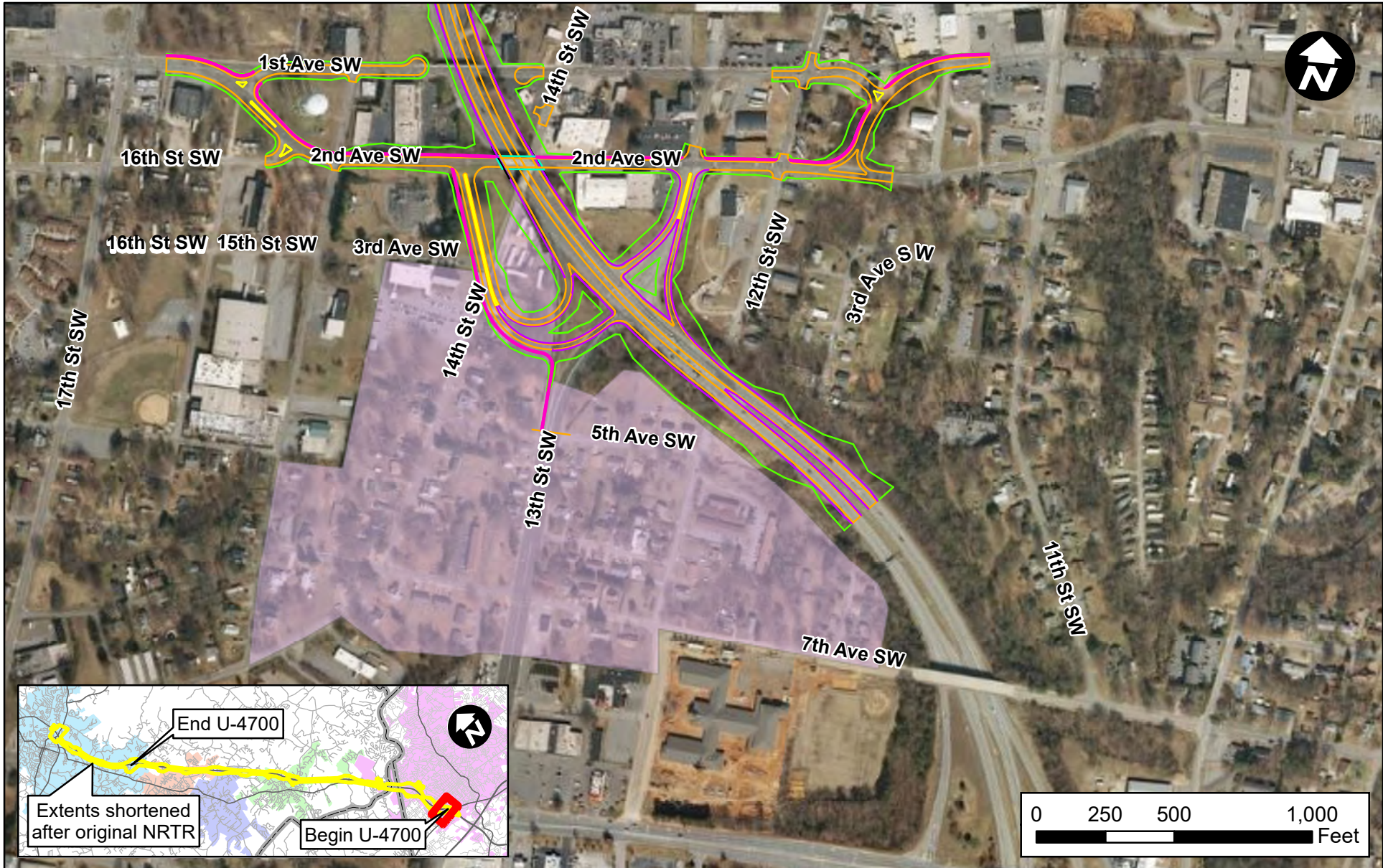
Caldwell County



- Slope Stakes
- Delineated Streams
- Recom. Alternative Stream Impacts
- Other Alternative Stream Impacts
- NRTR study area boundary
- 25 Ft. Buffer
- Delineated Wetlands
- Recom. Alternative Wetland Impacts
- Other Alternative Wetland Impacts
- Existing Endangered Plant Boundary (EPB)
- Recom. Alternative EPB Impacts
- Other Alternative EPB Impacts

U-4700 - U.S. 321 Widening

Figure 14M: Impacts to Streams and Wetlands Between Whispering Pines Dr and Southwest Blvd



- Proposed Roadway Bridge
- Proposed Concrete 4 in Sidewalk
- Proposed Concrete Median
- Proposed Edge of Transportation
- Proposed Paved Shoulder
- Proposed Retaining Wall
- Slope Stakes
- EJ Study Area

U-4700 - U.S. 321 Widening

Figure 15: EJ Study Area Impacts At 13th Street SW

Catawba County

Appendix A: Recommended Major Drainage Structures

Near Station	Site #	Field Verification ID #	Name	Existing Structure: Type, Size, Length	Proposed Structure	Estimated Min Length / Min Culvert Total Length	Cost Estimate ^a	Stream Classification	Proposed Wetland (ACRE) / Stream Impacts (LF) ^b	Intermittent / Perennial	FEMA	Channel Dimensions	Riparian Buffer Impacts
-L- 95+00	1	Frye Creek	Frye Creek	2 @ 10' X 10' RCBC, 120.5'	Retain and Extend	26' (LT) & 15' (RT)/ 161.5'	\$90,200	WS-IV	144 LF - Stream Impact	Perennial	Yes	8' wide, 5' deep	N/A
-L- 175+00	2	Catawba River	Catawba River	2 Bridges: #1: 10 spans, 825' length; #2: 12 spans, 944' length	Remove and Replace Bridges	NB Bridge: 1809' SB Bridge: 1720'	\$29,248,500	WS-IV, B, CA	Bridge (No impacts)	Perennial	Yes	680' wide, depth varies	Yes
-L- 338+00	3	SN	UT to Gunpowder Creek	6' X 7' RCBC, 275'	Retain and Extend	76' (LT) & 89' (RT)/ 440'	\$144,180	WS IV, CA	268 LF - Stream Impact	Perennial	Only at Outlet	12' wide, 5' deep	N/A
-L- 400+00	4	Billy Branch	Billy Branch	2 @ 6' X 7' RCBC, 264'	Retain and Extend	56' (LT) & 49' (RT)/ 369'	\$99,225	WS-IV	197 LF - Stream Impact	Perennial	Yes	15' wide, 3' deep	N/A
-L- 465+00	5	Little Gunpowder Creek	Little Gunpowder Creek	38' X 18' RC Arch, 147'	Retain and Extend	20'(LT) & 22.5'(RT)/ 189.5'	\$85,000	WS-IV	0.10 ACRE - Wetland Impact/ 150 LF - Stream Impact	Perennial	Yes	19' wide, 4' deep	N/A
-L- 625+00	6	Gunpowder Creek	Gunpowder Creek	2 Bridges: #1: 3 spans, 158' length; #2: 3 spans, 173' length	Retain and Widen Bridges	Widen NB Bridge 16' Widen SB Bridge 25'	\$1,051,400	C	Bridge (No impacts)	Perennial	Yes	22' wide, 7' deep	N/A
-L- 696+00	7	Brushy Fork	Brushy Fork	3 @ 9' X 9' RCBC, 136'	Retain and Extend	31'(LT) & 15'(RT)/182'	\$148,700	C	124 LF - Stream Impact	Perennial	Only at Outlet	9' wide, 11' deep	N/A
-L- 705+00	8	Angley Creek	Angley Creek	7' X 7' RCBC, 189'	Retain and Extend	41'(LT) & 23'(RT)/253'	\$59,040	C	366 LF - Stream Impact	Perennial	Yes	9' wide, 2' deep	N/A
-Y19- 19+88	17	SRR	UT to Catawba River	72" CMP, 209'	Retain and Extend	38'(RT)/ 247'	\$5,320	WS-IV, B, CA	59 LF - Stream Impact	Perennial	No	10' wide, 2" deep	N/A
-Y19 FLY- 14+98	17A	SC	UT to Catawba River	N/A	Proposed Bridge ^c	135'	\$610,000	WS-IV, B, CA	N/A	Perennial	No	5' wide, 5' deep	N/A
Wolfe Rd. 17+00	17B	SRR	UT to Catawba River	N/A	Proposed Culvert	187' - 8' x 8' RCBC	\$250,000	WS-IV, B, CA	380 LF - Stream Impact	Perennial	No	10' wide, 2" deep	N/A

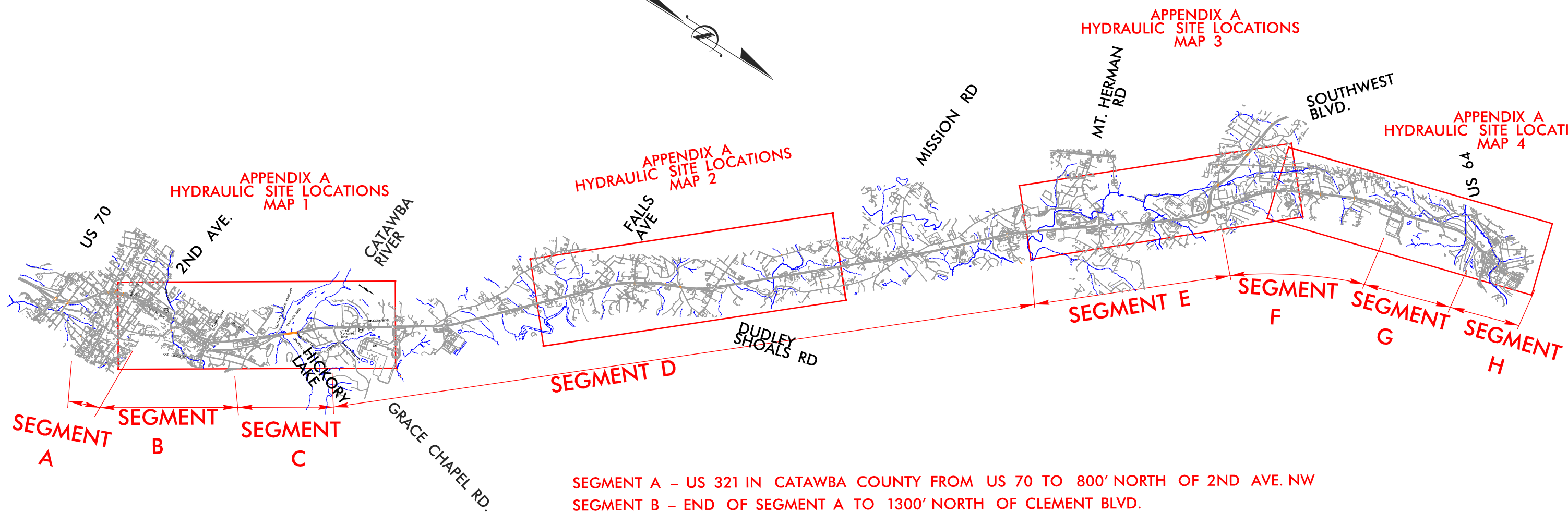
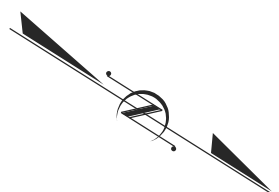
^a Cost Estimates are based off Bid Averages provided by NCDOT for 2012

^b Stream/wetland impacts are measured from openings of existing culvert to 25' beyond slope stakes

^c Only proposed for Flyover alternative at Grace Chapel Road intersection

Note: Site 3, 4, and 5 have potential dwarf-flowered heartleaf impacts
 N/A Indicates Not Applicable
 RCBC Indicates Reinforced Concrete Box Culvert
 CMP Indicates Corrugated Metal Pipe

B Indicates Class B
 C Indicates Class C
 CA Critical Area
 WS-IV Indicates Water Supply IV

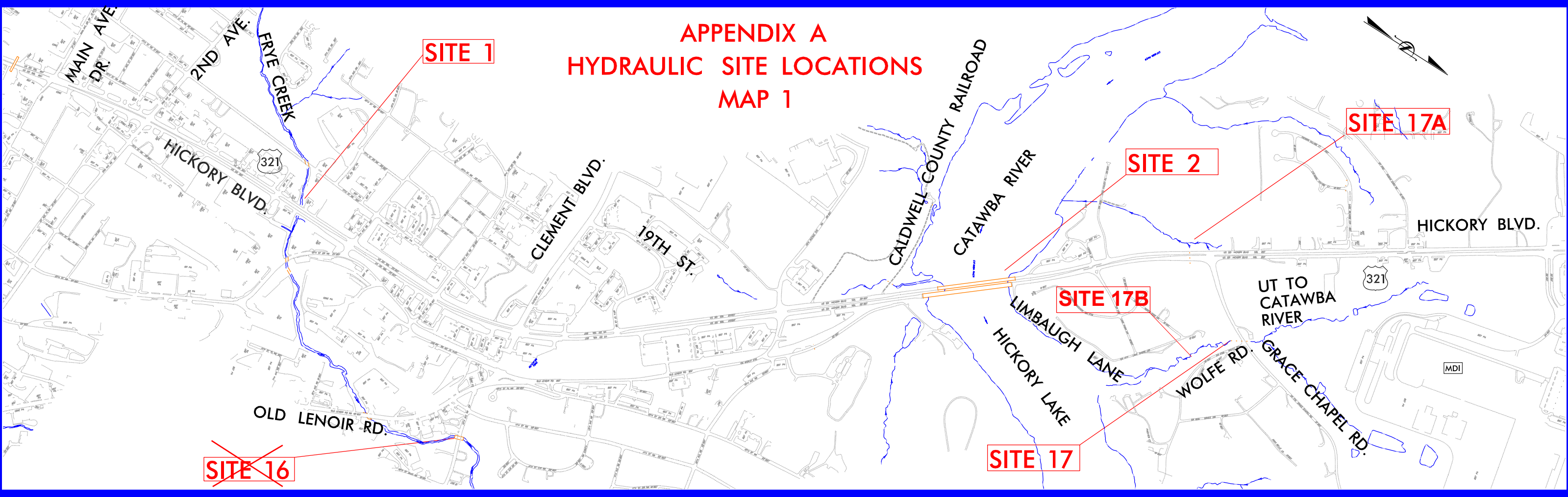


- SEGMENT A – US 321 IN CATAWBA COUNTY FROM US 70 TO 800' NORTH OF 2ND AVE. NW
- SEGMENT B – END OF SEGMENT A TO 1300' NORTH OF CLEMENT BLVD.
- SEGMENT C – END OF SEGMENT B TO JUST SOUTH OF GRACE CHAPEL RD.
- SEGMENT D – END OF SEGMENT C TO 400' SOUTH OF GUN POWDER CREEK.
- SEGMENT E – END OF SEGMENT D TO SOUTHWEST BLVD.
- SEGMENT F – END OF SEGMENT E TO JUST SOUTH OF MCLEAN DRIVE
- SEGMENT G – END OF SEGMENT F TO JUST SOUTH OF US 64 /NC 18-90
- SEGMENT H – END OF SEGMENT G TO US 64 /NC 18-90

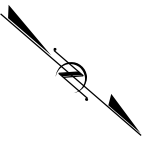
US 321 (U-4700)
SEGMENT BREAKDOWN MAP

INDEX

APPENDIX A
HYDRAULIC SITE LOCATIONS
MAP 1



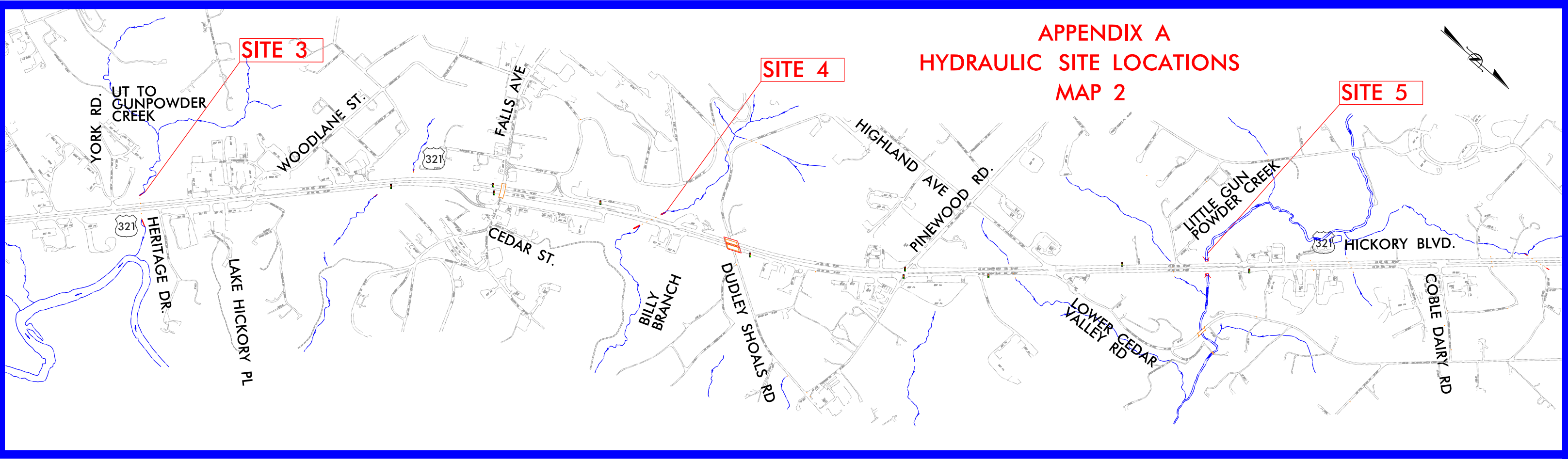
**APPENDIX A
HYDRAULIC SITE LOCATIONS
MAP 2**



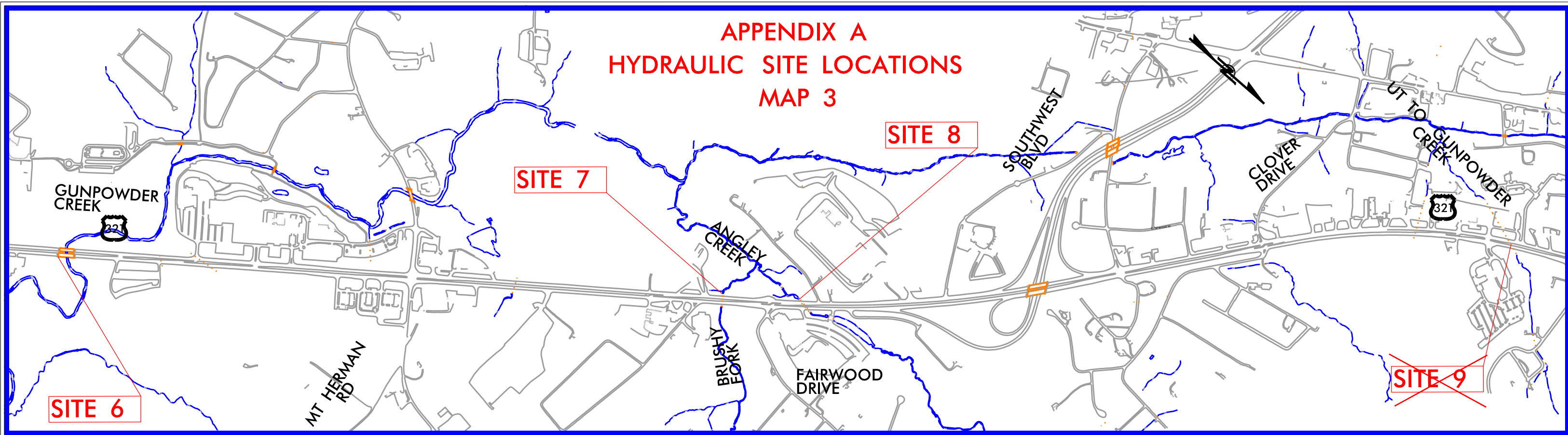
SITE 3

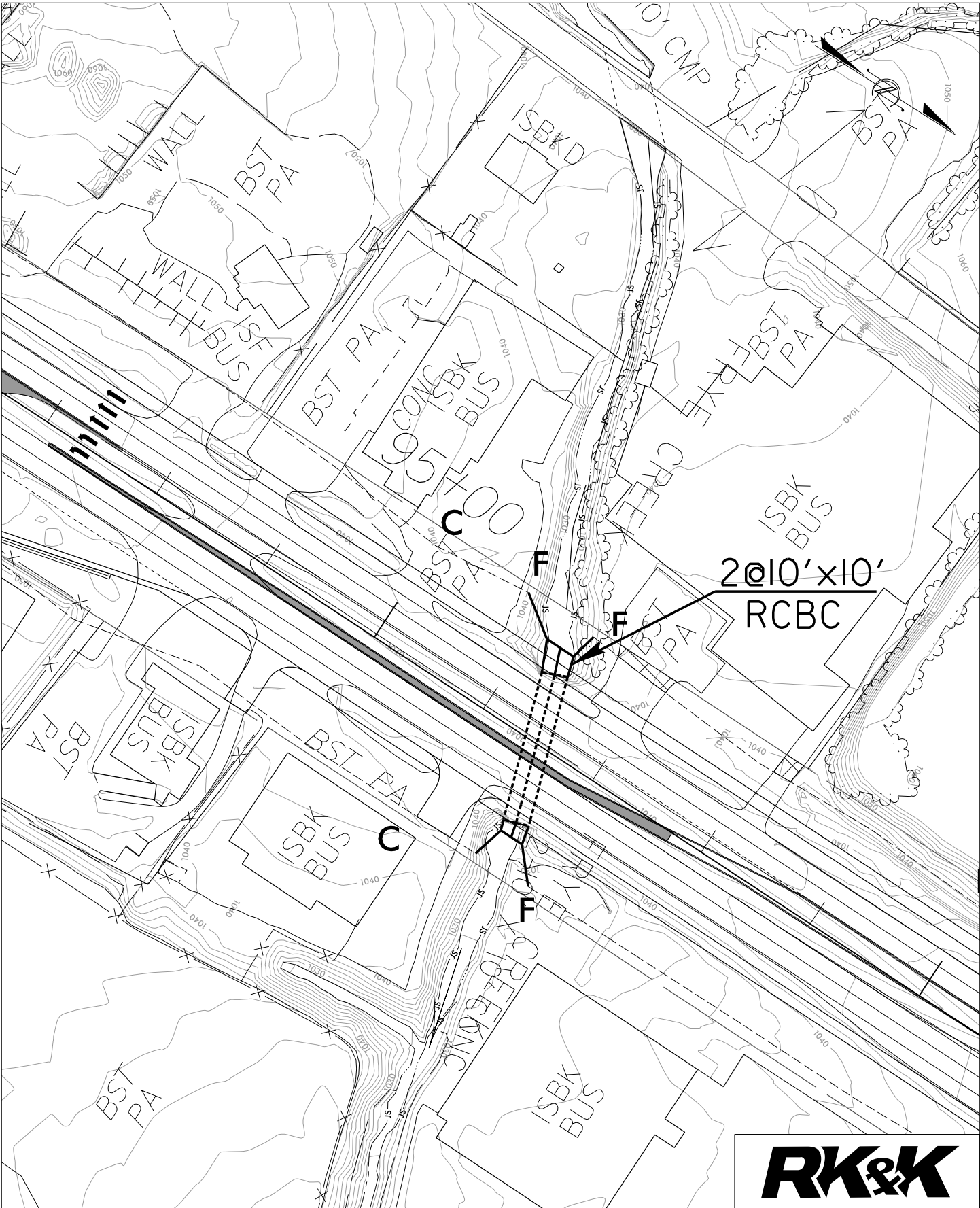
SITE 4

SITE 5



APPENDIX A
HYDRAULIC SITE LOCATIONS
MAP 3



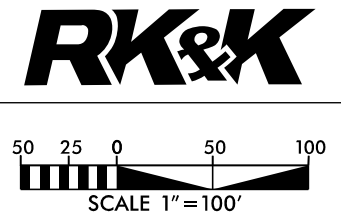


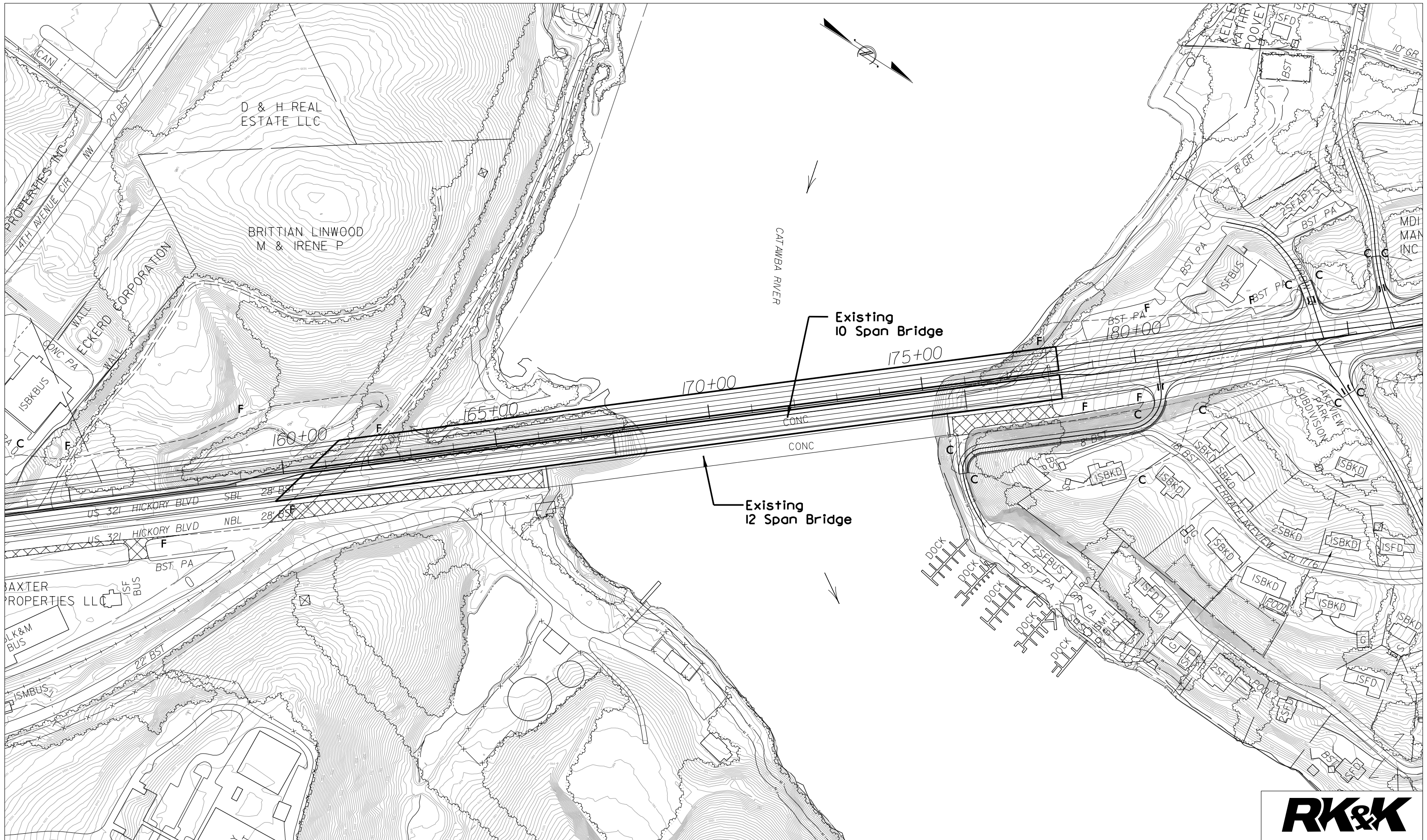
EXISTING STRUCTURE: 2@10'x10' RCBC, Total Length: 120.5'

PROPOSED STRUCTURE: Retain Existing and Extend,
New Total Length: 161.5'

TIP PROJECT U-4700

SITE 1
FRYE CREEK



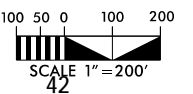


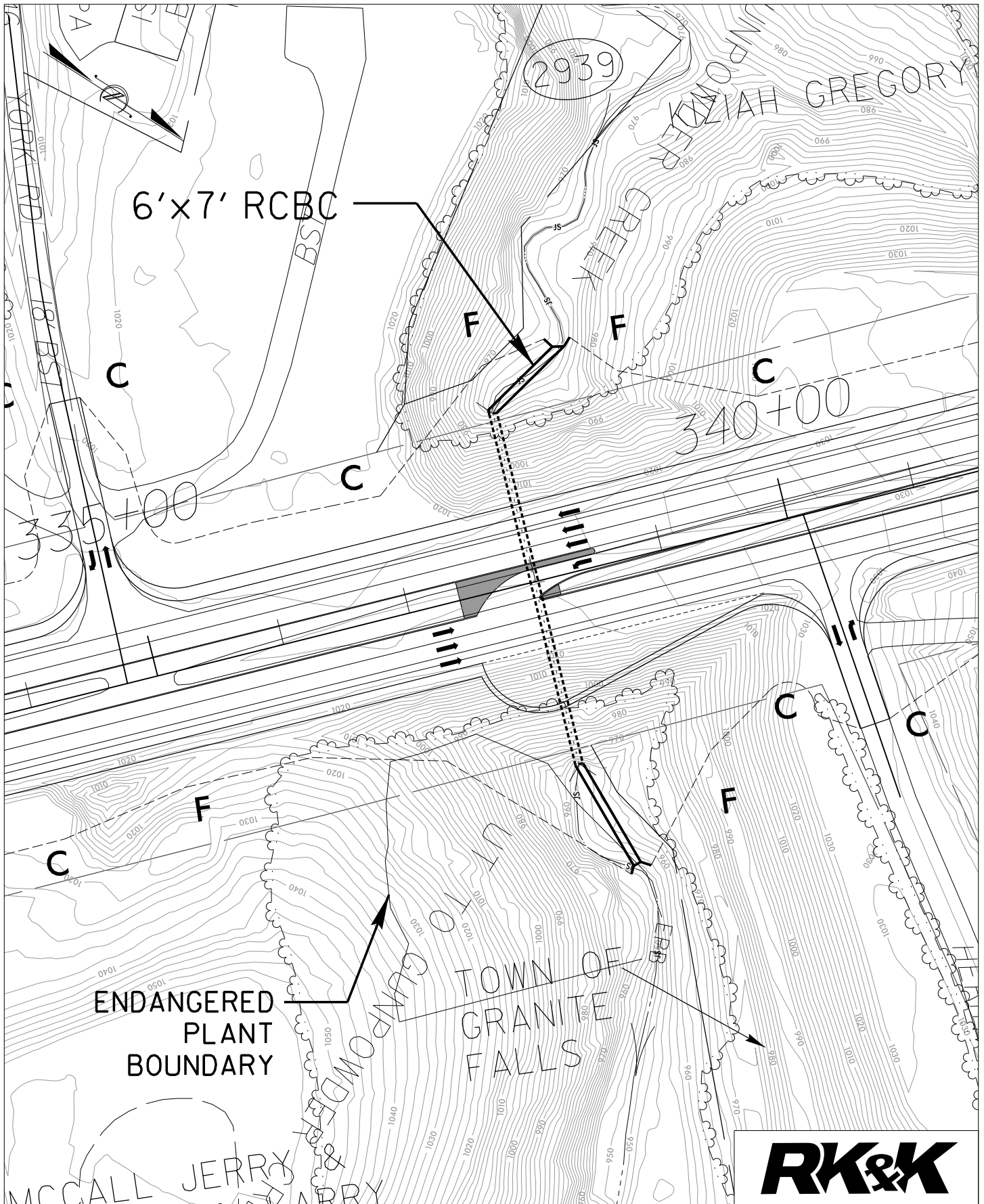
EXISTING STRUCTURES: Bridge #1: 10 Spans, Total Length: 825',
 Bridge #2: 12 Spans, Total Length: 944'

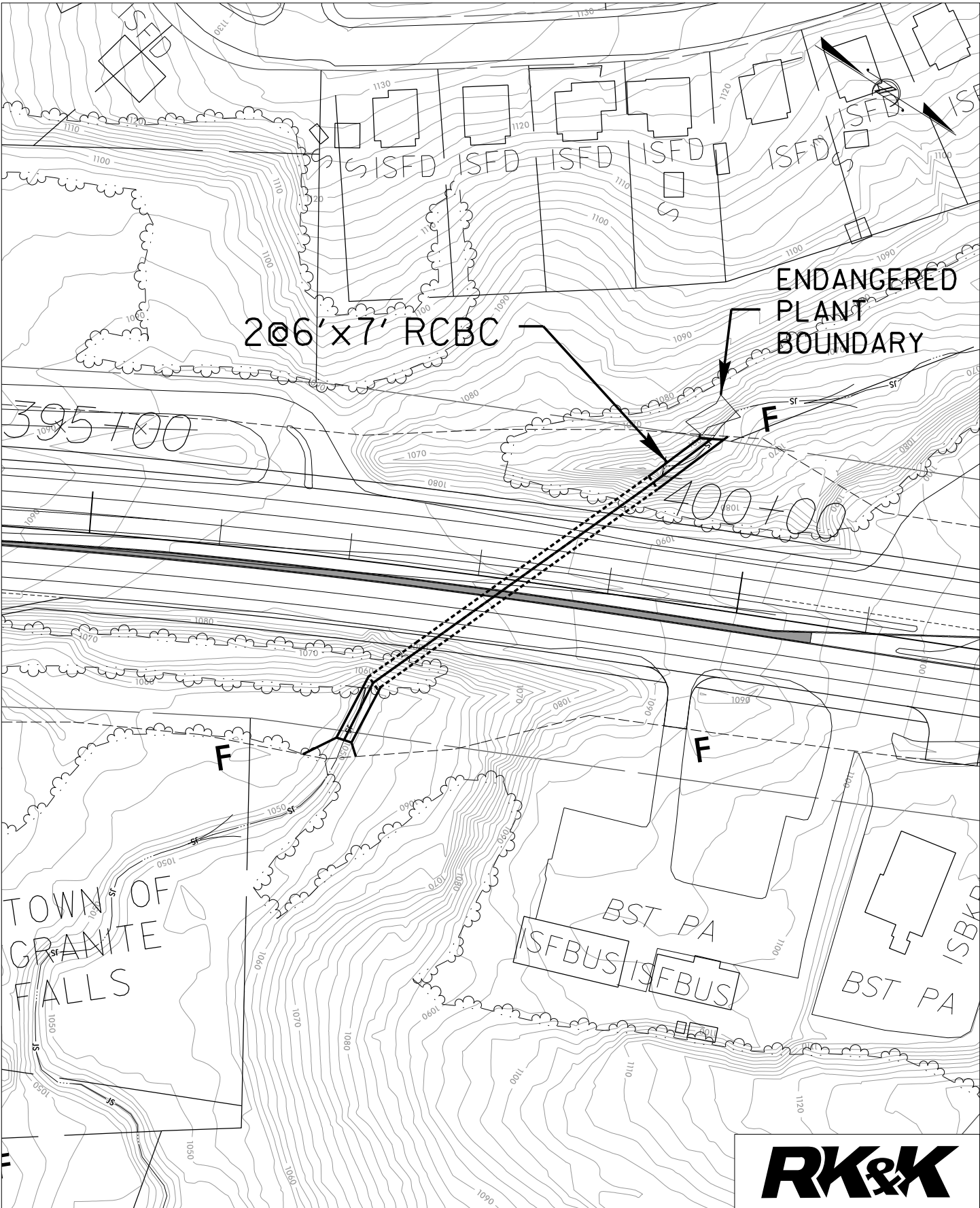
NEW TOTAL LENGTH: NB BRIDGE 1809'; SB BRIDGE 1720'

TIP PROJECT U-4700

SITE 2
 CATAWBA RIVER





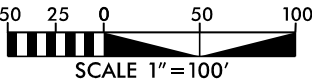


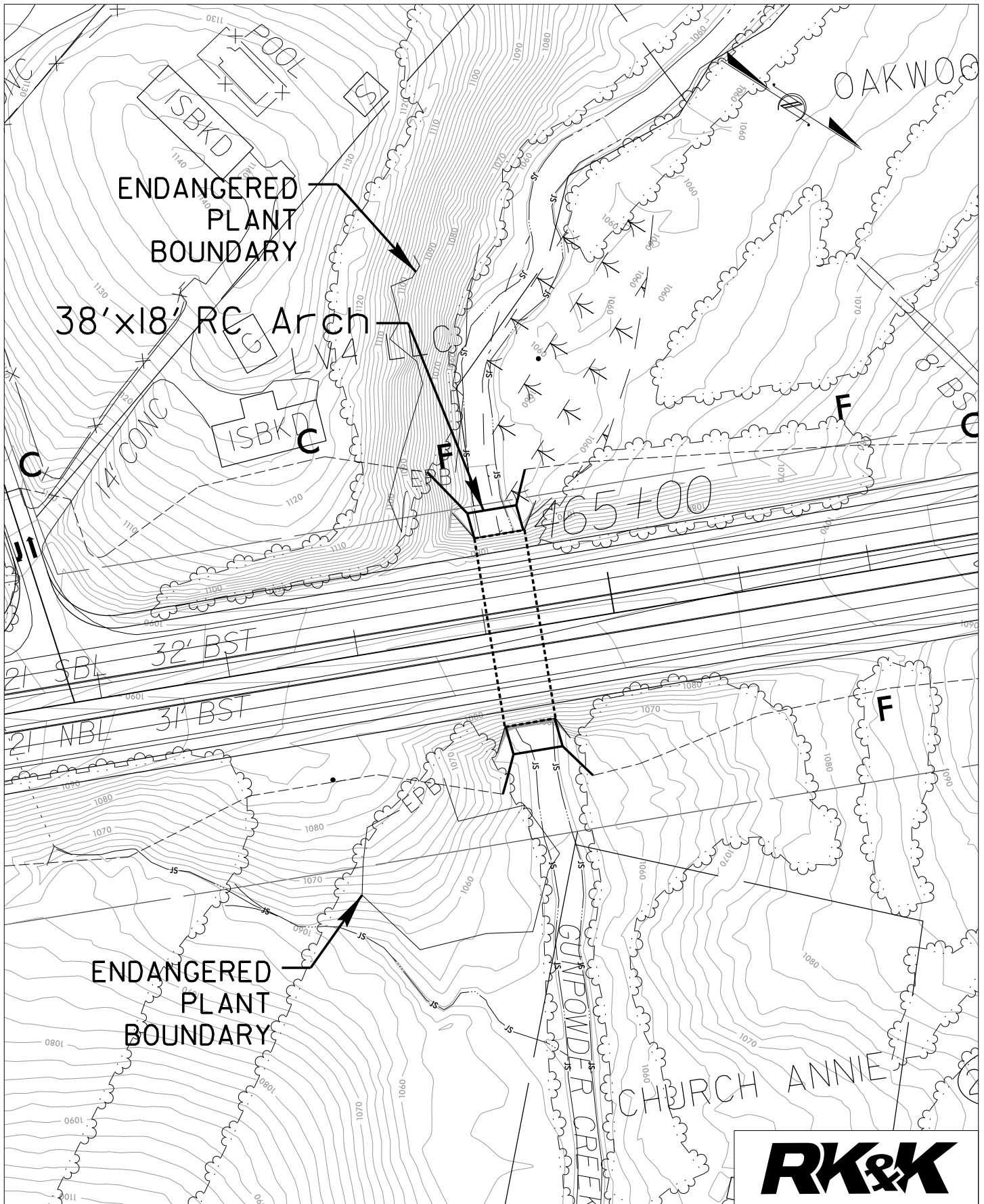
EXISTING STRUCTURE: 2@6'x7' RCBC, Total Length: 264'

PROPOSED STRUCTURE: Retain and Extend,
New Total Length: 369'

TIP PROJECT U-4700

SITE 4
BILLY BRANCH



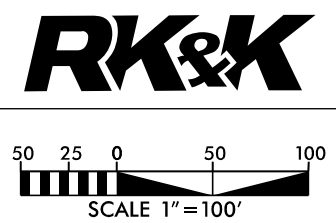


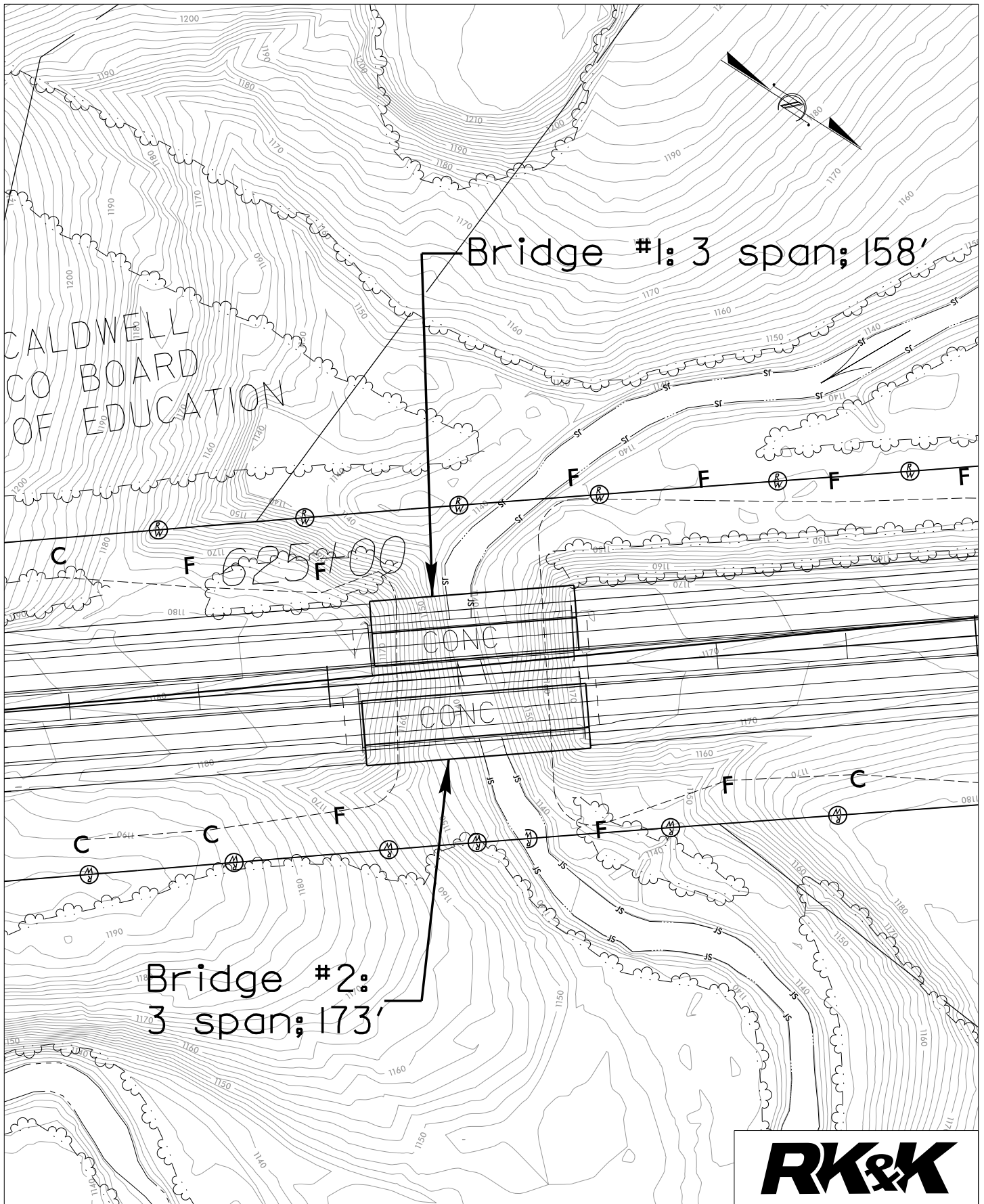
EXISTING STRUCTURE: 38'x18' RC Arch,
Total Length: 147'

PROPOSED STRUCTURE: Retain Existing and Extend,
New Total Length: 189.5'

TIP PROJECT U-4700

SITE 5
LITTLE GUNPOWDER CREEK





Bridge #1: 3 span; 158'

Bridge #2:
3 span; 173'

CALDWELL
CO BOARD
OF
EDUCATION

625 F+00

CONC
CONC

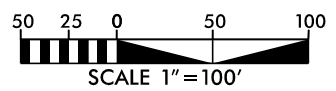


EXISTING STRUCTURES:

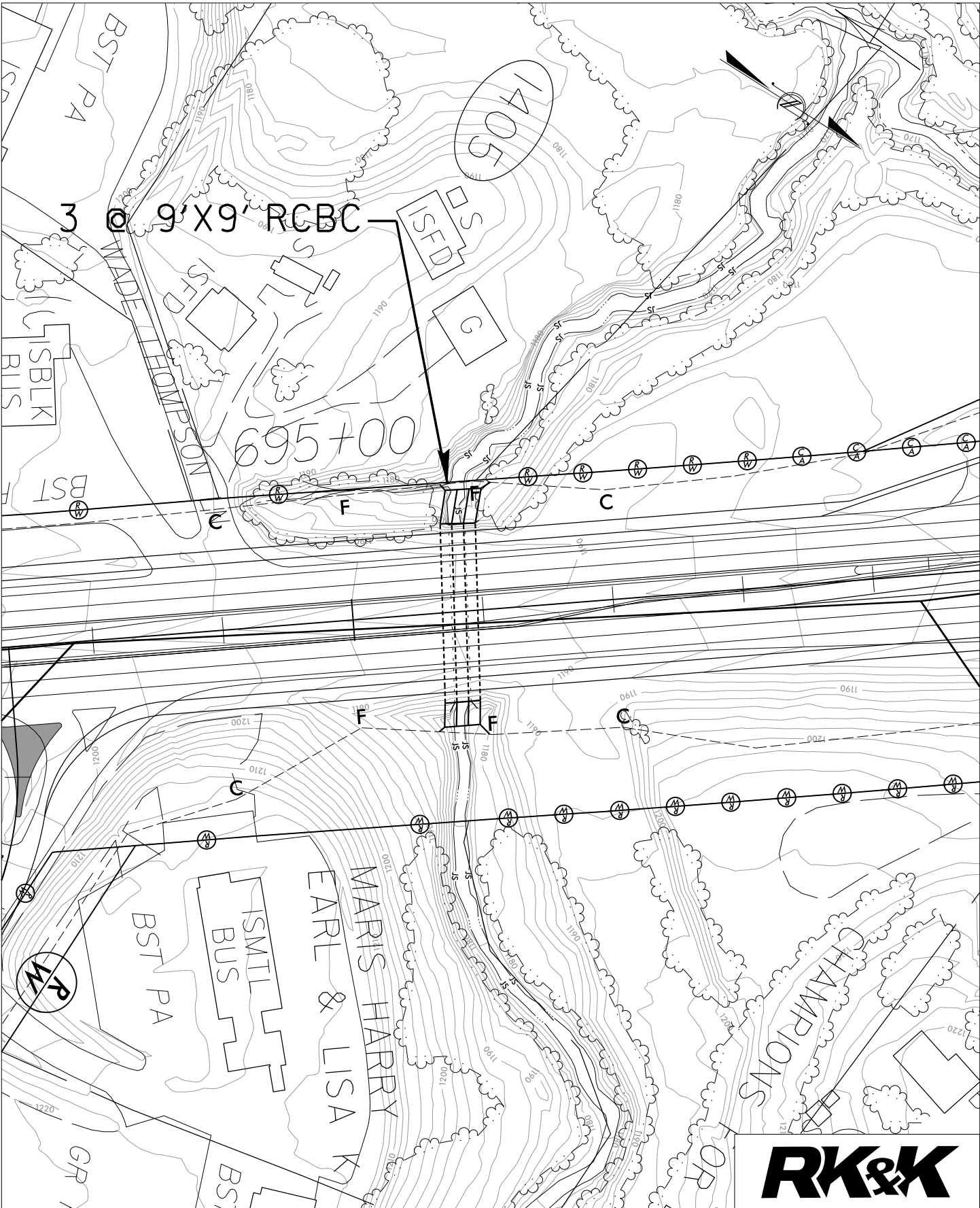
Bridge #1: 3 Span, Total Length: 158'
 Bridge #2: 3 Span, Total Length: 173'

TIP PROJECT U-4700

SITE 6
 GUNPOWDER CREEK



PROPOSED STRUCTURE: Retain Existing and Widen Bridges

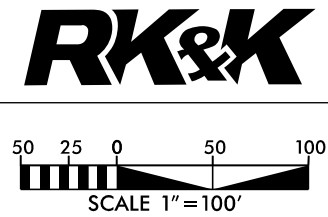


EXISTING STRUCTURES: 3 @ 9'x9' RCBC,
Total Length: 136'

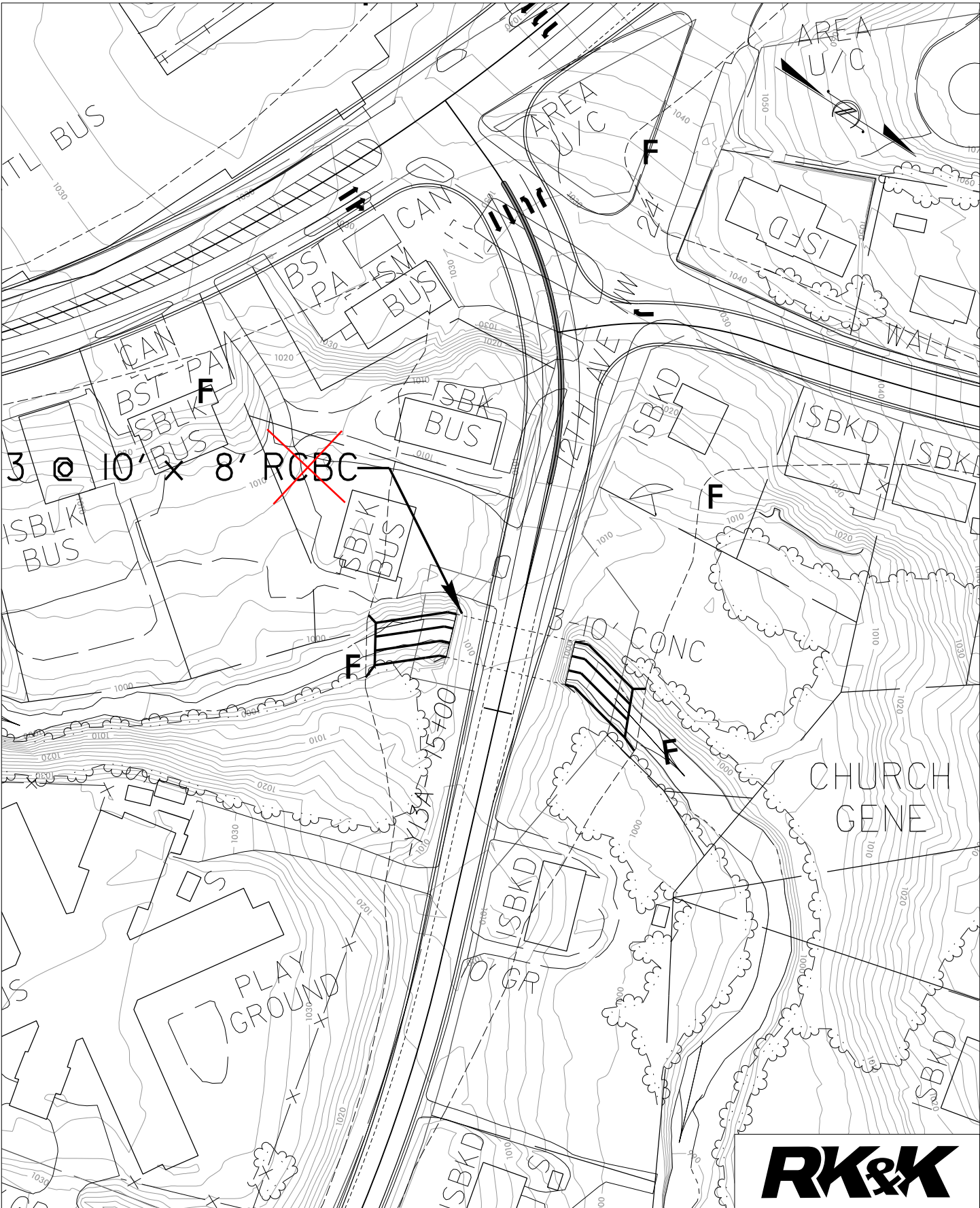
PROPOSED STRUCTURE: Retain Existing and Extend,
New Total Length: 182'

TIP PROJECT U-4700

SITE 7
BRUSHY FORK



RK&K

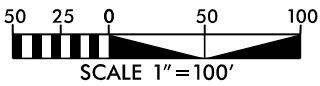


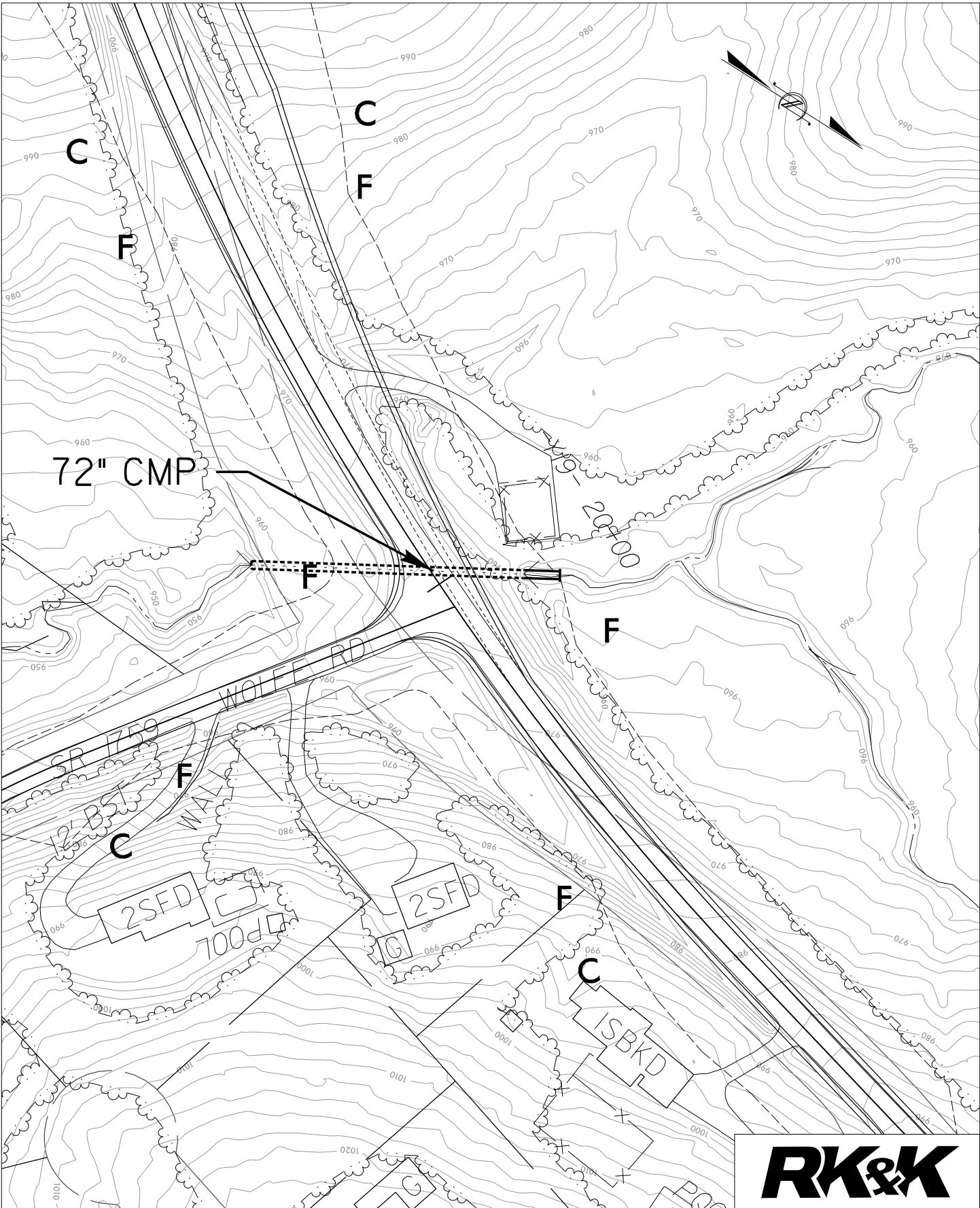
EXISTING STRUCTURES: 3 @ 10'x8' RCBC
 Total Length: 93'

PROPOSED STRUCTURE: Retain Existing and Extend,
 New Total Length: 212'

TIP PROJECT U-4700

~~SITE 16
 FRYE CREEK~~



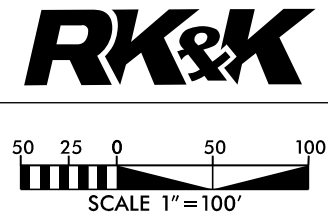


EXISTING STRUCTURES: 72" CMP
Total Length: 209'

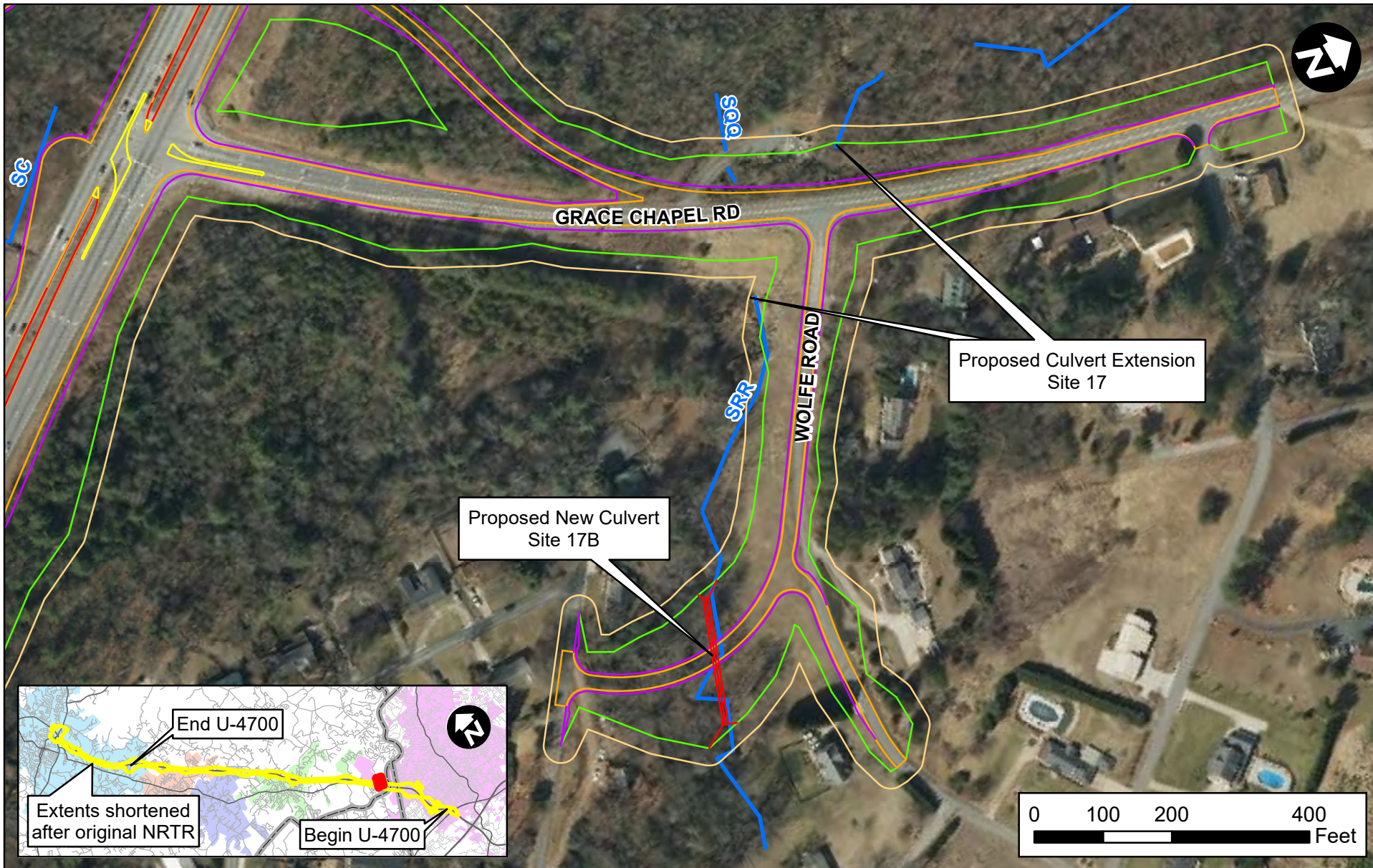
PROPOSED STRUCTURE: Retain Existing and Extend,
New Total Length: 237'

TIP PROJECT U-4700

SITE 17
UT TO CATAWBA RIVER

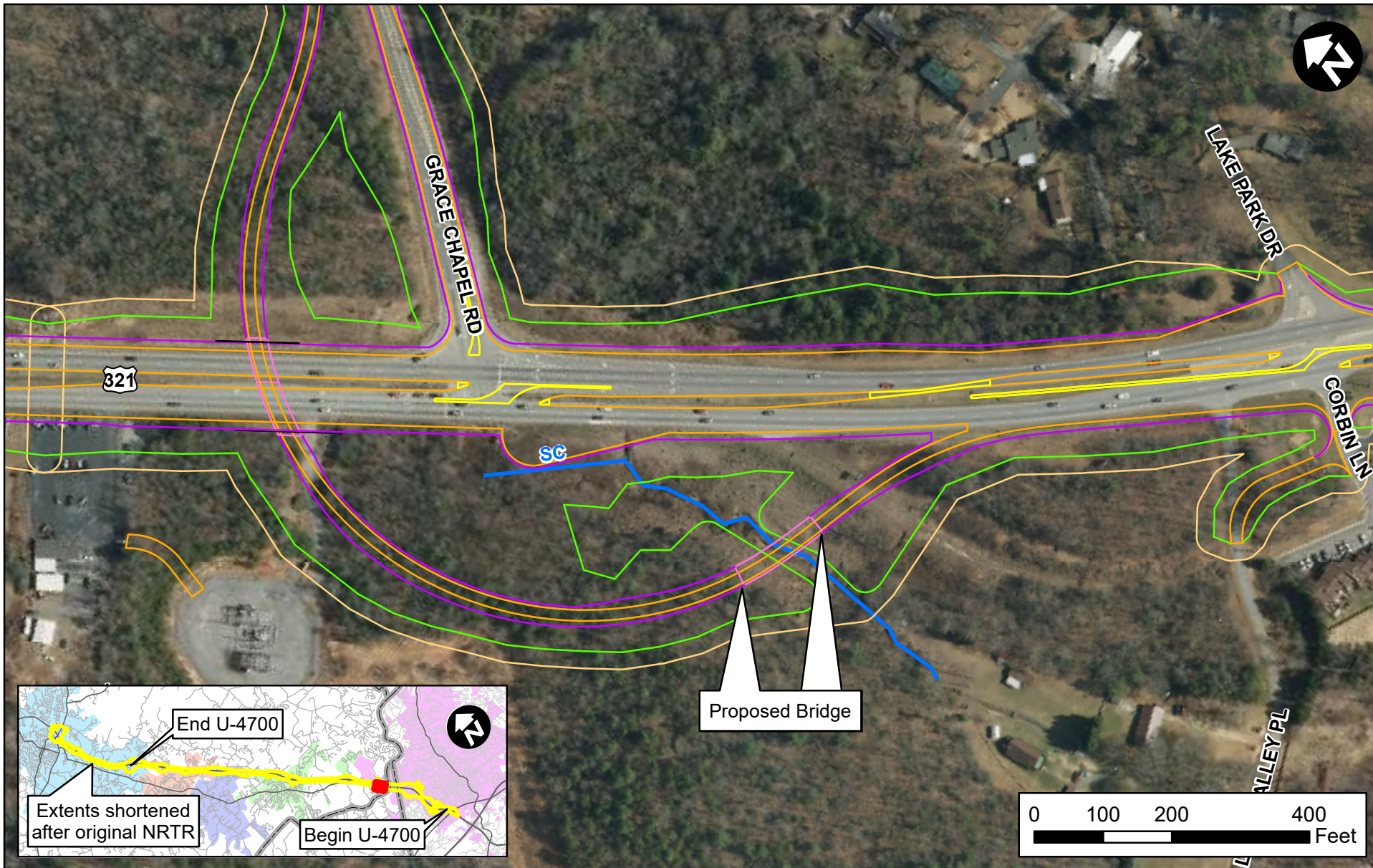


RK&K



- Proposed Concrete Structure
- Proposed Concrete Median
- Proposed Edge of Transportation
- Proposed Paved Shoulder
- Slope Stakes
- Delineated Streams
- 25 Ft. Buffer

U-4700 - U.S. 321 Widening
Figure 16: Site 17 and 17B - UT to Catawba River
 Existing Site 17 Structure: 72" CMP - Length: 209'
 Proposed Site 17 Structure: Retain Existing and Extend 28'
 Proposed Site 17B Structure: New 8' X 8' RCBC - Length: 190'
Catawba County



- Proposed Roadway Bridge
- Proposed Concrete Median
- Proposed Edge of Transportation
- Proposed Paved Shoulder
- Proposed Retaining Wall
- Slope Stakes
- Delineated Streams
- 25 Ft. Buffer

U-4700 - U.S. 321 Widening
Figure 17: Site 17A - UT to Catawba River
 Existing Structures: None
 Proposed Structure: Bridge - Length: 135'

Catawba County

Appendix B: Recommended Typical Sections

