



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

JAMES H. TROGDON, III
SECRETARY

June 26, 2019

Asheville Regulatory Field Office
US Army Corps of Engineers
151 Patton Avenue, Room 208
Asheville, North Carolina 28801-5006

ATTN: Ms. Nicholle Braspenickx, NCDOT Coordinator

Subject: **Request for Modification to Individual Section 404 and Section 401 Water Quality Certification** for the Winston-Salem Northern Beltway Interchange at US 52 (Future I-74), Forsyth County. Federal Aid Project No. NHP-0074(213), TIP Nos. R-2247EB. Division 9. Debit \$570 from WBS 34839.3.GV7

Reference: Section 404 and 401 Individual Permit Application requested October 2, 2017 for Winston Salem Northern Beltway from I-40 to US 52 (R-2247B Phase 2, CA, CB, CD, D, EA, EB, and EC), from US 52 to US 311 north (U-2579C Phase 2, D, E, and F) and from I-40 Business to US 311 South (U-2579AA and AB)

Section 404 Individual Permit issued for Winston Salem Northern Beltway from I-40 to US 52 (R-2247B Phase 2, CA, CB, CD, D, EA, EB, and EC), from US 52 to US 311 north (U-2579C Phase 2, D, E, and F) and from I-40 Business to US 311 South (U-2579AA and AB) January 22, 2018 (SAW-2017-02112)

Section 401 Water Quality Certification issued November 14, 2017 (WQC004131); Revision 1 dated November 27, 2017, Revision 2 dated December 21, 2017, Revision 3 dated February 7, 2019 for Winston Salem Northern Beltway from I-40 to US 52 (R-2247B Phase 2, CA, CB, CD, D, EA, EB, and EC), from US 52 to US 311 north (U-2579C Phase 2, D, E, and F) and from I-40 Business to US 311 South (U-2579AA and AB)

Dear Madam:

The purpose of this modification request is to provide final design and impact calculations for R-2247EB which was in preliminary design when the original permit was requested in 2017 for the proposed Winston Salem Northern Beltway from I-40 to US 52 (TIP Nos. R-2247B Phase 2, CA, CB, CD, D, EA, EB, and EC) and from US 52 to US 311 north (U-2579C Phase 2, D, E, and F) and from I-40 Business to US 311 South (U-2579AA and AB). R-2247EB is an approximately 2.94-mile section which includes widening along US 52 from Shore Road to Ziglar Road as well as a section of the Beltway to be

constructed that begins east of the intersection of Bethania-Rural Hall Road and Ziglar Road and extends to section U-2579F west of NC 66 (University Parkway).

The Winston-Salem Northern Beltway consists of multiple projects along the corridor length as shown in Figure 1. The original permit included impact tabulations for each of these projects along the corridor. As the Winston-Salem Northern Beltway corridor has been advanced a permit modification has been completed for each of the projects along its length with the permit modification updating and replacing the originally permitted impacts.

This permit modification is for the R-2247EB project which is an interchange of the Winston-Salem Northern Beltway, Future I-74 and US 52. The intersection of these roadways brings multiple project boundaries into the discussion. Additionally, the intersection of these roadways is in close proximity to the NC 65 interchange with US 52 which creates overlapping projects. The NC 65 interchange area with US 52 was to be upgraded in two separate projects. The first phase of the NC 65 upgrade revised the ramp configurations and NC 65 improvements were included as part of the R-2247EC project which was let as a design build project with the permit modification completed and construction underway. The second project R-2247EB focuses on upgrading US 52 including the interchange with the Winston-Salem Northern Beltway along with Future I-74 improvements. The overlapping portion of the R-2247EB and R-2247EC projects deal with the NC 65 ramp areas. Figure 2 provides the overlapping area as depicted in the original permit.

Over the elapsed time period from the original permit to today there has been several factors which affect the impacts tabulations. These include;

1. Project Limits
2. Original permit impact omissions
3. Permit sites impacted by multiple projects
4. Design revisions
5. 4B and 4C Process

PROJECT LIMIT UPDATES - Over the elapsed time period from the original permit to today the Department of Transportation revised the project limits of the R-2247EB and R-2247EA projects. Figure 3 illustrates the updated project limits. Specifically the western limit of R-2247EB has been shifted east of NC 65 effectively shortening R-2247EB in the east-west direction. This has the effect of lengthening the R-2247EA project by shifting its end point further east (east of NC 65). Additionally the R-2247EB project was extended to the ramp gore area of the Westinghouse Road interchange which is north of the original permit project limits as shown on Figure 3.

The original permit impact identification/tabulation included wetland impacts of 0.01acre at wetland 23 and 774 lf of impacts to stream QQ (Figure 4). As these impacts are no longer within the R-2247EB project limits they will shift to the R-2247EA project as illustrated in the permit impact narrative and tables in other sections of this document. The design of the project did not impact jurisdictional features within the short northern extension along US 52.

Effectively this will decrease impacts for the R-2247EB project and increase impacts to the R-2247EA project by 774 lf, respectively. The revision to the section totals are provided in Table 5.

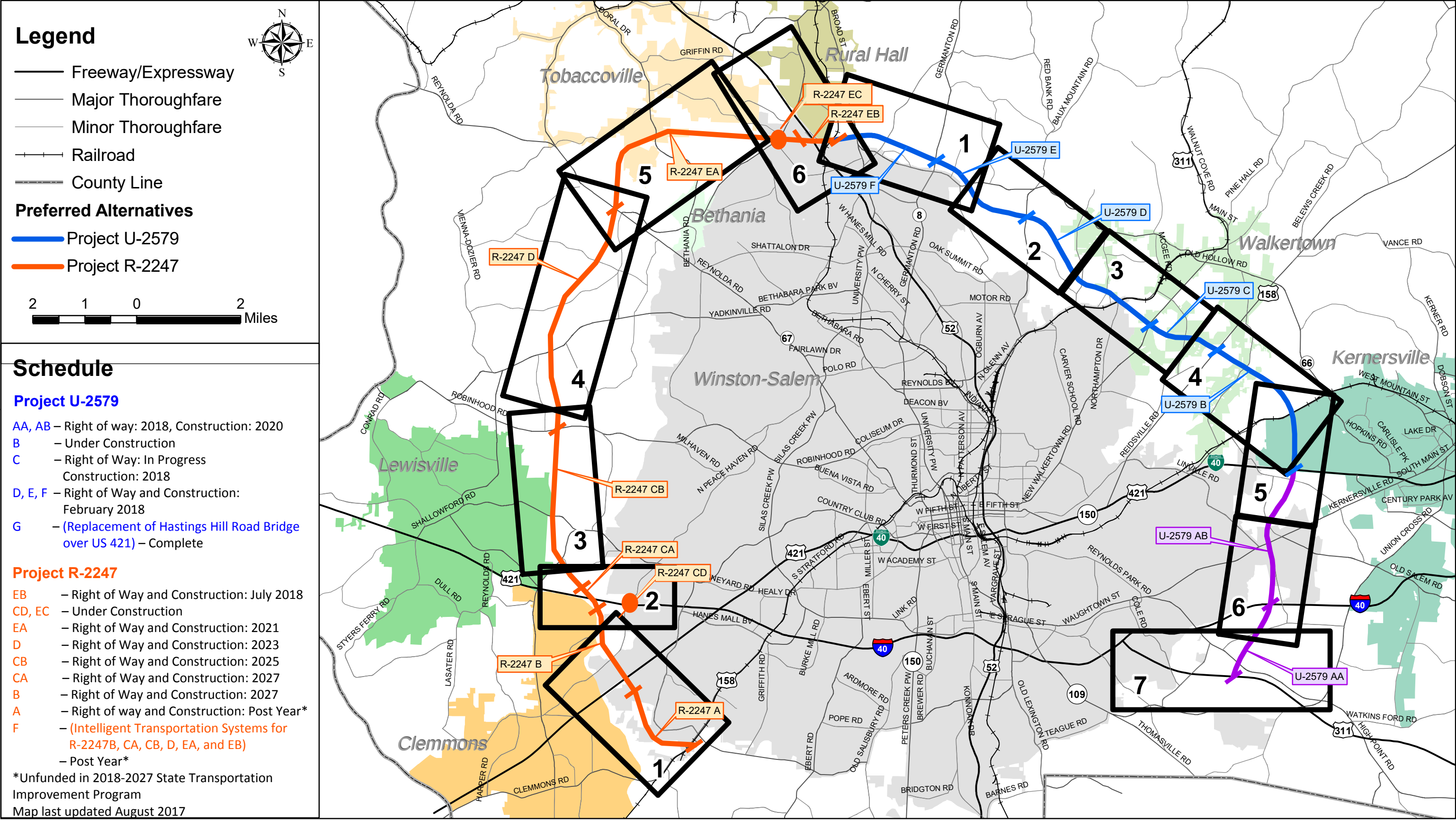
ORIGINAL PERMIT IMPACT OMISSIONS – The phased nature of the work in the NC 65 interchange under the R-2247EC and R-2247EB projects created the opportunity for impacts to be potentially missed. The original permit did not identify all impacts to stream WW and wetland W42 within the original permit footprint.



Winston-Salem Northern Beltway

Project R-2247, Project U-2579, and Project U-2579A

FIGURE 1



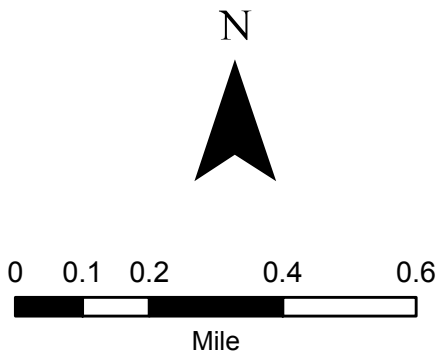
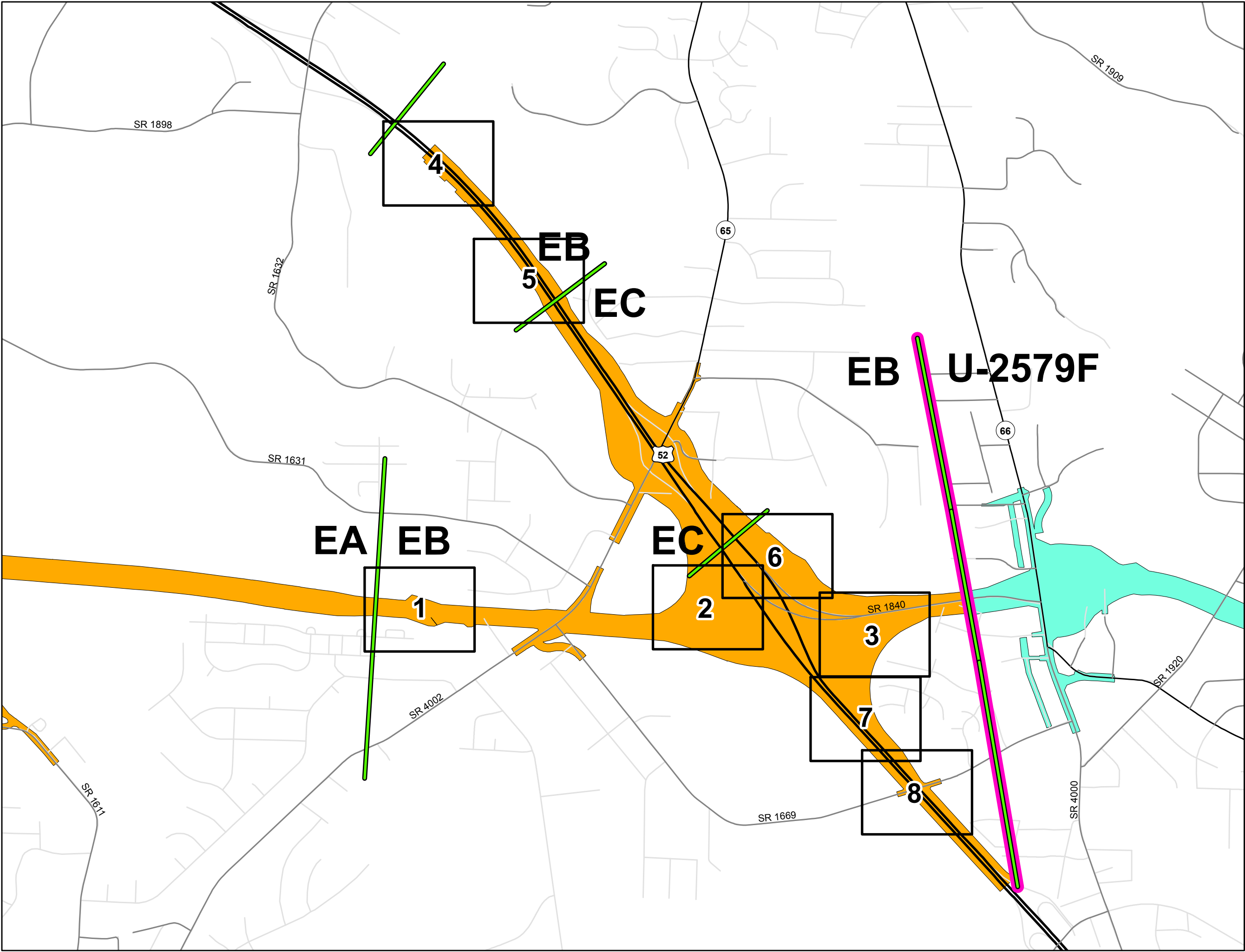


FIGURE 2

- Legend**
- U-2579 Corridor
 - R-2247 Corridor
 - R-2247 Section Breaks
 - R-2247/U-2579 Section Break
 - Section Map Sheets
 - Interstate
 - US Route
 - NC Route
 - Secondary Road
 - Other Existing Road

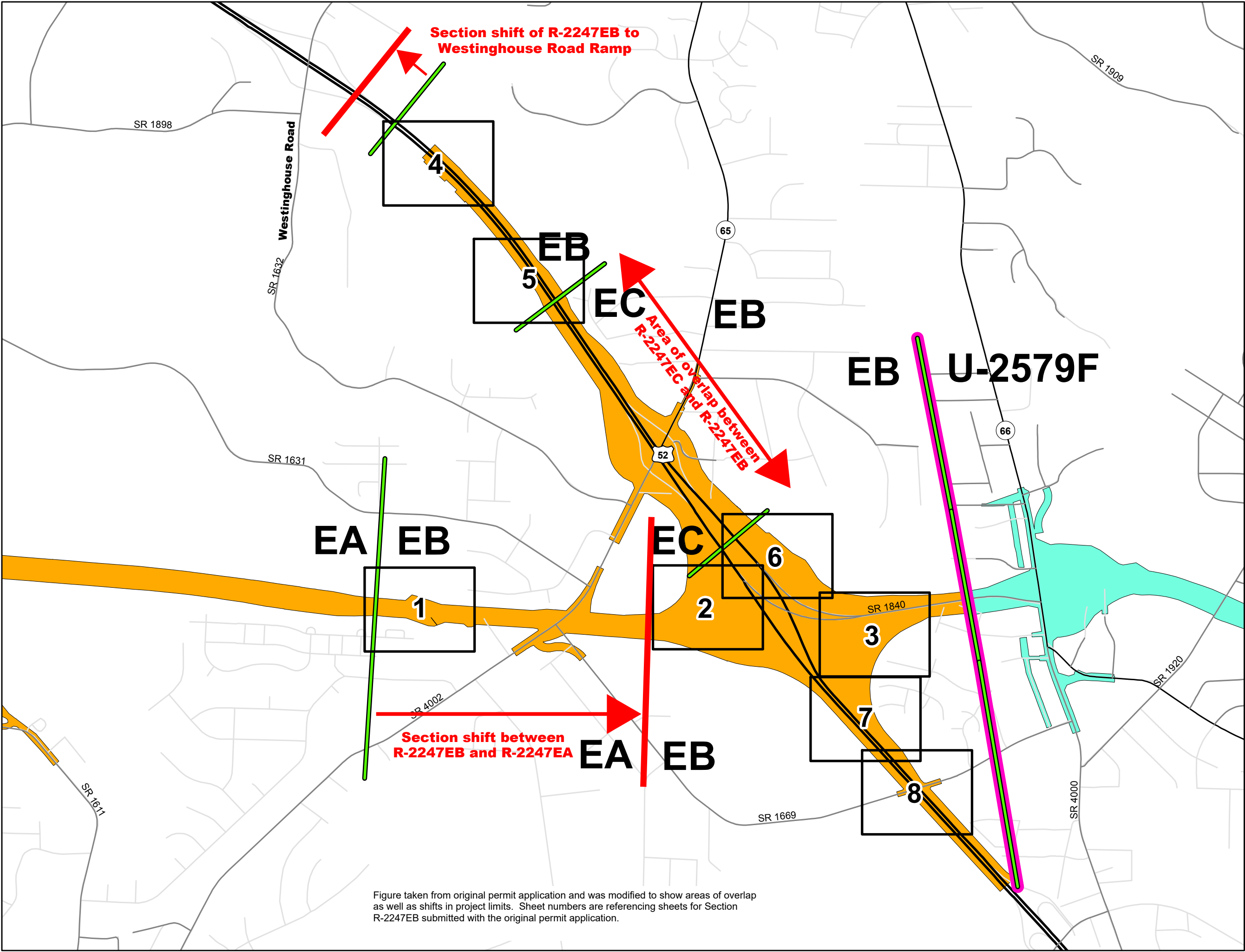


Figure taken from original permit application and was modified to show areas of overlap as well as shifts in project limits. Sheet numbers are referencing sheets for Section R-2247EB submitted with the original permit application.

FIGURE 3
Project Limits
With Section
Changes

— Shift/Revision in Project Limits

Legend

- U-2579 Corridor
- R-2247 Corridor
- R-2247 Original Section Breaks
- R-2247/U-2579 Section Break
- Section Map Sheets
- Interstate
- US Route
- NC Route
- Secondary Road
- Other Existing Road

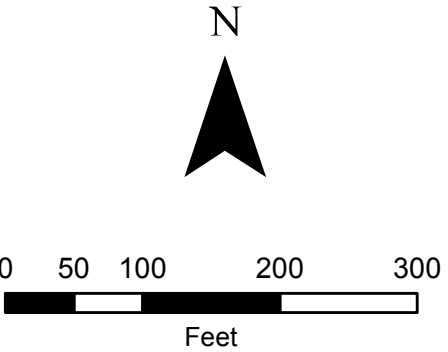
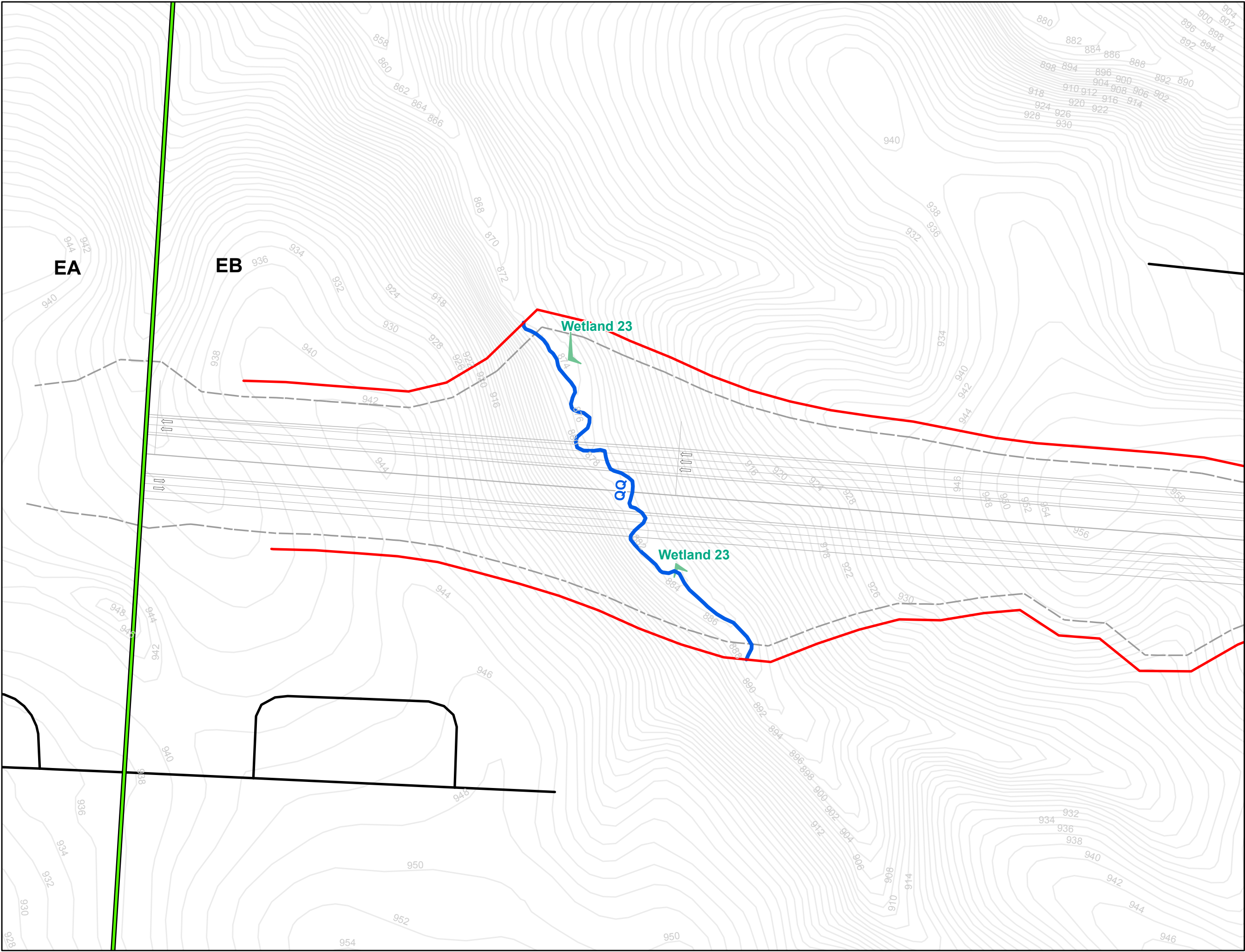


FIGURE 4

- Legend**
- R-2247EB Slope Stakes + 25' *
 - All Streams
 - All Wetlands
 - All Ponds
 - Streams within Slope Stakes + 25' *
 - Wetlands within Slope Stakes + 25' *
 - Ponds within Slope Stakes + 25'
 - Existing Roads
 - R-2247 Section Breaks
- * = Preliminary Impacts

PERMIT SITES IMPACTED BY MULTIPLE PROJECTS - The R-2247EB widening of US 52 within the R-2247EC project limits created additional impacts to wetlands W49, W50, W26 and streams III, TT, LLL, and SS which were not included in the impact tabulations for the R-2247EB project in the original permit. The overlapping nature of these impacts are addressed in permit impact sheets with a combination of shading and hatching and as shown in the table below:

Permit Sites Impacted by R-2247EB and R-2247EC

Feature	Wetland Size (ac)	R-2247EC Impacts (ac)	Impacts Mitigated under R-2247EC (ac)	Wetland Remaining (ac)	R-2247EB Change in Impacts Previously Mitigated (ac)	Additional Mitigation required under R-2247EB (ac)
W49 (Site 6B)	0.02	< 0.01 Fill	0.01	0.01	< 0.01	0.01 Fill
		< 0.01 Excavation			Excavation to Fill	
		< 0.01 Mechanized Clearing			< 0.01 Mechanized Clearing to Fill	
W50 (Site 8A)	0.15	0.04 Fill	0.06	0.09	0.02	0.02 Mechanized Clearing
		0.02 Mechanized Clearing			Mechanized Clearing to Fill	
W26 (Site 8C)	0.3	0.22 Fill	0.24	0.06	0.01	0.06 Fill
		0.01 Mechanized Clearing			Mechanized Clearing to Fill	

Stream	R-2247EC Impacts (lf)	Impacts Mitigated under R-2247EC (lf)	R-2247EB Change in Impacts (lf)	Additional Mitigation required under R-2247EB (lf)*
TT (Site 6A)	112 Permanent	112	10 Temporary to Permanent	31 Permanent
	20 Temporary			10 Temporary to Permanent
	15 Bank Stabilization			
LLL (Site 7)	156 Permanent	156	11 Temporary to Permanent	27 Permanent
	25 Temporary			11 Temporary to Permanent
	21 Bank Stabilization			
SS (Site 8B)	275 Permanent	275	33 Temporary to Permanent	33 Temporary to Permanent
	44 Temporary			
III (Site 9A)	30 Permanent	30	17 Temporary to Permanent	504 Permanent
	17 Temporary			17 Temporary to Permanent

Notes: * These wetland and stream impacts are included in the permanent impact totals requiring mitigation for R-2247EB shown in Tables 1 and 2, respectively.

DESIGN REVISIONS – The design requirements for the R-2247EB project were updated to include higher design speed for selected roadways which increased impacts for the interchange. For example, the higher design speed for Ramp B resulted in design revisions which increased the footprint of the project and increased impacts to streams RR and VV totaling 320 lf. The design of the project included adjusting multiple elements to meet the required criteria and a detailed accounting of how these revisions incrementally affect impacts is not feasible. However, this process was implemented with a focus of decreasing impacts through avoidance and minimization where practicable and feasible and these efforts are discussed in a separate section. During the design update the interchange was shifted slightly from northeast to southwest which decreased impacts to streams DDD and WW while increasing impacts to wetlands W43, W34 and streams VV and RR. These changes in impacts due to design changes were included in the information presented at the 4B and 4C meetings.

4B and 4C Process – The advancement of the design of the project identified and quantified impacts which were discussed at the 4B and 4C meeting. These discussions determined that wetlands W29 and W26 would be a total take in lieu of a partial impact. Ultimately the changes in impacts from the original permit to the current impacts is a combination of the factors above.

There will be 5,817 linear feet of permanent stream impacts and 516 linear feet of temporary stream impacts associated with construction of the section R-2247EB project. Permanent impacts to wetlands total 0.43 acre due to fill, excavation, and mechanized clearing on the R-2247EB project. No temporary wetland impacts due to fill or hand clearing will occur during project construction.

Please see the enclosed mitigation acceptance letter, SHPO concurrence memorandum, Concurrence Point 4B and 4C meeting minutes, Stormwater Management Plan, permit drawings, and roadway plans for section R-2247EB.

Information regarding project purpose and need, NEPA document status, resource status, federally protected species, moratorium, indirect cumulative impact analysis, cultural resources, wild and scenic rivers, and FEMA compliance submitted in the original permit application remains valid and is incorporated by reference.

In March 2019, the SHPO concurred with findings from the archaeological data recovery at site 31FY925. Based on the fieldwork Management Summary it was concluded that the stones on site were probably placed as a property boundary rather than being part of a potential mill site. It was determined that archaeological site 31FY925 is not eligible for listing in the National Register of Historic Places (NRHP) and that further reporting of this resource is not necessary.

Impacts to Waters of the U.S.

Tables 1 and 2 summarize the impacts to jurisdictional water resources for the final design of R-2247EB. Site numbers correspond with the permit (hydraulic) drawings included in this application. The stream and wetland site IDs correspond with the Preliminary Jurisdiction Determination Report, R-2247 / U-2579, January 2016. A brief description of each impact site will follow the tables.

Table 1. R-2247EB Wetlands Impacts*

Permit Site Number	Site ID ¹	Wetland Size (ac) ²	Permanent Fill Impacts (ac)	Excavation (ac)	Mechanized Clearing (ac.)	Impacts Requiring Mitigation (ac)
6B ⁴	W49	0.02	0.01	0	0	0.01
8A ⁴	W50	0.15	0.02	0	0.02	0.02
8C ⁴	W26	0.30	0.07	0	0	0.06

Permit Site Number	Site ID¹	Wetland Size (ac)²	Permanent Fill Impacts (ac)	Excavation (ac)	Mechanized Clearing (ac.)	Impacts Requiring Mitigation (ac)
9B	W42	0.27	0.12	0.06	0.04	0.22
11	W43	0.04	0.03	< 0.01	< 0.01	0.04
12B	W34	0.04	0	< 0.01	< 0.01	0.01
13B	W30	< 0.01	< 0.01	0	0	< 0.01
17A	W29	0.07	0.02	0.05	0	0.07
Total³:			0.29	0.12	0.07	0.43

Notes: * Wetlands impacted are riparian.

1 Wetland number corresponds with the Preliminary Jurisdictional Determination Report, R-2247 / U-2579, January 2016 labeling.

2 Wetland size is based on NCDOT WET File.

3 Rounded totals are the sum of actual impacts to 1/1000th.

4 Totals for impact type include changes from those permitted for section R-2247EC. Impacts that were previously mitigated for in the R-2247EC section have been subtracted from the "Impacts Requiring Mitigation" column for section R-2247EB.

Site 6B impacts are due to roadway fill and for the extension of a 48" RCP and the widening of US 52 (Future I-74). Wetland impacts at this location are in addition to previously permitted impacts for section R-2247EC (Site #1) and also include changes in impact types for impacts that were previously mitigated. Impacts will be 0.01 acre of wetland fill, of which < 0.01 acre was for previously permitted excavation and < 0.01 acre was for previously permitted mechanized clearing impacts. New wetland fill impacts that have not been mitigated for are 0.01 acre and will result in a total take of wetland W49.

Site 8A impacts are due to roadway fill and mechanized clearing needed to tie in the ramp on the Y62LPA roadway alignment with the previously permitted section R-2247EC (Site #4). There will be a total of 0.04 acre of wetland impacts at Site 8A which include 0.02 acre of new mechanized clearing impacts, as well as < 0.01 acre of fill impacts, and 0.02 acre of fill that was previously permitted and mitigated for as mechanized clearing for section R-2247EC (Site #4).

Site 8C impacts are due to roadway fill necessary for the Y62RPB alignment. Impact totals at this site are 0.07 acre of wetland fill, of which 0.06 acre will be new impact and 0.01 acre will be changing in impact type from mechanized clearing to wetland fill. This 0.01 acre of impact was permitted and mitigated for in section R-2247 EC (Site #5). This will be a total take of wetland W26.

Site 9B impacts are for the overpass of the South Bound US 52 over the Y62RPC alignment. Proposed wetland impacts include roadway fill, excavation, and mechanized clearing. A lateral base ditch will be used to convey stormwater along the toe of slope and into Stream III. There will be 0.12 acre of wetland fill, 0.06 acre excavation impact, and 0.04 acre of mechanized clearing associated with roadway fill and the lateral base ditch.

Site 11 impacts are due to fill, excavation and mechanized clearing needed for the roadway as well as a lateral base ditch being placed at the toe of slope along the RPC alignment. Of the 0.04 acre of permanent wetland impacts at Site 11, 0.03 acre is due to fill impacts, < 0.01 is for mechanized clearing, and < 0.01 acre is for excavation. Site 11 is a total take of wetland W43.

Site 12B impacts are necessary for a proposed channel change along the toe of slope of the RPC alignment. Wetland impacts at this location include excavation and mechanized clearing needed to tie the existing stream, which runs through wetland W34, to the proposed channel. Permanent impacts of 0.01 acre are proposed, of which < 0.01 acre is for excavation and < 0.01 acre is for mechanized clearing.

Site 13B impacts are necessary for roadway fill and placement of a 42" RCP. Wetland impacts at this site are < 0.01 acre and will result in a total take of wetland W30.

Site 17A impacts include wetland excavation of 0.05 acre and 0.02 acre fill. Wetland W29 appears to be an abandoned sediment basin that was left in place after construction. The proposed design would involve breaching the dam, placement of a 36 inch RCP, grading, and stabilizing the channel down to Grassy Creek. Impacts at this site will result in a total take of wetland W29.

Table 2. R-2247EB Surface Water Impacts and Descriptions

Permit Site Number	Stream ID/Waterbody	Type of Stream	Impact Type	Permanent Impacts lf	Temporary Impacts lf	Permanent Impacts Requiring USACE Mitigation
1	QQQ	Perennial	2 @ 7' x 7' RCBC	23	17	Yes
1	QQQ	Perennial	Bank Stabilization	43	0	No
2	PPP	Intermittent	Roadway Fill	85	0	Yes
3	OOO	Intermittent	Roadway Fill	50	0	Yes
4A	UU	Perennial	8' x 7' RCBC	30	16	Yes
4A	UU	Perennial	Bank Stabilization	39	0	No
4B	UU	Perennial	Outlet Protection	40	7	Yes
5	WWW	Intermittent	30" Alternate Pipe	12	0	Yes
5	WWW	Intermittent	Outlet Protection	29	0	Yes
6A	TT	Perennial	48" RCP	15	25	Yes
6A	TT	Perennial	Outlet Protection	16	0	Yes
6A	TT	Perennial	Perm. Fill Change	10	0	Yes
7	LLL	Perennial	Outlet Protection	27	25	Yes
7	LLL	Perennial	Perm. Fill; Change in Type	11	0	Yes
8B	SS	Intermittent	Perm. Fill; Change in Type	33	0	Yes
9A	III	Perennial	Roadway Fill	504	0	Yes
9A	III	Perennial	Perm. Fill; Change in Type	17	0	Yes
10A	VV	Perennial	Rip Rap Fill	30	26	Yes*
10B	VV	Perennial	Bank Stabilization	8	23	No
10C	VV	Perennial	4' x 5' RCBC	281	28	Yes*
10C	VV	Perennial	Outlet Protection	33	0	Yes*
10C	VV	Perennial	Bank Stabilization	30	0	No
10D	VV	Perennial	Bank Stabilization	47	0	No
10E	VV	Perennial	5' x 5' RCBC	343	25	Yes*
10E	VV	Perennial	Bank Stabilization	24	0	No
10E	VV	Perennial	Outlet Protection	29	0	Yes*
10F	VV	Perennial	6' x 5' RCBC	215	27	Yes*
10F	VV	Perennial	Bank Stabilization	33	0	No
10F	VV	Perennial	Outlet Protection	47	0	Yes*
10G	VV	Perennial	Bank Stabilization	97	0	No
10H	VV	Perennial	7' x 5' RCBC	273	27	Yes*
10H	VV	Perennial	Rip Rap Fill	75	0	Yes*
12A	RR	Perennial	Roadway Fill/ Channel Change	282	11	Yes
13A	DDD	Intermittent	42" Alternate Pipe	52	0	Yes
13A	DDD	Perennial	42" Alternate Pipe	23	25	Yes
13A	DDD	Perennial	Outlet Protection	36	0	Yes
14A	WW	Perennial	8' x 6' RCBC	154	10	Yes*
14A	WW	Perennial	Bank Stabilization	24	0	No
14B	WW	Perennial	8' x 6' RCBC/ Channel Change	926	0	Yes*

Permit Site Number	Stream ID/Waterbody	Type of Stream	Impact Type	Permanent Impacts lf	Temporary Impacts lf	Permanent Impacts Requiring USACE Mitigation
15A	Grassy Creek (XX)	Perennial	2 @ 9' x 9' RCBC	83	27	Yes*
15A	Grassy Creek (XX)	Perennial	Bank Stabilization	37	0	No
15B	Grassy Creek (XX)	Perennial	Roadway Fill/ Channel Change	1,092	25	Yes*
15C	Grassy Creek (XX)	Perennial	Bank Stabilization	34	22	No
15D	Grassy Creek (XX)	Perennial	Bank Stabilization	13	44	No
15E	Grassy Creek (XX)	Perennial	Bank Stabilization	13	19	No
15F	Grassy Creek (XX)	Perennial	Bank Stabilization	19	26	No
15G	Grassy Creek (XX)	Perennial	2 @ 9' x 9' RCBC	334	22	Yes*
15G	Grassy Creek (XX)	Perennial	Rip Rap Fill	27	0	Yes*
16	AAA	Perennial	7' x 6' RCBC	39	27	Yes
16	AAA	Perennial	Inlet Protection	22	0	No
17B	ZZ	Intermittent	Ditch Excavation	25	0	Yes
18	NNNN	Intermittent	Bank Stabilization	33	12	No
Total:				5,817	516	
Total Permanent Impacts (Perm. Fill + Bank Stabilization):				5,817		
Bank Stabilization:				494		
Total Impacts Requiring Mitigation:				5,323		

*NCDWR-required mitigation totals 3,942 lf.

Site 1 and Site 2 impacts are due to the extension of a double 7' x 7' RCBC with headwall and wingwalls as well as roadway fill for the expansion of US 52 (Future I-74). In order to match the existing culvert, the proposed culvert extension will not be buried or have sills placed inside the barrels. Lateral base ditches will be placed parallel to the roadway fill slope and rip rap will be placed on both embankments of the stream where the base ditches discharge into the stream. Of the 66 lf of permanent stream impacts at Site 1, 23 lf is due to the installation of the double 7' x 7' RCBC extension and 43 lf is due to bank stabilization. All of the 85 lf of permanent stream impacts at Site 2 are due to roadway fill.

Site 3, Site 4A, and Site 4B impacts are due to the extension of an 8' x 7' RCBC with headwalls and wingwalls, roadway fill, installation of a supplemental 60" welded steel pipe, and outlet channel protection for the expansion of US 52 (Future I-74). The proposed 8' x 7' RCBC will match the existing culvert and will not be buried or have sills placed within either of the barrels. Bank stabilization will be installed along the stream where two lateral base ditches discharge, upstream of the culvert. Embedded rip rap outlet protection will be installed on the downstream end of the culvert that also serves as the discharge point of the 60" steel pipe, lateral base ditch, and 24" RCP. The 60" supplemental steel pipe is designed to meet the 50 Year Storm Event in conjunction with the existing 8' x 7' RCBC and will be installed using trenchless methods. A retaining wall was added to avoid utility conflict on the downstream end which also reduced stream impacts. All of the 50 lf of permanent stream impacts at Site 3 are due to roadway fill and the installation of a supplemental pipe. Of the 69 lf of permanent stream impacts at Site 4A, 30 lf is due to the installation of the 8' x 7' RCBC extension and 39 lf is due to bank stabilization. The 40 lf of permanent stream impacts at Site 4B is due to outlet channel protection embedded in the stream for the supplemental pipe, the 8' x 7' RCBC, and a 24" RCP stormwater pipe.

Site 5 impacts are due to outlet channel protection and for installation of a 30" alternate steel pipe. The 30" steel pipe will be installed using trenchless methods and will replace a 15" CMP and a 24" CMP. The existing pipes will be filled and stormwater inputs to these pipes will be directed to the new pipe. Of the 41 lf of permanent stream impacts at Site 5, 29 lf is due to outlet channel protection and 12 lf is due to the installation of the 30" alternate steel pipe.

Site 6A impacts are due to the extension of a 48" RCP and rip rap channel protection for the expansion of US 52 (Future I-74). Previous permanent impacts of 28 lf for section R-2247EC (Site #1) have been permitted and mitigated for at this location. There will be a change in impact type from temporary surface water impacts permitted in R-2247EC to permanent surface water impacts of 10 lf. Additional permanent impacts include 41 lf of stream impacts. Of the 41 lf of permanent stream impacts at Site 6A, 15 lf is due to the installation of the 48" pipe extension and corresponding roadway fill, 16 lf is due to outlet channel protection which will be embedded into the natural stream bottom, and 10 lf is from surface water impacts that changed from temporary to permanent impacts for the extension of the culvert.

Site 7 impacts are due to the extension of a 66" RCP and outlet channel protection for the expansion of US 52 (Future I-74). Previous impacts for section R-2247EC (Site #2) have been permitted and mitigated for at this location. Additional permanent impacts include 38 lf of stream impacts. Of the 38 lf of permanent stream impacts at Site 7, 11 lf is due to the installation of the 66" pipe extension which is a change from temporary impacts permitted as part of section R-2247EC to permanent impacts. At the outlet of the proposed pipe and at the discharge point of a lateral base ditch there will be 27 lf of permanent outlet channel protection/rip rap which will be embedded into the natural stream bottom.

Site 8B impacts are due to the installation of a 15" RCP for the expansion of US 52 (Future I-74). Previous impacts for section R-2247EC (Site #6) have been permitted and mitigated for at this location. Impacts to surface water at this location change in impact type from temporary impacts permitted for section R-2247EC to permanent impacts for a total of 33 lf. The 33 lf of permanent stream impacts at Site 8B is due to the installation of the 15" RCP that will connect a pipe running under the SB52 alignment with a previously permitted downstream pipe which runs under the Y62RPB ramp alignment.

Site 9A and Site 10A impacts are due to roadway fill, and rip rap channel protection for the overpass of the SB52 alignment over the Y62RPC alignment. Previous impacts for section R-2247EC (Site #8) have been permitted and mitigated for at this location. Additional permanent impacts include 521 lf of stream impacts at Site 9A and 30 lf of permanent impacts at Site 10A. The 521 lf of permanent stream impacts at Site 9A is due to the roadway fill and corresponding piping of the stream to accommodate the overpass. Of the 521 lf of permanent impacts, 504 lf is new roadway fill impact while 17 lf was previously permitted as a temporary impact for section R-2247EC and is being reported as a change in impact type. A lateral base ditch running along the toe of slope will convey stormwater and discharge into the upstream end of Stream VV. The 30 lf of permanent stream impacts at Site 10A is due to rip rap channel protection which will be embedded into the natural bottom of the stream.

Site 10B impacts are due to bank stabilization at a 24" RCP stormwater outfall coming from the expansion of US 52 (Future I-74). Permanent impacts of 8 lf are proposed at this site.

Site 10C, Site 10D, and Site 10E impacts are due to the interchange at US 52. Roadway impacts include installation of a 4' x 5' RCBC, installation of a 5' x 5' RCBC, bank stabilization, and rip rap channel protection. Of the 344 lf of permanent impacts at Site 10C, 281 lf is due to installation of the 4' x 5' RCBC, 30 lf is for bank stabilization, and 33 lf is due to outlet channel protection which will be embedded into the natural stream bottom. There is 47 lf of permanent stream impact for bank stabilization at Site 10D between the two new sections of culvert which will also be the discharge point of four lateral base ditches running along the proposed toe of slope for the RPB alignment and the LPB alignment. Of the 396 lf of permanent impacts at Site 10E, 343 lf is due to installation of the 5' x 5'

RCBC, 24 lf is for bank stabilization at the culvert inlet, and 29 lf is for outlet channel protection which will be embedded into the natural stream bottom.

Site 10F and Site 10G impacts are due to the interchange at US 52. Roadway impacts include installation of a 6' x 5' RCBC, bank stabilization, and rip rap channel protection. Of the 295 lf of permanent impacts at Site 10F, 215 lf is due to installation of the 6' x 5' RCBC, 47 lf is for embedded channel protection at the outlet of the proposed culvert and 33 lf is for bank stabilization where two lateral base ditches discharge into the stream at the inlet to the culvert. The 97 lf of permanent stream impact at Site 10G is for bank stabilization on the downstream end of the culvert.

Site 10H and Site 12A impacts are due to alignments EBBYP and RPC of the interchange at US 52. Roadway impacts include installation of a 7' x 5' RCBC, rip rap fill at the culvert outlet, and a channel change. Of the 348 lf of permanent impacts at Site 10H, 273 lf is due to installation of the 7' x 5' RCBC and 75 lf is due to channel protection/rip rap at the outlet of the proposed culvert. The 282 lf of permanent stream impact at Site 12A is for roadway fill impacts associated with the interchange. Water from this stream will be redirected through the channel change at wetland W34.

Site 13A impacts are due to installation of an alternate 42" steel pipe and outlet channel protection. Of the 111 lf of permanent impacts at Site 13A, 75 lf is due to the installation of the 42" RCP and 36 lf is for placement of embedded outlet channel protection.

Site 14A impacts are due to a proposed 8' x 6' RCBC under the RPA alignment of the interchange at US 52. Permanent surface water impacts are anticipated for the installation of an 8' x 6' RCBC along with bank stabilization at the discharge point of a lateral base ditch near the culvert inlet. Of the 178 lf of permanent impacts at Site 14A, 154 lf is due to the installation of the 8' x 6' RCBC and 24 lf is for bank stabilization at the culvert inlet.

Site 14B and Site 15D impacts are due to the interchange at US 52. Roadway impacts include installation of an 8' x 6' RCBC as well as a channel relocation. Permanent impacts totaling 926 lf at Site 14B are due to the installation of the 8' x 6' RCBC and channel relocation. Stream WW will be piped under the EBBYP alignment and discharge into a rip rap-lined channel which will then discharge into Grassy Creek (XX) at Site 15D. Permanent impacts of 13 lf at Site 15D are for bank stabilization where the relocated channel for Stream WW enters Grassy Creek.

Site 15A and Site 15B impacts are due to the RPD alignment of the US 52 Interchange. Permanent impacts include roadway fill needed for the relocation and piping of Grassy Creek along with bank stabilization at the culvert inlet at Site 15A. Of the 120 lf of permanent impacts at Site 15A, 83 lf will be for the installation of a double 9' x 9' RCBC and 37 lf will be for bank stabilization at the culvert inlet north of the WBBYP alignment. There will be permanent impacts of 1,092 lf at Site 15B which will tie into Site 15A at the double 9' x 9' culvert. Site 15B begins where Grassy Creek currently exits the culvert running under US 52 and includes the placement of the double 9' x 9' RCBC as well as a channel change that ties back into Grassy Creek approximately 150 feet east of Norfolk Southern (NS) Railroad tracks. The double 9' x 9' RCBC will be buried one foot and include a flood bench.

Site 15C impacts are due to stormwater drainage design south of the EBBYP alignment of the interchange at US 52. All of the 34 lf of permanent impacts are due to bank stabilization at the outfall of a 24" pipe that discharges into Grassy Creek (XX).

Site 16 impacts are due to installation of a 7' x 6' RCBC which will flow under the RPD alignment of the US 52 Interchange. Of the 61 lf of permanent impacts at Site 16, 39 lf is due to the culvert and 22 lf is for inlet channel protection which will be embedded into the existing stream bottom. Stream AAA will flow

through the 7' x 6' RCBC where it will outlet at a relocated channel of Grassy Creek located to the north of the RPD alignment.

Site 15 E and Site 17 B impacts are for excavation and bank stabilization. The proposed base ditch will receive stormwater from the RPD alignment as well as adjacent neighborhoods and will connect to Grassy Creek on the downstream end. There will be permanent bank stabilization of 13 lf along Grassy Creek at the confluence with the proposed base ditch at Site 15E. Permanent surface water impacts of 25 lf for ditch excavation is proposed at Site 17 B.

Site 15F impacts are for bank stabilization along Grassy Creek at the discharge point of a base ditch. Permanent impacts of 19 lf are proposed at this site.

Site 15G impacts are for the extension of a double barrel 9' x 9' RCBC along Grassy Creek as well as rip rap outlet channel protection. There will be permanent surface water impacts of 361 lf, of which 334 lf is due to the extension of the culvert and 27 lf is for rip rap placed for outlet channel protection where the culvert ties into the existing stream.

Site 18 impacts are due to bank stabilization at the inlet to a proposed 48" steel pipe. Permanent bank stabilization of 33 lf will be placed at the inlet to the 48" steel pipe where two lateral base ditches discharge.

There are no impacts anticipated to jurisdictional open waters for R-2247EB.

Pipe burial requirements provided by the 4B/4C meeting minutes

As requested in the Concurrence Point 4B/4C meeting for R-2247EB, Table 3 includes all cross pipes in jurisdictional streams and the proposed burial depth of their inverts. Please note that due to the slope, length of culverts, and the high calculated velocities, most pipes on R-2247EB carrying jurisdictional streams will not be buried based on discussions held during the 4B/4C meetings regarding stream stability. Additionally, sills will not be placed in existing culverts in order to maintain design capacity.

Table 3. Pipe Invert Burial Depth in Jurisdictional Streams for R-2247EB

Pipe Location	Size and Material	Impact Site	Pipe Invert Burial Depth (feet)
64+85 -L-	2 @ 7' x 7' RCBC (Extension)	1	0'
77+07 -L-	8' x 7' RCBC (Ext.) w/ 60" Steel (Flood bench pipe)	4	0'
107+98 -L-	48" Steel (Extension)	6	0'
111+58 -L-	66' Steel (Extension)	7	0'
20+18 -RPB-	4' x 5' RCBC	10C	0'
17+92 -LPB-	5' x 5' RCBC	10E	0'
27+38 -WBBYP-	6' x 5' RCBC	10F	0'
12+01	7' x 5' RCBC	10H	0'
169+98 -L-	8' x 6' RCBC	14B	0'
186+91 -L-	2 @ 9' x 9' RCBC	15A	1' w/ flood bench
106+53 -Y68-	2 @ 9' x 9' RCBC (Extension)	15G	0'
19+90 -RPD-	7' x 6' RCBC	16	0'

Summary of Jurisdictional Impacts by TIP

The preliminary proposed impacts for the overall project (TIP Nos. R-2247B Phase 2, CA, CB, CD, D, EA, EB, and EC and TIP Nos. U-2579AA, AB, C Phase 2, D, E, and F) will be approximately 9.53 acres of permanent wetland impacts and 57,925 linear feet of permanent stream impacts. Reference Tables 4 and 5 for a breakdown of impacts by section.

The impacts reported in this Individual Permit Modification Application for R-2247 sections CD and EC and U-2579C Phase 2 (Sites 3-5), U-2579D, E & F and U-2579C Phase 2 Sites 1 and 2 are based on the permitted plans and final design for R-2247EB. The proposed impacts for the remaining project sections were determined by offsetting preliminary slope stake lines outward 25 feet on both sides of the alignment and counting impacts to all jurisdictional features. As the final design is completed for each of the remaining sections, impacts will be updated and permit modification requests will be submitted as necessary.

Table 4. Summary of Wetland Impacts by Project TIP

Section	Design Stage	Impacts from Phased IP Application (ac)	Final Impacts (ac) ¹	Impacts Requiring Mitigation (ac)
R-2247EC	Permitted	0.31	0.31	0.31
R-2247CD	Permitted	0.04	0.04	0.04
U-2579C Phase 2	Permitted	0.68	0.68	0.68
U-2579AA	Preliminary	1.43	-	1.43
U-2579AB	Preliminary	1.5	-	1.5
U-2579D	Permitted	0.08	0.04	0.04
U-2579E	Permitted	0.99	0.85	0.85
U-2579F	Permitted	0.24	0.20	0.20
R-2247EA	Preliminary	0.58[0.57]**	-	0.58 [0.57]**
R-2247EB	Final	0.08 [0.09]**	0.43	0.43
R-2247B Phase 2	Preliminary	0.27	-	*
R-2247CA	Preliminary	0.71	-	*
R-2247CB	Preliminary	1.98	-	*
R-2247D	Preliminary	0.52	-	*
Totals		9.41	9.54²	6.06

¹ Final impacts for each section in the preliminary design stage will be updated with future modifications.

² Assumes the preliminary impacts for the future sections.

* Indicate these sections will be let in greater than 5 years.

** Due to the revised project limits of R-2247EA and R-2247EB, 0.01 acre of wetland impact is shifted from the R-2247EB project to the R-2247EA project. Therefore the new totals are 0.58 acre of preliminary wetland impact for Section R-2247EA and 0.08 acre of preliminary wetland impact for Section R-2247EB.

Table 5. Summary of Stream Impacts by Project TIP

Section	Design Stage	Impacts from Phased IP Application (lf)	Final Impacts (lf) ¹	Impacts Requiring Mitigation (lf)
R-2247EC	Permitted	865	865	814
R-2247CD	Permitted	699	699	611
U-2579C Phase 2	Permitted	3,527	3,266	3,178
U-2579AA	Preliminary	3,019	-	3,019
U-2579AB	Preliminary	10,351+	-	10,351+
U-2579D	Permitted	5,043	4,701	4,302

Section	Design Stage	Impacts from Phased IP Application (lf)	Final Impacts (lf) ¹	Impacts Requiring Mitigation (lf)
U-2579E	Permitted	4,864	4,831	4,817
U-2579F	Permitted	2,544	2,522	2,502
R-2247EA	Preliminary	7,310 [6,536] ***	-	774*
R-2247EB	Final	5,819 [6,593] ***	5,817	5,323
R-2247B Phase 2	Preliminary	862	-	**
R-2247CA	Preliminary	3,056	-	**
R-2247CB	Preliminary	5,674	-	**
R-2247D	Preliminary	5,762	-	**
Totals		59,395	58,735²	35,691

1 Final impacts for each section in the preliminary design stage will be updated with future modifications.

2 Assumes the preliminary impacts for the future sections.

+This value was inadvertently mis-represented in the U-2579DEF Permit Modification application as 10,315. It has been corrected here.

*Mitigation for the original R-2247EA section impacts (6,536 lf) was provided by a Mitigation Bank. The 774 lf represents the preliminary impacts which have been included in mitigation totals for the project which are shifting from the R-2247EB project to the R-2247EA project based on revised project limits.

** Indicate these sections will be let in greater than 5 years.

*** Due to the revised project limits of R-2247EA and R-2247EB, 774 lf of stream impact is shifted from the R-2247EB project to the R-2247EA project. Therefore the new totals are 7,310 lf of preliminary stream impact for Section R-2247EA and 5,819 lf of preliminary stream impact for Section R-2247EB.

The final design impacts for R-2247EB had an increase of 0.34 acre of wetlands and a reduction of 496 linear feet of stream. Included in the net reduction of 496 linear feet of stream is the 926 linear feet that was omitted from preliminary design impact totals as well as the 774 linear feet that will now be part of section R-2247EA. The decrease in impacts to streams will result in a surplus of previously requested stream mitigation from the NCDMS. The increase in wetland mitigation credits needed will be requested from the NCDMS; see further details in the compensatory mitigation section.

Avoidance and Minimization Efforts

Avoidance and minimization efforts were detailed in the previous permit application for the project. The following additional measures have been incorporated during development of the R-2247EB project plans:

- Guardrail with 2:1 slopes were utilized throughout the project to minimize project footprint, therefore minimizing surface water impacts to streams and wetlands.
- Ditches and pipes that outlet adjacent to wetlands have been designed to have non-erosive velocities to help protect existing wetlands.
- Grass swales were utilized throughout the project where possible to promote sedimentation and infiltration of runoff by providing additional attenuation.
- In ditches with slopes that made vegetative liners impracticable, rip rap liners have been proposed in order to reduce velocity, prevent erosion and protect downstream features.
- Two dry detention basins and a preformed scour hole are included along the project.
- Ditches have been designed to achieve grass swale credit.
- Streambed rip rap protection provided if outlet velocity is greater than 10 fps.
- Energy dissipator provided if outlet velocity is greater than 15 fps.
- Lowered the vertical profile of the interchange to minimize Duke Power and NS Railroad conflicts which reduced the project footprint and associated impacts.
- Shifted Ramp DB and Loop D away from Grassy Creek.
- Eliminated Ramp DB crossing over Grassy Creek.
- Added retaining walls along west side of US 52 to minimize Piedmont Natural Gas (PNG) conflicts which also reduced stream impacts.

Compensatory Mitigation

Total impacts for the R-2247EB final design are 5,817 linear feet of permanent stream impact and 0.43 acre of permanent wetland impact. Of the total stream impacts, 494 linear feet is bank stabilization and will not require mitigation. There will be a total of 279 lf embedded channel protection placed at inlets, outlets, and where channel changes tie into existing channels which has been included in mitigation totals. Compensatory mitigation is required for 5,323 linear feet of stream and 0.43 acre of wetland for section R-2247EB and will be provided by the NCDMS (see attached acceptance letter dated 9/29/2017). The final design results in a 1,270 lf reduction of stream impacts requiring mitigation on R-2247EB. Approximately 774 lf of that decrease as well as 0.01 acre of wetland impact is due to shifting of section breaks between R-2247EB and R-2247EA and will need to be captured and mitigated when section R-2247EA has final design completed. The previous mitigation acceptance accounted for 6,593 linear feet of stream and 0.09 acre of wetland mitigation for R-2247EB. The final design results in a reduction of required mitigation by 1,270 lf of stream and an increase of required mitigation for 0.35 acre of wetland for R-2247EB.

With the changes in impacts and required mitigation of those impacts, a total of 0.13 acre of wetland mitigation will be requested and 2,331 linear feet of mitigation should be made available due to reducing impacts on section R-2247EB (See Tables 6 and 7 as follows).

Table 6. Summary of Wetland Impacts by Project TIP Requiring Mitigation

Section	Design Stage	Wetland Impacts Requiring Mitigation from Phased IP Application (ac)	Final Wetland Impacts Requiring Mitigation (ac) ¹	Difference in Impacts Requiring Mitigation (ac)
R-2247EC	Permitted	0.31	0.31	0
R-2247CD	Permitted	0.04	0.04	0
U-2579C Phase 2 (U-2579D, E & F Sites 28 & 29)	Permitted	0.68	0.68	0
U-2579AA	Preliminary	1.43	1.43	0
U-2579AB	Preliminary	1.50	1.50	0
U-2579D	Permitted	0.08	0.04	-0.04
U-2579E	Permitted	0.99	0.85	-0.14
U-2579F	Permitted	0.24	0.20	-0.04
R-2247EA	Preliminary	0.58 [0.57]*	0.058 [0.57]*	0
R-2247EB	Final	0.08 [0.09]*	0.43	0.35
Totals		5.93	6.06	0.13

¹ Final impacts for each section in the preliminary design stage will be updated with future modifications.

* Due to the revised project limits of R-2247EA and R-2247EB, 0.01 acres of wetland impact is shifted from the R-2247EB project to the R-2247EA project. Therefore the new totals are 0.58 acre of preliminary wetland impact for Section R-2247EA and 0.08 acre of preliminary wetland impact for Section R-2247EB.

Table 7. Summary of Stream Impacts by Project TIP Requiring Mitigation

Section	Design Stage	Stream Impacts Requiring Mitigation from Phased IP Application (lf)	Final Stream Impacts Requiring Mitigation (lf) ¹	Difference in Impacts Requiring Mitigation (lf)
R-2247EC	Permitted	814	814	0
R-2247CD	Permitted	611	611	0
U-2579C Phase 2 (U-2579D, E & F Sites 29 & 30)	Permitted	3,409	3,178	-231
U-2579AA	Preliminary	3,019	3,019	0
U-2579AB	Preliminary	10,351*	10,351*	0
U-2579D	Permitted	5,043	4,302	-741
U-2579E	Permitted	4,864	4,817	-47
U-2579F	Permitted	2,544	2,502	-42
R-2247EA**	Preliminary	774**	774**	774
R-2247EB	Final	5,819	5,323	-496
Totals		37,248	35,691	-783

¹ Final impacts for each section in the preliminary design stage will be updated with future modifications.

* This value was inadvertently mis-represented in the U-2579DEF Permit Modification application as 10,315. It has been corrected here.

** Mitigation for the original R-2247EA section impacts (6,536 lf) was provided by a Mitigation Bank. The 774 lf represents the preliminary impacts which have been included in mitigation totals for the project which are shifting from the R-2247EB project to the R-2247EA project based on revised project limits.

Utility Impacts

There will be no impacts to jurisdictional waters of the U.S. or regulated stream buffers associated with overhead or underground utility relocations for R-2247EB. Tree clearing will be necessary along a portion of Grassy Creek for relocation of overhead transmission lines. Pursuant to Duke Energy's clearing specifications in environmentally sensitive areas, hand clearing will be the clearing method utilized within 50 feet of the stream. For all other sections, the utility impacts will be determined during final design.

Regulatory Approvals

The design-build let date for the R-2247EB project was August 21, 2018. Final completion of construction is anticipated in September 2022.

Section 404: We are hereby requesting the modifications described above for the USACE Individual 404 Permit signed January 22, 2018 (SAW-2017-02112), for the above described activities.

Section 401: We are hereby requesting a modification to the 401 Water Quality Certification from the NCDWR issued November 14, 2017 (revised November 27, 2017, December 21, 2017, & February 7, 2019) (WQC004131). In compliance with Section 143-215.3D(e) of the NCAC, we will provide \$570.00 to act as payment for processing the Section 401 permit modification (see Subject line).

A copy of this modification request and its distribution list will be posted on the NCDOT website at: <https://xfer.services.ncdot.gov/pdea/PermApps/>

Thank you for your assistance with this project. If you have any questions or need additional information, please contact Bill Barrett at 919-707-6103 or wabarrett@ncdot.gov.

Sincerely,

Carla Dagnino

for

Philip S. Harris III, P.E., C.P.M., Manager
Environmental Analysis Unit Head

cc:

NCDOT Permit Application Standard Distribution List.

Attachments:

Figure 1: Winston-Salem Northern Beltway Overview
Figure 2: Section R-2247EB Preliminary Impact Master Sheet
Figure 3: Project Limits With Section Changes
Figure 4: Section R-2247EB Preliminary Impact Sheet 1
NCDMS Acceptance Letter (dated 9/29/2017)
SHPO Concurrence Memorandum
Concurrence Point 4B/4C Meeting Minutes for R-2247EB
Stormwater Management Plan for R-2247EB
Permit Drawings for R-2247EB
Roadway Plans for R-2247EB



ROY COOPER
Governor

September 29, 2017

Mr. Philip S. Harris III, P.E., CPM
Natural Environment Section, PDEA
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina 27699-1598

Dear Mr. Harris:

Subject: DMS Mitigation Acceptance Letter: **U-2579 / R-2247**, Winston-Salem Northern Beltway – from South of I-40 Southwest of the City to I-74 / US 311 Southeast of the City, Forsyth County

The purpose of this letter is to notify you that the Division of Mitigation Services (DMS) will provide the stream and wetland mitigation for the subject project. Based on the information supplied by you on September 28, 2017, the stream and wetland impacts are located in CU 03040101 of the Yadkin River basin and 03010103 of the Roanoke River basin in the Central Piedmont (CP) Eco-Region, and are as follows:

Stream & Wetlands	River Basin	CU Location	Eco-Region	Stream			Wetlands		
				Cold	Cool	Warm	Riparian	Non-Riparian	Coastal Marsh
Impacts	Yadkin	03040101	CP	0	0	30,834.0	4.79	0	0
Impacts	Roanoke	03010103	CP	0	0	6,414.0	1.14	0	0

*Some of the stream and wetland impacts may be proposed to be mitigated at a 1:1 mitigation ratio. See permit application for details.

These impacts and associated mitigation needs were under projected by the NCDOT in the 2017 impact data. DMS will commit to implement sufficient compensatory stream and riparian wetland mitigation credits to offset the impacts associated with this project as determined by the regulatory agencies using the delivery timeline listed in Section F.3.c.iii of the In-Lieu Fee Instrument dated July 28, 2010. If the above referenced impact amounts are revised, then this mitigation acceptance letter will no longer be valid and a new mitigation acceptance letter will be required from DMS.

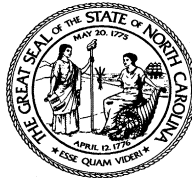
If you have any questions or need additional information, please contact Ms. Beth Harmon at 919-707-8420.

Sincerely,


James B. Stanfill
DMS Credit Management Supervisor

Cc: Mr. James Lastinger, USACE – Raleigh Regulatory Field Office
Ms. Amy Chapman, NC Division of Water Resources – Raleigh
File: U-2579 / R-2247





**North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office**

Ramona M. Bartos, Administrator

Governor Roy Cooper
Secretary Susi H. Hamilton

Office of Archives and History
Deputy Secretary Kevin Cherry

March 18, 2019

MEMORANDUM

TO: Matthew Wilkerson
Archaeology Group Leader
Environmental Analysis Unit
NCDOT Division of Highways

FROM: Ramona M. Bartos

SUBJECT: Winston-Salem Northern Beltway, Western Section, R-2247, Forsyth County,
CH 91-0603

Thank you for your letter of February 26, 2019, transmitting the end of fieldwork management summary for the archaeological data recovery at site 31FY925 associated with the above-referenced project. We have reviewed the management summary and offer the following comments.

Our office concurs with the findings presented in the management summary and your consultant's interpretation that the site does not reflect a mill but rather is probably imported rock placed along a property line for use in creating or improving a stream crossing during logging operations. Given this reinterpretation of the site, we also concur that the site is no longer considered eligible for listing in the National Register of Historic Places (NRHP). Further, we concur that no additional archaeological reporting of this resource is necessary.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-814-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

MEETING MINUTES

DATE: March 19, 2019

CLIENT: NCDOT

PROJECT: R-2247EB Winston-Salem Northern Beltway Interchange at US 52 (Future I-74)

MEETING LOCATION: NCDOT Roadway Design Conference Room, Building A

STARTING TIME: 8:00 am

ENDING TIME: 10:00 am

SUBJECT: 4B Merger Meeting Minutes

Meeting Attendees

Robert Patterson, NCDEQ-DWR
Dave Wanucha, NCDEQ-DWR (via phone)
Nicholle Braspennickx, USACE
Marla Chambers, NCWRC
Amy Euliss, NCDOT-Division DEO (via phone)
Craig Lee, NCDOT-Hydraulics (via phone)
Michael Shumsky, NCDOT-Design Build
Jon Nance, NCDOT-Design Build
Andy Hussey, NCDOT-Design Build
Bill Barrett, NCDOT-EAU
John Jamison, NCDOT-EPU
Mike Sanderson, NCDOT-EPU
Mark Staley, Roadside (via phone)
Matt Adams, Blythe Construction
Luca Pellegrini, Blythe Construction
Richard Hiner, Wood PLC (via phone)
Eddie Vance, STV
Adam Alvey, STV
Mark Pugh, STV

Note: Discussion and comments from meeting are in blue

General

- Project Overview
 - Plan Sheet 4 – Begin Project at North End of US 52
 - Plan Sheet 17 – End Project at South End of US 52
 - Plan Sheet 12 – Tie to U-2579DEF (Winston-Salem Outer Beltway)
 - Plan Sheet 13 – Future Beltway Project R-2247EA
 - Plan Sheets 7, 8 & 9 – Project Encompasses Current Design-Build Project R-2247EC

- Blyth Construction has both Design-Build Contracts (R-2247EB & EC)
 - Proposed drainage for EC Project is shown as existing on EB Plans
- Project located within the Yadkin River Basin. There are no specific stormwater requirements, but will use maximum extent practicable
 - Identified 2 potential locations for stormwater basin which are under review
- Culverts
 - 10 Large Culverts on the Project
 - Including 3 extensions
 - 2 replacements
 - 5 new crossings
 - 2 FEMA (Grassy Creek)
 - Use streambed riprap protection if outlet velocity is greater than 10 fps
 - Use energy dissipator if outlet velocity is greater than 15 fps
- Avoidance and Minimization
 - Reduced earthwork (million cubic yards of borrow to be balanced on-site)
 - Lowered interchange/reduced footprint
 - Eliminated a new continuous 1200' culvert (Ramp & Loop B)
 - Retained 350' open channel inside Loop B
 - Retained 100' minimum open channel between culverts
 - Shifted Ramp DB and Loop D away from Grassy Creek
 - Eliminated Ramp DB crossing over Grassy Creek
 - Reduced 1600' mainline culvert to 1200'
 - Based on preliminary design reduced stream impacts by 20%
- General Comments
 - Culverts that will not be buried should be called out on plans as "Do Not Bury" and those that are to be buried should be noted as such. For permitting phase a table is to be developed listing all culverts and noting whether they are buried or not; and including buried depth.
 - Any buried culvert should consider using sills to avoid head-cutting. If we are burying a new RCBC then we will provide sills but if it is an extension that is currently buried without sills, then using sills may not be possible due to hydraulic constraints.
 - Provide inlet and outlet details which display the culvert and channel cross section on Permit Drawings (4C Plans).
 - Use geotextile liner under rip rap in channel changes unless there is a flood bench. In that case, use Class II stone on the toe of the bench and coir fiber matting on the bench. If bench is built on fill material, use riprap.
 - Riprap outlet pads should be flush with the streambed.
 - Marla Chambers w/ NCWRC mentioned several times to assess using low-flow and high-flow barrels for multiple-barrel culverts.

SHT 4

- Culvert extension up and downstream for Beaver Dam Creek (QQQ)
 - Team currently evaluating a retaining wall to avoid utility conflict on downstream end which will reduce impacts
- Impacts to 2 small tributaries (PPP & SSS) from embankment
- Discussion about adding sills and backfilling existing culvert extension:

- Amy Euliss opposed backfill existing culverts running under US 52 due to the difficulty getting equipment into the culvert and the high cost to the department. If the hydraulic capacity allows sills to be added, the culvert will fill in on its own over time.
- Provide a cross section of the culvert showing the floodplain in the permit plans.
- Craig Lee is open to further discussion of sills based on meeting design flow

SHT 5

- Culvert extension up and downstream for Muddy Creek (UU)
 - Adding a supplemental 60" trenchless pipe for capacity
 - Team currently evaluating a retaining wall to avoid utility conflict on downstream end which will reduce impacts
- Impacts to small tributary (OOO) from embankment
- Same comments as sheet 4

SHT 6

- No Jurisdictional Impacts

SHT 7

- Evaluating a U-shaped retaining wall to avoid utility conflict at tributary (WWW)
- Tributary TT and W49 are impacted from EC Section (Site 1)
 - Additional impacts from SB 52 split on downstream end
- Discussion on method to distinguish new EB impacts from previous EC impacts
 - Perhaps a note or table at each site
 - Use different hatching or shading
 - STV will provide an example prior to submittal

SHT 8-A

- Tributary LLL is impacted from EC Section (Site 2)
 - No additional impacts anticipated

SHT 8-B

- Tributary SS and W50 are impacted from EC Section (Site 4)
 - Additional impacts due to NB 52 tie in will be included

SHT 8-C

- Tributary LLL is impacted from EC Section (Site 2)
 - Additional impacts from SB 52 split will be included

SHT 8-D

- Tributary SS and W26 are impacted from EC Section (Site 6)
 - Additional impacts from SB 52 split will be included for impacts to wetland and stream (SS, W48 and W26).
- Amy Euliss recommended that W26 be a total take
- Show EC riprap pads

SHT 9

- Note: Plan sheet 9 was revised after posted for agency review; an updated sheet was provided at the 4b meeting.
- Revised cross pipe location
 - Elevations did not work with preliminary layout
 - Tie to new 42" trenchless pipe from EC Section
- Generally positive comments about revised cross pipe location

SHT 9-A

- Tributary III is impacted from EC Section (Site 7)
 - No additional impacts anticipated

SHT 9-B

- New impacts to tributary DDD and W30
- New impacts to tributary WW
 - Replacing existing 72" CMP with 7'x7' RCBC
- It was noted that this is a long culvert (approx. 1,200'), so will not be buried.
- Also, Amy requested that for the 4c plans, that appropriated details be included (e.g. for bank stabilization).
- Preliminary stormwater basin
 - Replace 30" CMP outfall pipe

SHT 9-C

- Impacts to tributaries VV and III
 - Drainage from cross pipe diverted from III to VV
- It was requested that the Stream Form for Stream VV be checked to see if there was any biology in the stream. The Stream Form is attached with Lines 20-24 outlined. It is noted that the stream assessment was conducted "above culvert," which should be a good justification to not provide fish passage.
- Impacts to W42

SHT 9-D

- 4 culverts replaced single 1200' culvert
- Culverts buried 1'
- Reduced total impacts
- Amy Euliss recommended arming the banks in-between the culverts, for short segments (100' or less), and for any segments that are currently incised and unstable.
- Culverts do not need to be buried

SHT 10-A

- Realigned Ramp DB out of Grassy Creek floodplain and eliminated culvert
- Reduced length of 7'x7' RCBC from 1600' to 1200'
- Culvert not buried because of length
- Preliminary stormwater basin inside Loop D
- Check to see if adding a bench is possible (may not be due to already large cut)

SHT 11-A&B

- Approximately 550' double RCBC buried 1' w/ 1' flood bench (Grassy Creek)
- Riprap lined channel change (Is riprap bottom preferred?)
- Single 7'x6' RCBC buried 1'
- Show detail at tributary culvert outlet and make sure it flows to low portion of channel change, not to the bench
- Amy requested that the side slope of the bench be armored with Class 2 riprap. We need to ensure that the larger rock is used to line the benches, especially at the lowest rocks on the bench.
- Make sure that the outfall ditch along slope prior to bridge is stable; possibly add riprap protection to the toe of slope

SHT 12

- No Jurisdiction Features

SHT 13-A

- Downstream culvert from sheet 9-D
- Channel change (Riprap?)
- No impacts to W34 and W35
- Amy stated that there will be impacts to W34 for the tie-in.
- Impacts to W43
 - Impacts not in functional design

- Riprap line the channel change
- Amy Euliss recommended that W43 be a total take
- Grass hatching missing in wetland

SHT 14-A

- W29 is an abandoned stormwater basin
 - Breach dam and provide stable channel to Grassy Creek
- Impacts to tributary ZZ
- Bank stabilization at Grassy Creek
- Discussion about abandoned stormwater basin being a permitted NPDES basin
- Note: Per an email from Joe Fogarty, PE (City of Winston-Salem), there is no record of a stormwater feature at this location; most likely an old sediment basin left in place after construction. A copy of the email will be attached to these minutes.

SHT 14-B

- Replace existing 36" CMP with trenchless pipe
 - Bank stabilization only
 - Ties to 48" RCP pipe system

SHT 14-C

- Extend existing 9'x9' RCBC (Grassy Creek)

SHT 15

- Inlet end of 1200' 7'x7' RCBC

SHT 16

- No Jurisdictional Impacts

SHT 17

- No Jurisdictional Impacts

From: Shumsky, Michael J <mshumsky@ncdot.gov>
Sent: Wednesday, February 13, 2019 4:05 PM
To: PELLEGRINI Luca; ADAMS Matthew; Robbins, Mark; Vance, Edward; Bailey, Stacey
Cc: Euliss, Amy; Lee, Craig J; Capps, Karen B; Archer Sr, Wright; Nance, Jon G
Subject: FW: [External] RE: stormwater feature impacted by R-2247EB

****This e-mail is from outside STV****

For your records.

Michael J. Shumsky, PE
Design-Build Engineer
Design-Build Unit
North Carolina Department of Transportation

919 707 6627 office
mshumsky@ncdot.gov

1595 Mail Service Center
Raleigh, NC 27699-1595



Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Patterson, Robert D <robert.patterson@ncdenr.gov>
Sent: Wednesday, February 13, 2019 1:48 PM
To: Euliss, Amy <aeuliss@ncdot.gov>; Lee, Craig J <cjlee@ncdot.gov>; Shumsky, Michael J <mshumsky@ncdot.gov>
Cc: Braspennickx, Nicholle M CIV USARMY CESAW (US) <Nicholle.M.Braspennickx@usace.army.mil>; Barrett, William A <wabarrett@ncdot.gov>; Wanucha, Dave <dave.wanucha@ncdenr.gov>
Subject: RE: [External] RE: stormwater feature impacted by R-2247EB

Sounds good. Thank you for verifying!

Robert D. Patterson, P.E.

Stormwater Engineer

919-707-3880* | Robert.Patterson@ncdenr.gov | ***Note new number as of Jan. 30, 2019**

<https://deq.nc.gov/about/divisions/water-resources/water-quality-permitting/transportation-permitting>

NC Dept. of Environmental Quality | DWR Transportation Permitting
512 N. Salisbury St., 12th floor | 1617 Mail Service Center | Raleigh, NC 27699-1617

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From: Euliss, Amy

Sent: Wednesday, February 13, 2019 1:26 PM

To: Patterson, Robert D <robert.patterson@ncdenr.gov>; Lee, Craig J <cjlee@ncdot.gov>; Shumsky, Michael J <mshumsky@ncdot.gov>

Cc: Braspennickx, Nicholle M CIV USARMY CESAW (US) <Nicholle.M.Braspennickx@usace.army.mil>; Barrett, William A <wabarrett@ncdot.gov>; Wanucha, Dave <dave.wanucha@ncdenr.gov>

Subject: FW: [External] RE: stormwater feature impacted by R-2247EB

Robert,

I reached out to the City of WS after our 4B meeting this morning. They have no record of a permitted stormwater device at the approximate location on the attached map. Unless you have any objections, we will proceed with the feature as a wetland and not a permitted post construction stormwater device.

Michael,

Can you share this email and Robert's response with the rest of the Design Build team? Thanks.

Craig,

Can you add a note to the meeting minutes? Thanks.

For referenced this is for wetland W29 on plan sheet 14-A or R-2247EB.

Amy Euliss
Division 9 Environmental Officer
North Carolina Department of Transportation

336 747 7802 office
aeuliss@ncdot.gov

375 Silas Creek Parkway
Winston Salem, NC 27127-7167



From: Joe Fogarty <josephf@cityofws.org>

Sent: Wednesday, February 13, 2019 1:19 PM

To: Euliss, Amy <aeuliss@ncdot.gov>; Keith Huff <keithh1@cityofws.org>

Cc: Shumsky, Michael J <mshumsky@ncdot.gov>; Lee, Craig J <cjlee@ncdot.gov>; Barrett, William A <wabarrett@ncdot.gov>

Subject: [External] RE: stormwater feature impacted by R-2247EB

CAUTION: External email. Do not click links or open attachments unless you verify. Send all suspicious email as an attachment to report.spam@nc.gov

Amy,

We have no records of a Stormwater feature tied to a permit at this location. My initial assumption is that it is likely an old sediment basin that was just left in place after the construction of the development it may have served.

Regards,

Joe Fogarty PE

City of Winston-Salem
Stormwater Engineer
City Hall – Suite 53
101 N. Main Street,
Winston-Salem NC 27101

Tel: (336) 747-6961

E-mail: josephf@cityofws.org

From: Euliss, Amy <aeuliss@ncdot.gov>

Sent: Wednesday, February 13, 2019 12:43 PM

To: Keith Huff <keithh1@cityofws.org>; Joe Fogarty <josephf@cityofws.org>

Cc: Shumsky, Michael J <mshumsky@ncdot.gov>; Lee, Craig J <cjlee@ncdot.gov>; Barrett, William A <wabarrett@ncdot.gov>

Subject: stormwater feature impacted by R-2247EB

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Keith and Joseph,

NCDOT is impacting a feature as part of the WS beltway that has a riser pipe. We need to know if this is a stormwater feature that is tied to a permit. It is currently unmaintained and overgrown. DWR is asking us to research if there is a permit tied to it. If it is a permitted device, I also need to know if it was a Phase II requirement. I have attached a screen shot of the approximate location. Thanks.

Amy Euliss
Division 9 Environmental Officer
North Carolina Department of Transportation

336 747 7802 office
aeuliss@ncdot.gov

375 Silas Creek Parkway
Winston Salem, NC 27127-7167



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NC DWQ Stream Identification Form Version 4.11

VV above Collier

Date: 07/15/2015	Project/Site: R2247/U-2579	Latitude: 36.2074
Evaluator: M. Martin, R. Crowther	County: Forsyth	Longitude: -80.3019
Total Points: Stream is at least intermittent if ≥ 19 or perennial if $\geq 30^*$ 31.5	Stream Determination (circle one) Ephemeral Intermittent <u>Perennial</u>	Other e.g. Quad Name:

A. Geomorphology (Subtotal = 15.5)

	Absent	Weak	Moderate	Strong
1 ^a . Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

^a artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8.5)

12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 7.5)

18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: - Caddis fly
- Salamander

Sketch:



MEETING MINUTES

DATE: May 15, 2019

CLIENT: NCDOT

PROJECT: R-2247EB Winston-Salem Northern Beltway Interchange at US 52 (Future I-74)

MEETING LOCATION: NCDOT Structure Design Conference Room, Building A

STARTING TIME: 8:30 am

ENDING TIME: 11:30 am

SUBJECT: 4C Merger Meeting Minutes

Meeting Attendees

Robert Patterson, NCDEQ-DWR
Dave Wanucha, NCDEQ-DWR (via phone)
Nicholle Braspenickx, USACE
Marla Chambers, NCWRC
Amy Euliss, NCDOT-Division DEO (via phone)
Craig Lee, NCDOT-Hydraulics
Michael Shumsky, NCDOT-Design Build
Bill Barrett, NCDOT-EAU
Jordan Scott – NCDOT - Resident Engineer
Matt Adams, Blythe Construction
Luca Pellegrini, Blythe Construction
Richard Hiner, Wood PLC (via phone)
Eddie Vance, STV
Joseph Freeman, STV
Mark Pugh, STV
Michael Iagnocco, STV
Josh Kotheimer, STV

Note: Discussion and comments from meeting are in blue

Project Limits

- Project extended approximately 500 L.F. north along US 52
- EA/EB project limits shifted from the west side of NC-65 to the east side of NC-65
- EB project impacts includes work inside the EC limits due to project overlap
 - The permit mod for EB will cover the extension of pipe culverts and additional road work located within the overlap with the EC section.

Site Overview

- Duke Transmission Lines

- PNG Line
- NS Railroad Right of Way
- Grassy Creek – FEMA Regulated Stream
- Project located within the Yadkin River Basin. There are no specific stormwater requirements. However, the Design-Build Team will provide stormwater treatment where there are opportunities
 - Identified two locations for stormwater basin
- Culverts
 - 10 Large Culverts on the Project
 - Including 3 extensions
 - 2 replacements
 - 5 new crossings
 - 2 FEMA (Grassy Creek)
 - New double box culvert at Grassy Creek buried 1' below streambed w/ 1' flood bench
 - Sills not placed in existing culverts to maintain design capacity
 - Remaining culverts were not buried because of length and slope of barrel
 - Riprap pads will be flush with the streambed
 - 2 Small Pipe Culvert Extensions
 - Additional impacts to the R-2247EC Project

Pipe Location	Size and Material	Impact Site	Pipe Invert Burial Depth (feet)
64+85 -L-	2 @ 7'x7' RCBC (Extension)	1	0'
77+07 -L-	8'x7' RCBC (Ext.) w/ 60" Steel (Flood bench pipe)	4	0'
107+98 -L-	48" Steel (Extension)	6	0'
111+58 -L-	66' Steel (Extension)	7	0'
20+18 -RPB-	4'x5' RCBC	10C	0'
17+92 -LPB-	5'x5' RCBC	10E	0'
27+38 -WBBYP-	6'x5' RCBC	10F	0'
12+01	7'x5' RCBC	10H	0'
169+98 -L-	8'x6 RCBC	14B	0'
186+91 -L-	2 @ 9'x9' RCBC	15A	1' w/ flood bench

106+53 -Y68-	2 @ 9'x9' RCBC (Extension)	15G	0'
19+90 -RPD-	7'x6' RCBC	16	0'

Project Design

- Project design speed increased to 70 mph
- Avoidance and Minimization
 - Lowered interchange to minimize Duke Power and NS Railroad conflicts
 - Reduced earthwork (million cubic yards of borrow to balanced on-site)
 - Eliminated a new continuous 1200' culvert (Ramps & Loop B)
 - Retained 350' open channel inside Loop B
 - Retained 100' minimum open channel between culverts
 - Shifted Ramp DB and Loop D away from Grassy Creek
 - Eliminated Ramp DB crossing over Grassy Creek
 - Reduced 1600' mainline culvert to 1200'
 - Added retaining walls along west side of US 52 to minimize PNG conflicts
 - Reduced stream impacts

Discussion on method to distinguish new EB impacts from previous EC impacts

- See examples of Permit Drawing Sheet 19 attached at end
 - Show overlapping impacts as depicted in the attachment.
 - If there is a change in impact type it should be shown with the new type of impact hatching overlapping with the impact previously shown on the 2247EC permit drawings.
 - On the impact summary sheet impact changes should be counted on separate lines and noted so that totals for mitigation can be properly accounted for.
- General Comments
 - Breakout items on impact summary table to show specific type of impact such as inlet protection, outlet protection, channel relocation, culvert construction, etc.
 - Adjust labeling for impacts from R2247 EC being shown on all plan sheets.
 - Make sure all labels are properly grey scaled, and are discernable from each other when printed.
 - Place label beside impacts shown from R2247 EC ex. TS (EC).
 - Bank stabilization should be shown with a "S" callout and noted separately in the impact summary sheet.
 - If there is no significant realignment of the channel, at inlets and outlets of culverts impacts should be shown as bank stabilization.

SHT 4

- Site 1 – Beaver Dam Creek (QQQ)

- Impacts due to culvert extension upstream and channel change to match new end of culvert
- A retaining wall was added to avoid utility conflict on downstream end which reduced stream impacts
- Sill have not been added to the existing culvert to meet design capacity
- **Site 2 – Intermittent Stream (PPP)**
 - Impacts due to roadway embankment

SHT 5

- **Site 3 – UT to Beaver Dam Creek (OOO)**
 - Impacts due to culvert extension upstream, channel change to match new end of culvert and riprap fill in channel
 - A retaining wall was added to avoid utility conflict on downstream end which reduced stream impacts
 - Flood bench will be constructed for supplemental 60” trenchless steel pipe
- **Site 4 – Perennial Stream (UU)**
 - Impacts due to roadway embankment

SHT 6

- No Jurisdictional Impacts

SHT 7

- **Site 5 – Intermittent Stream (WWW)**
 - Impacts due to 30” pipe and riprap outlet protection
 - 18” downstream of proposed channel and 30” pipe discussed, is located inside of the gas ROW and is used as a crossing for the maintenance road.
- **Site 6 – Perennial Stream (TT) and Wetland (W49)**
 - Tributary TT and W49 are additional impacted to EC Section (Site 1)
 - Additional impacts due to SB 52 split: roadway embankment and riprap outlet protection
 - Adjust visual and impact descriptions to bank stabilization as noted in general section.

SHT 8

- **Site 7 – Perennial Stream (LLL)**
 - Impacts due to 66” pipe and riprap outlet protection
 - Additional impacts to the EC Section (Site 2)
 - Additional impacts to the upstream section was avoided
- **Site 8 – Intermittent Stream (SS) and Wetlands (W26 and W50)**
 - Additional impacts to the EC Section (Sites 4, 5 & 6)
 - W26 is a total take as recommended at the 4b meeting

SHT 9

- **Site 9 – Perennial Stream (III) and Wetland (W42)**
 - No additional impacts to inlet end of culvert; EC Section (Site 7)
 - Additional impacts to outlet end of culvert; EC Section (Site 8)
 - Impacts due to NC-65 Ramp C, SB 52 and Beltway Ramp B
- **Site 10 – Perennial Stream (VV)**
 - Site 10A due to riprap fill
 - Site 10B is bank stabilization only
 - Adjust visual and impact descriptions to bank stabilization as noted in general section, add detail to plan sheet.
 - Site 10C is new box culvert with channel change and riprap fill at downstream end

- Did not bury culvert, see the stream form attached
- Adjust visual and impact descriptions to bank stabilization as noted in general section.
- **Dry Detention Basin**
 - Detention basin located between mainline and north bound 52 to meet maximum extent practicable
 - Treats new pavement from mainline (Future I-74) and NB52
- **Site 13 – Perennial Stream (DDD) and Wetland (W30)**
 - Wetland impacts due to roadway fill
 - Stream impacts due to riprap outlet channel protection
 - Add grass symbols for wetlands, missing from WET file. Bill Barrett will address.

SHT 10

- **Site 10 – Perennial Stream (VV)**
 - Site 10D is bank stabilization only
 - Sites 10E and 10F are new box culverts with channel change and riprap fill
 - Did not bury culvert, see the stream form attached
 - Site 10F should also be bank stabilization, adjust visual and impact descriptions to bank stabilization as noted in general section.
- **Dry Detention Basin**
 - Detention basin located inside loop D to meet maximum extent practicable
 - Treats new pavement from NB52 and loop D
- **Site 14 – Perennial Stream (WW)**
 - Site impacts due to new box culvert and channel change
 - Did not bury culvert, total culvert length is approximately 1200'
 - Did not add a channel bench due to deep cut
- **Site 15 – Perennial Stream - Grassy Creek (XX)**
 - Site 15D impacts due to stream WW channel change and tie into Grassy Creek
 - Shift label over to the right of the match line to eliminate text conflicts and make it clear that the label is for the Grassy Creek impact on permit sheets.
 - Show where the tie in of the channel change and Grassy Creek meet to be bank stabilization, adjust visual and impact descriptions to bank stabilization as noted in general section.

SHT 11

- **Site 15 – Perennial Stream - Grassy Creek (XX)**
 - Sites 15A & 15B impacts due to new double box culvert, channel change and bank stabilization
 - Culvert will be buried 1' with 1' flood bench
 - Channel change will be riprap lined with Class I
 - Class II riprap will be used on the low flow channel bank
 - Coir fiber matting will be used on the flood bench
 - Add sill callout on inlet/ outlet details.
 - Show inlet improvements on 9x9 as bank stabilization, adjust visual and impact descriptions to bank stabilization as noted in general section, add detail to plan sheet.
 - Site 15C impact for bank stabilization at project outfall point

- Move label on permit sheets so that it does not conflict with the proposed ditch.
 - Remove ditch flow line shown on Site 15C..
- **Site 16 – Perennial Stream (AAA)**
 - Impacts due to new box culvert and riprap channel protection
 - Did not bury culvert; ties to relocated Grassy Creek

SHT 12

- No Jurisdictional Impacts

SHT 13

- **Site 10D – Perennial Stream (VV)**
 - Site 10D is bank stabilization only
 - Matchline to Plan Sheet 10 (Permit Drawing Sheets 38 & 39)
 - Site 10G is bank stabilization only
 - Site 10H is a new culverts with channel change and riprap fill
 - Did not bury culvert, see the stream form attached
 - Don't use stream form as justification not to bury culvert. Culvert not buried due to discussion at 4B including culvert length, slope, rip rap in bed, etc.
- **Site 12A – Perennial Stream (RR)**
 - Impacts due to roadway embankment and channel change
- **Site 11 – Wetland (W43)**
 - Impacts due to roadway embankment
- **Site 12B – Wetland (W34)**
 - Impacts due to channel excavation
 - Add mechanical clearing for construction of channel change.

SHT 14

- **Site 15 – Perennial Stream - Grassy Creek (XX)**
 - Sites 15E & 15F for bank stabilization only
 - Adjust visual and impact descriptions to bank stabilization as noted in general section.
 - Site 15G impacts due to culvert extension, channel change and riprap channel protection
- **Site 17 – Intermittent Stream (ZZ) and Wetland (W29)**
 - Appears to be an abandoned stormwater basin which was discussed at the 4B meeting
 - Per an email from Joe Fogarty, PE (City of Winston-Salem), there is no record of a stormwater feature at this location; most likely an old sediment basin left in place after construction.
 - Show wetland as total take since area will be drained.
- **Site 18 – Intermittent Stream (NNNN)**
 - New trenchless 48" steel pipe replacing an existing 36" CMP
 - Tie to existing drainage system downstream
 - Adjust rip rap to better match stream.

SHT 15

- **Site 14 – Perennial Stream (WW)**
 - Site impacts due to new culvert
 - Did not bury culvert, total culvert length is approximately 1200'

SHT 16

- No Jurisdictional Impacts

SHT 17

- No Jurisdictional Impacts



North Carolina Department of Transportation

Highway Stormwater Program
STORMWATER MANAGEMENT PLAN
FOR NCDOT PROJECTS

(Version 2.08; Released April 2018)

WBS Element: C204137 TIP No.: R-2247EB County(ies): Forsyth Page 1 of 10

General Project Information

WBS Element:	C204137	TIP Number:	R-2247EB	Project Type:	New Location	Date:	4/10/2019
NCDOT Contact:	Craig J Lee, PE			Contractor / Designer:	Edward J. Vance, PE		
Address:	1020 Birch Ridge Dr. Raleigh, NC 27610			Address:	STV Engineers 900 W. Trade Street, Suite 715 Charlotte, NC 28202		
	Phone: 919-707-6708				Phone: 704-372-1885		
	Email: cjlee@ncdot.gov				Email: edward.vance@stvinc.com		
City/Town:	Winston-Salem			County(ies):	Forsyth		
River Basin(s):	Yadkin-Pee Dee			CAMA County?	No		
Wetlands within Project Limits?	Yes						

Project Description

Project Length (lin. miles or feet):	2.94	Surrounding Land Use:	Residential (Single Family), Commercial, Industrial					
		Proposed Project	Existing Site					
Project Built-Up Area (ac.)	246.1	ac.	42.4	ac.				
Typical Cross Section Description:	8 lane divided freeway with a 20' grass median: (2) 14 foot outside paved shoulders, (3) 12 foot travel lanes, (2) 6 foot aux lanes, (2) 12 foot paved median shoulders - Total width of 156'			4 lane divided highway with a 28.5 foot grass median: (2) 10 foot outside paved shoulders, (2) 12 foot travel lanes, (2) 3.5 foot paved median shoulders - Total width of 103.5'				
Annual Avg Daily Traffic (veh/hr/day):	Design/Future:	687000	Year:	2035	Existing:	61700	Year:	2015
General Project Narrative: (Description of Minimization of Water Quality Impacts)	Project Description: The proposed project (R-2247EB) is part of the future I-74 Winston Salem Northern Beltway at the interchange at US 52 (Future I-74) and will construct approximately .45 miles of 6-lane widening of US 52 and 2.5 miles of 8-lane divided highway. The project includes 2 major interchanges: NC 65 and US 52 (Future I-74). There are 7 proposed culvert crossings and 3 culvert extensions on the project at Beaver Dam Creek, Grassy Creek, 7 unnamed tributaries to Grassy Creek, and one unnamed tributary to Beaver Dam Creek. Pipe culverts will be used to convey all other jurisdictional stream crossings through the project. Wetlands are also located throughout the length of the entire project. Impact Minimization Efforts: Guardrail with 2:1 slopes were utilized throughout the project to minimize project footprint, therefore minimizing surface water impacts to streams and wetlands. Ditches and pipes that outlet adjacent to wetlands have been designed to have non-erosive velocities to help protect existing wetlands. Grass swales were utilized throughout the project where possible to promote sedimentation and infiltration of runoff by providing additional attenuation. In ditches with slopes that made vegetative liners impracticable, rip rap liners have been proposed in order to reduce velocity, prevent erosion and protect downstream features. Stormwater BMP Measures: Two dry detention basins and a preformed scour hole are proposed at specific locations along the project. The Design-Build Team has designed ditches to achieve grass swale credit.							

Waterbody Information

Surface Water Body (1):	Beaver Dam Creek		NCDWR Stream Index No.:	12-94-2			
NCDWR Surface Water Classification for Water Body	Primary Classification:	Class C					
	Supplemental Classification:	None					
Other Stream Classification:	None						
Impairments:	None						
Aquatic T&E Species?	No	Comments:					
NRTR Stream ID:	QQQ			Buffer Rules in Effect:	N/A		
Project Includes Bridge Spanning Water Body?	No	Deck Drains Discharge Over Buffer?	N/A	Dissipator Pads Provided in Buffer?	N/A		
Deck Drains Discharge Over Water Body?	N/A	(If yes, provide justification in the General Project Narrative)		(If yes, describe in the General Project Narrative; if no, justify in the General Project Narrative)			
(If yes, provide justification in the General Project Narrative)							



North Carolina Department of Transportation

Highway Stormwater Program
STORMWATER MANAGEMENT PLAN
FOR NCDOT PROJECTS



(Version 2.08; Released April 2018)

WBS Element: C204137 TIP No.: R-2247EB County(ies): Forsyth Page 2 of 10

Additional Waterbody Information

Surface Water Body (2):	Grassy Creek		NCDWR Stream Index No.:	12-94-7-3	
NCDWR Surface Water Classification for Water Body	Primary Classification:	Class C			
	Supplemental Classification:	None			
Other Stream Classification:	None				
Impairments:	None				
Aquatic T&E Species?	No	Comments:			
NRTR Stream ID:	XX			Buffer Rules in Effect:	N/A
Project Includes Bridge Spanning Water Body?	No	Deck Drains Discharge Over Buffer?	N/A	Dissipator Pads Provided in Buffer?	N/A
Deck Drains Discharge Over Water Body?	N/A	(If yes, provide justification in the General Project Narrative)		(If yes, describe in the General Project Narrative; if no, justify in the General Project Narrative)	
(If yes, provide justification in the General Project Narrative)					

Additional Comments



North Carolina Department of Transportation
Highway Stormwater Program
STORMWATER MANAGEMENT PLAN



(Version 2.08; Released April 2018)

FOR NCDOT PROJECTS

WBS Element: C204137

TIP No.: R-2247EB

County(ies): Forsyth

Page 4 of 10

Swales															
Sheet No.	Station & Coordinates (Road and Non Road Projects)	Surface Water Body	Base Width (ft)	Front Slope (H:1)	Back Slope (H:1)	Drainage Area (ac)	Recommended Treatm't Length (ft)	Actual Length (ft)	Longitudinal Slope (%)	Q2 (cfs)	V2 (fps)	Q10 (cfs)	V10 (fps)	Rock Checks Used	BMP Associated w/ Buffer Rules?
8	-L- 127+90 M 36.211717 / -80.304413	(1)Beaver Dam Creek	0.0	6.0	6.0	0.3	27	260	0.50%	0.7	0.8	0.9	0.8	No	No
8	-L- 135+50 M 36.210001 / -80.302901	(2)Grassy Creek	0.0	6.0	6.0	0.5	53	500	0.59%	1.6	1.0	2.0	1.2	No	No
9	-L- 139+00 M 36.209214 / -80.302219	(2)Grassy Creek	0.0	6.0	6.0	0.4	37	350	0.72%	1.0	1.0	1.3	1.0	No	No
9	-L- 143+00 M 36.208317 / -80.301432	(2)Grassy Creek	0.0	6.0	6.0	0.4	43	400	0.72%	1.2	1.0	1.5	1.1	No	No
9	-L- 147+00 M 36.207414 / -80.300667	(2)Grassy Creek	0.0	6.0	6.0	0.4	42	400	0.72%	1.2	1.0	1.5	1.1	No	No
9	-L- 150+70 M 36.206590 / -80.299944	(2)Grassy Creek	0.0	6.0	6.0	0.4	40	370	0.83%	1.1	1.1	1.4	1.1	No	No
9	-L- 152+50 Lt 36.206312 / -80.299313	(2)Grassy Creek	0.0	6.0	4.0	0.9	87	500	1.15%	2.4	1.6	3.0	1.7	No	No
9	-L- 156+50 Rt 36.205105 / -80.299049	(2)Grassy Creek	0.0	6.0	4.0	1.4	145	600	1.60%	2.6	1.9	3.3	2.0	No	No
9	-L- 154+00 M 36.205843 / -80.299301	(2)Grassy Creek	0.0	5.0	6.0	0.6	60	330	1.94%	1.9	1.7	2.5	1.8	No	No
10	-L- 160+00 Rt 36.204366 / -80.298215	(2)Grassy Creek	0.0	4.0	6.0	0.6	64	350	3.49%	1.0	1.9	1.3	2.0	No	No
10	-L- 164+00 Lt 36.204114 / -80.296733	(2)Grassy Creek	0.0	6.0	4.0	0.8	80	250	2.81%	2.1	2.0	2.7	2.2	No	No
10	-L- 166+50 Lt 36.203786 / -80.296020	(2)Grassy Creek	0.0	6.0	6.0	1.1	106	250	1.71%	2.4	1.7	3.0	1.9	No	No
10	-L- 163+50 M 36.203971 / -80.297038	(2)Grassy Creek	0.0	4.0	8.0	0.3	32	180	2.49%	1.1	1.6	1.3	1.7	No	No
10	-L- 166+50 M 36.203561 / -80.296164	(2)Grassy Creek	0.0	4.0	8.0	0.6	63	300	1.84%	2.0	1.7	2.6	1.8	No	No
10	-L- 168+25 Lt 36.203588 / -80.295492	(2)Grassy Creek	0.0	6.0	6.0	0.8	76	175	0.74%	1.8	1.1	2.3	1.3	No	No
10	-L- 168+25 M 36.203351 / -80.295619	(2)Grassy Creek	0.0	4.0	8.0	0.4	37	175	0.63%	1.2	1.0	1.5	1.0	No	No
10	-L- 169+50 M 36.203231 / -80.295226	(2)Grassy Creek	0.0	4.0	8.0	0.5	45	125	0.30%	1.5	0.8	1.9	0.9	No	No
10	-L- 170+00 Lt 36.202934 / -80.293732	(2)Grassy Creek	0.0	4.0	6.0	0.8	83	175	3.17%	1.6	2.0	2.0	2.1	No	No
11	-L- 176+50 M 36.202869 / -80.292911	(2)Grassy Creek	0.0	4.0	8.0	0.5	48	250	0.30%	1.5	0.8	2.0	0.9	No	No

Additional Comments



North Carolina Department of Transportation
Highway Stormwater Program
STORMWATER MANAGEMENT PLAN
FOR NCDOT PROJECTS



(Version 2.08; Released April 2018)

WBS Element: C204137

TIP No.: R-2247EB

County(ies): Forsyth

Page 5

of

10

Swales															
Sheet No.	Station & Coordinates (Road and Non Road Projects)	Surface Water Body	Base Width (ft)	Front Slope (H:1)	Back Slope (H:1)	Drainage Area (ac)	Recommended Treatm't Length (ft)	Actual Length (ft)	Longitudinal Slope (%)	Q2 (cfs)	V2 (fps)	Q10 (cfs)	V10 (fps)	Rock Checks Used	BMP Associated w/ Buffer Rules?
11	-L- 176+00 Lt 36.203129 / -80.293055	(2)Grassy Creek	0.0	6.0	10.0	0.9	87	200	0.07%	2.1	0.5	2.7	0.5	No	No
11	-L- 178+65 Lt 36.203121 / -80.292200	(2)Grassy Creek	0.0	6.0	10.0	1.1	107	265	0.26%	2.3	0.8	3.0	0.9	No	No
11	-L- 178+65 M 36.202870 / -80.292195	(2)Grassy Creek	0.0	4.0	8.0	0.4	40	215	0.27%	1.3	0.8	1.7	0.8	No	No
11	-L- 178+65 M 36.202870 / -80.292195	(2)Grassy Creek	0.0	4.0	5.0	0.6	55	235	0.58%	1.8	1.2	2.3	1.3	No	No
11	-L- 178+65 Lt 36.203121 / -80.292200	(2)Grassy Creek	0.0	6.0	10.0	1.1	113	235	1.21%	2.4	1.4	3.1	1.6	No	No
11	-L- 181+00 M 36.202910 / -80.291336	(2)Grassy Creek	0.0	6.0	6.0	0.4	41	220	0.87%	1.4	1.1	1.8	1.2	No	No
11	-L- 188+00 M 36.203226 / -80.289024	(2)Grassy Creek	0.0	6.0	6.0	0.7	68	600	1.02%	2.1	1.3	2.7	1.6	No	No
11	-L- 193+00 Rt 36.203118 / -80.287340	(2)Grassy Creek	0.0	6.0	4.0	0.3	34	100	2.39%	1.0	1.6	1.2	1.7	No	No
11	-L- 194+00 Rt 36.203193 / -80.286927	(2)Grassy Creek	0.0	6.0	4.0	0.6	63	200	2.49%	1.8	1.9	2.3	2.0	No	No
11	-L- 194+00 M 36.203507 / -80.286991	(2)Grassy Creek	0.0	6.0	6.0	0.5	54	500	2.28%	1.6	1.7	2.1	1.8	No	No
11	-L- 196+00 Rt 36.203285 / -80.286283	(2)Grassy Creek	0.0	6.0	4.0	1.0	104	300	2.42%	2.8	2.0	3.5	2.4	No	No
5	-L- 80+10 Lt 36.222479 / -80.313729	(1)Beaver Dam Creek	0.0	6.0	6.0	0.4	40	290	3.17%	0.9	1.6	1.1	0.9	No	No
6	-L- 83+00 Lt 36.221882 / -80.313077	(1)Beaver Dam Creek	0.0	6.0	4.0	0.7	72	450	3.06%	1.4	1.9	1.8	2.0	No	No
6	-L- 87+50 Lt 36.220932 / -80.312076	(1)Beaver Dam Creek	0.0	6.0	4.0	0.9	88	450	1.68%	1.6	1.6	2.1	1.7	No	No
6	-L- 92+00 Lt 36.219977 / -80.311077	(1)Beaver Dam Creek	0.0	6.0	4.0	0.3	34	200	0.64%	0.6	0.9	0.8	0.9	No	No
6	-L- 95+00 Lt 36.219285 / -80.310450	(1)Beaver Dam Creek	0.0	6.0	4.0	0.3	26	100	0.21%	0.5	0.5	0.6	0.6	No	No
7	-L- 98+30 Lt 36.218552 / -80.309805	(1)Beaver Dam Creek	0.0	6.0	4.0	0.7	71	330	1.92%	1.4	1.6	1.8	1.7	No	No
7	-L- 105+00 Lt 36.217089 / -80.308460	(1)Beaver Dam Creek	0.0	6.0	4.0	1.9	185	670	0.93%	4.7	1.8	6.0	1.9	No	No
7	-L- 105+30 Rt 36.216581 / -80.309161	(1)Beaver Dam Creek	0.0	6.0	4.0	0.5	54	280	1.00%	1.1	1.2	1.4	1.3	No	No

Additional Comments



North Carolina Department of Transportation
Highway Stormwater Program
STORMWATER MANAGEMENT PLAN



(Version 2.08; Released April 2018)

FOR NCDOT PROJECTS

WBS Element: C204137

TIP No.: R-2247EB

County(ies): Forsyth

Page 6 of 10

Swales															
Sheet No.	Station & Coordinates (Road and Non Road Projects)	Surface Water Body	Base Width (ft)	Front Slope (H:1)	Back Slope (H:1)	Drainage Area (ac)	Recommended Treatm't Length (ft)	Actual Length (ft)	Longitudinal Slope (%)	Q2 (cfs)	V2 (fps)	Q10 (cfs)	V10 (fps)	Rock Checks Used	BMP Associated w/ Buffer Rules?
8	-NB52- 31+40 Lt 36.214187 / -80.305936	(1)Beaver Dam Creek	0.0	6.0	4.0	0.7	72	180	1.67%	1.8	1.6	2.3	1.9	No	No
8	-NB52- 33+20 Lt 36.213779 / -80.305585	(1)Beaver Dam Creek	0.0	6.0	4.0	0.8	76	330	1.87%	2.0	1.7	2.5	2.0	No	No
8	-NB52- 40+20 Lt 36.212240 / -80.304181	(1)Beaver Dam Creek	0.0	6.0	4.0	1.2	117	430	0.58%	3.1	1.4	3.9	1.4	No	No
9	-NB52- 49+50 Lt 36.210139 / -80.302339	(1)Beaver Dam Creek	0.0	6.0	4.0	0.9	93	250	1.18%	2.9	1.7	3.7	1.9	No	No
9	-NB52- 51+25 Lt 36.209779 / -80.301966	(2)Grassy Creek	0.0	6.0	4.0	1.0	104	175	0.97%	2.9	1.6	3.8	1.7	No	No
9	-NB52- 59+50 Lt 36.208248 / -80.299931	(2)Grassy Creek	0.0	6.0	4.0	0.7	69	350	0.47%	1.3	1.0	1.7	1.1	No	No
9	-NB52- 63+00 Lt 36.207506 / -80.299130	(2)Grassy Creek	0.0	6.0	4.0	0.4	36	350	1.74%	1.0	1.4	1.3	1.5	No	No
9	-NB52- 66+50 Rt 36.206505 / -80.298917	(2)Grassy Creek	0.0	7.0	10.0	1.8	181	350	1.43%	3.8	1.8	4.8	1.9	No	No
8	-SB52- 37+85 Rt 36.212465 / -80.305775	(1)Beaver Dam Creek	0.0	4.0	6.0	1.1	110	385	0.74%	2.3	1.4	3.0	1.5	No	No
8	-SB52- 49+85 Rt 36.209740 / -80.303410	(2)Grassy Creek	0.0	6.0	6.0	1.8	177	365	0.29%	5.0	1.1	6.4	1.2	No	No
14	-SB52- 92+25 Lt 36.200142 / -80.295686	(2)Grassy Creek	0.0	6.0	4.0	1.5	149	325	1.19%	3.1	1.8	3.9	1.9	No	No
14	-SB52- 95+50 Lt 36.199586 / -80.294800	(2)Grassy Creek	0.0	6.0	4.0	1.4	136	325	1.10%	2.9	1.7	3.8	1.8	No	No
14	-SB52- 98+50 Lt 36.199050 / -80.293995	(2)Grassy Creek	0.0	6.0	6.0	0.5	50	300	0.97%	1.1	1.1	1.4	1.2	No	No
14	-SB52- 95+00 Rt 36.199462 / -80.295165	(2)Grassy Creek	0.0	6.0	6.0	0.5	47	200	0.99%	1.3	1.2	1.7	1.3	No	No
14	-Y68- 110+50 M 36.196961 / -80.290757	(2)Grassy Creek	0.0	4.0	6.0	0.3	31	300	0.80%	1.0	1.1	1.3	1.1	No	No
14	-Y68- 110+50 M 36.196961 / -80.290757	(1)Beaver Dam Creek	0.0	3.0	3.0	0.4	38	300	0.26%	1.2	0.9	1.6	0.9	No	No
14	-Y68- 112+00 Rt 36.196565 / -80.290555	(2)Grassy Creek	0.0	6.0	6.0	0.6	58	250	0.91%	1.7	1.2	2.1	1.4	No	No
13	-EBBYP- 26+00 Rt 36.201297 / -80.300826	(2)Grassy Creek	0.0	6.0	4.0	0.6	61	400	2.08%	1.2	1.6	1.5	1.7	No	No
13	-EBBYP- 31+00 Lt 36.201322 / -80.299127	(1)Beaver Dam Creek	0.0	6.0	4.0	1.4	136	300	0.57%	2.8	1.3	3.6	1.4	No	No

Additional Comments

[illegible]

Additional Comments

Highway Stormwater Program STORMWATER MANAGEMENT PLAN FOR NCDOT PROJECTS

(Version 2.08; Released April 2018)

WBS Element:

TIP No.: R-2247EB

County(ies): Forsyth

Page 8 of 10

Preformed Scour Holes and Energy Dissipators

[illegible]

Additional Comments

* Refer to the NCDOT Best Management Practices Toolbox (2014), NCDOT Standards, the Federal Highway Administration (FHWA) Hydraulic Engineering Circular No. 14 (HEC-14), Third Edition, Hydraulic Design of Energy Dissipators for Culverts and Channels (July 2006), as applicable, for design guidance and criteria.

Additional Comments



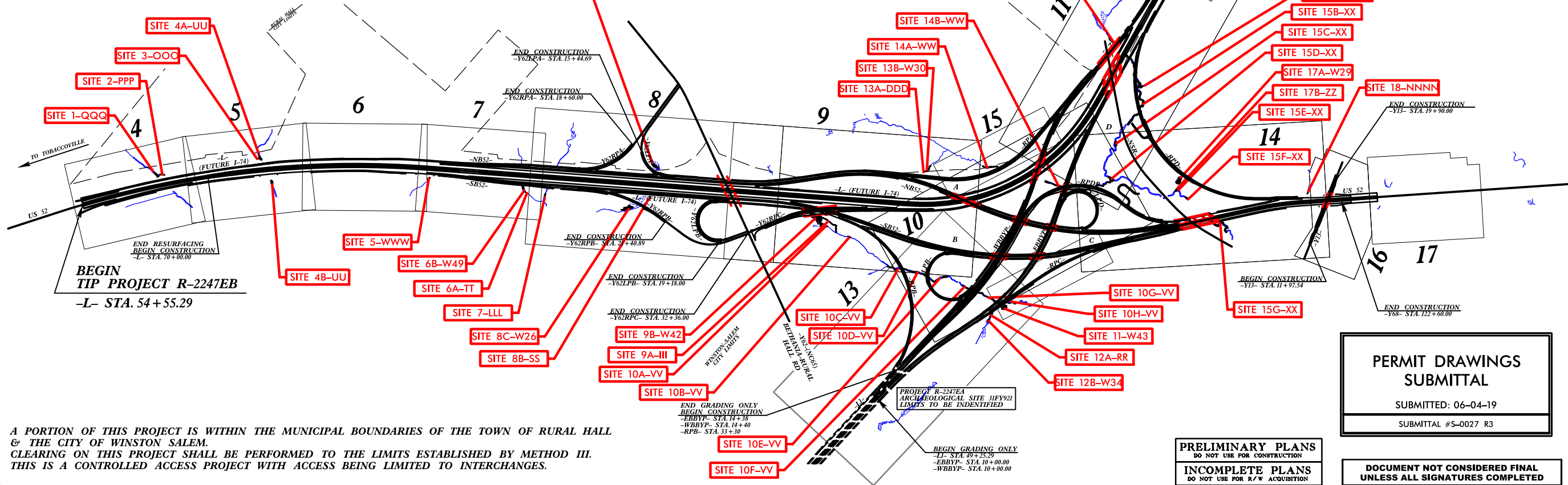
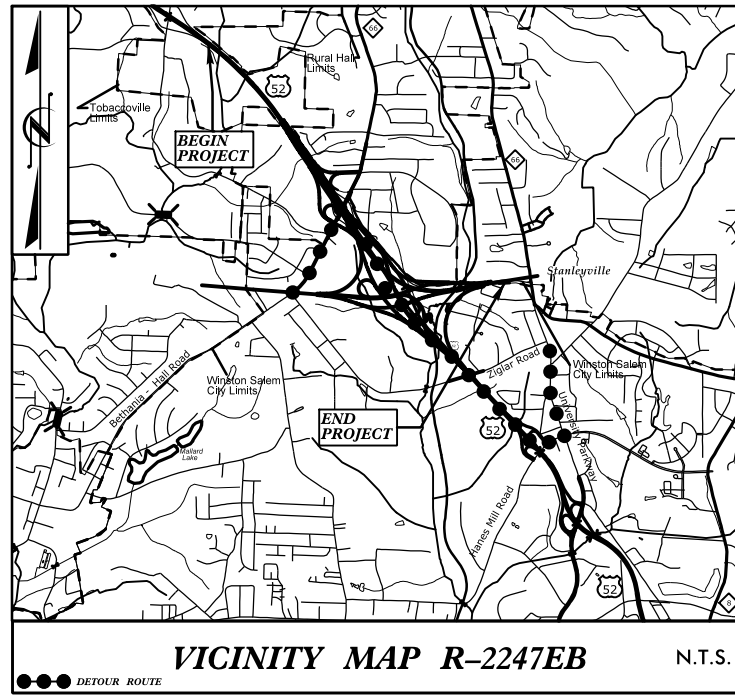
Page 10 of 10

Additional Comments

6/3/2019 R:\Hydraulics\PERMITS-Environmental\Drawings\PRM SH\PRM SH_T03-xx-2019\R2247EB-Hyd-prm-psht01.tsh.dgn
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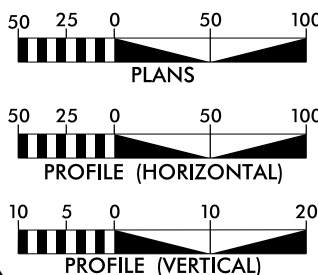
CONTRACT: C204137

TIP PROJECT: R-2247EB



A PORTION OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF THE TOWN OF RURAL HALL & THE CITY OF WINSTON SALEM.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III.
THIS IS A CONTROLLED ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES.

GRAPHIC SCALES



DESIGN DATA

ADT 2015 = 61,700
ADT 2035 = 68,700
K = 9%
D = 55%
T = 21%*
V = 70 MPH
* (TTST=14%+DUAL 7%)
FUNC. CLASSIFICATION =
RURAL FREEWAY
STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-2247EB = 2.875 MILES
LENGTH STRUCTURE TIP PROJECT R-2247EB = 0.061 MILES*
TOTAL LENGTH OF TIP PROJECT R-2247EB = 2.936 MILES
* LENGTH BASED ON EB BRIDGES

NCDOT CONTACT: K. ZAK HAMIDI, PE
DESIGN BUILD PROJECT ENGINEER -
TRANSPORTATION PROGRAM MANAGEMENT UNIT

PLANS PREPARED FOR THE NCDOT BY:



2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
AUGUST 21, 2018

LETTING DATE:
AUGUST 21, 2018



STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number F-0991

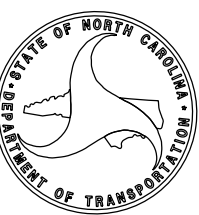
MARK F. ROBBINS, PE
DESIGN PROJECT MANAGER

J. ADAM FREEMAN, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.
ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.



STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

FORSYTH COUNTY

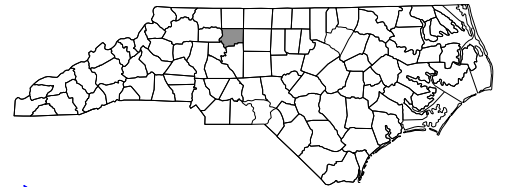
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INTERCHANGE AT US 52 (FUTURE I-74)

TYPE OF WORK: GRADING, DRAINAGE, PAVING, SIGNING AND STRUCTURES

WETLAND AND SURFACE WATER IMPACTS PERMIT

PERMIT DRAWING
SHEET 1 OF 71

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2247EB	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34409.3.17	NHP-0052(056)	P.E., ROW, UTILITIES & CONSTRUCTION	



PERMIT DRAWINGS
SUBMITTAL

SUBMITTED: 06-04-19

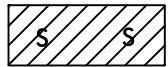
SUBMITTAL #S-0027 R3

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



DENOTES TEMPORARY
IMPACTS IN SURFACE WATER



DENOTES IMPACTS IN
SURFACE WATER

BLYTHE

STV ^{100 years}
STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number F-0991

PROJECT REFERENCE NO. SHEET NO.

R-2247EB 4

ROADWAY DESIGN ENGINEER HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 2 OF 71

SITE 1 - QQQ

SEE PERMIT DRAWING
SHEET 4

LANTAL TEXTILES, INC.

2' LATERAL BASE DITCH
CLASS '1' RIP RAP
EST 264 TONS
EST 447 SY GEOTEXTILE
SEE DETAIL 2

2' SPECIAL LATERAL BASE DITCH
SEE DETAIL 18

BANK STABILIZATION
AT INLET
CLASS '1' RIP RAP
EST 34 TONS
EST 57 SY GEOTEXTILE
SEE DETAIL 16 & 58

4' LATERAL BASE DITCH
CLASS '1' RIP RAP
EST 230 TONS
EST 389 SY GEOTEXTILE
SEE DETAIL 7

ARC HBRHLNCOOL, LLC

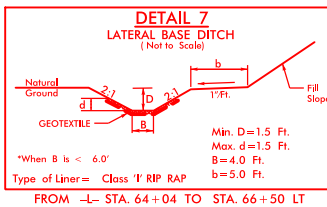
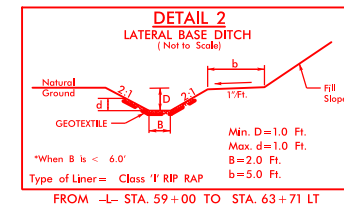
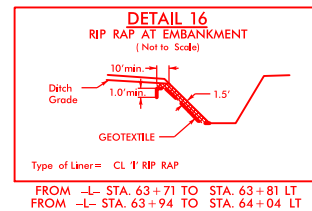
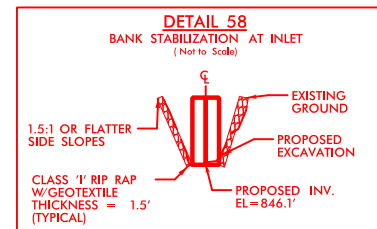
SITE 2 - PPP

EXTEND EXISTING
DOUBLE 7' X 7' RCBC 26 L.F.
WITH HEADWALL & WINGWALLS
NOT BURIED

MATCHLINE -L- STA 68+00
SEE SHEET 5

JERRY D. STOLTZ

20+00 -SBRPC-



6/3/2019
B:\Hydraulics\PERMITS\Environmental\Drawings\PRM_SHT_03-xx-2019\R2247EB_Hyd.prm.PSH04.dgn



DENOTES TEMPORARY
IMPACTS IN SURFACE WATER



DENOTES IMPACTS IN
SURFACE WATER



STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number F-0991

PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

4A

ROADWAY DESIGN
ENGINEER

HYDRAULICS
ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

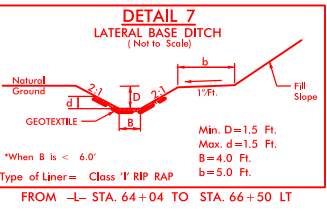
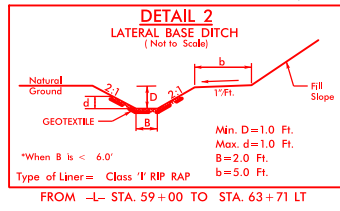
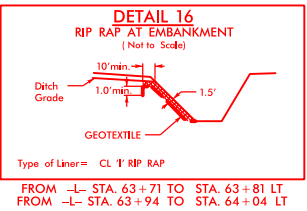
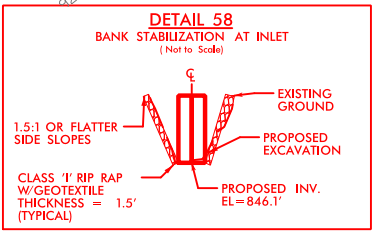
PERMIT DRAWING
SHEET 3 OF 71

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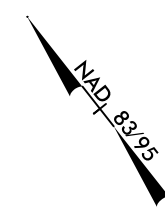
SEE PERMIT DRAWING
SHEET 4

SITE 2 - PPP

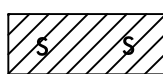
MATCHLINE -L- STA 68+00
SEE SHEET 5



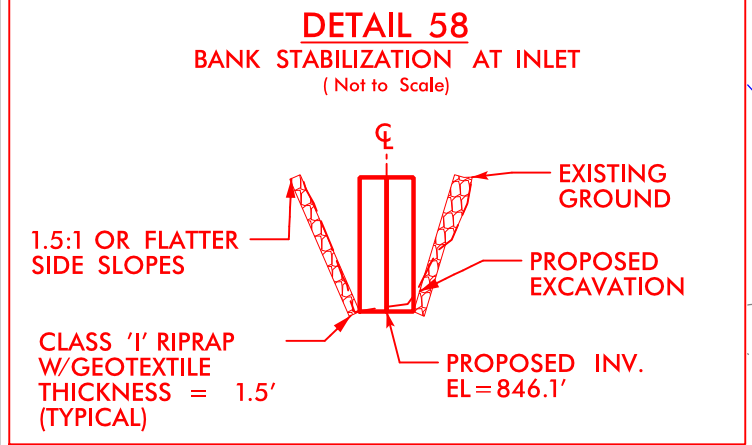
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DENOTES TEMPORARY
IMPACTS IN SURFACE WATER



DENOTES IMPACTS IN
SURFACE WATER

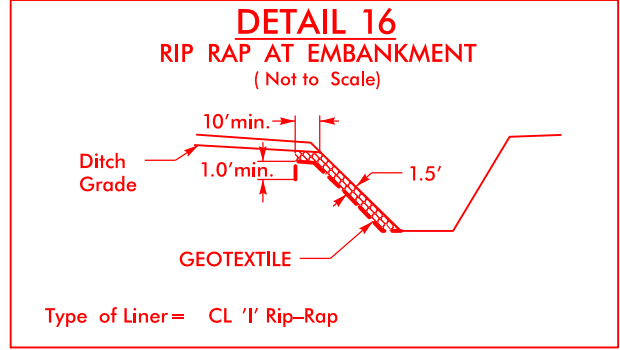


**BANK STABILIZATION
AT INLET**
CLASS 'I' RIP RAP
EST 24 TONS
EST 34 SY GEOTEXTILE
SEE DETAIL 16 & 58

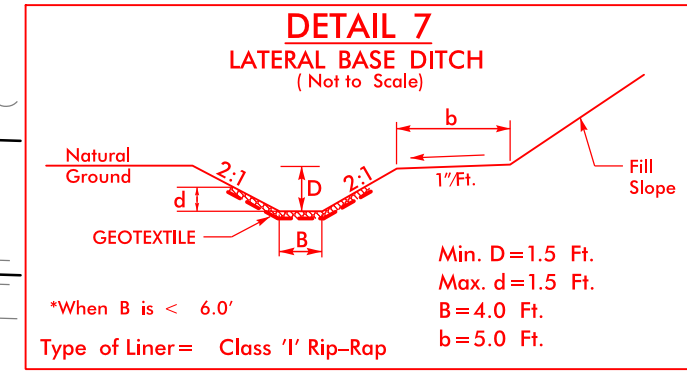
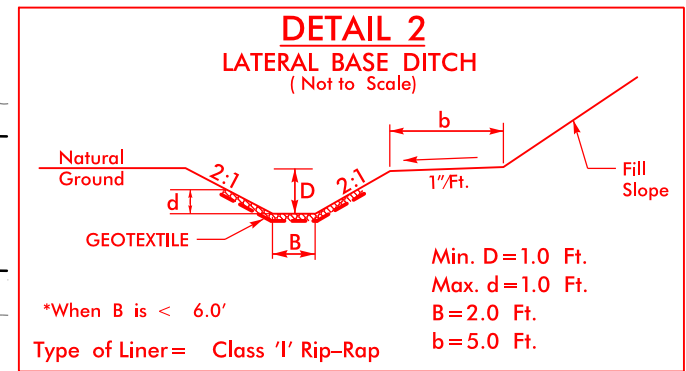
2' LATERAL BASE DITCH
CLASS 'I' RIP RAP
EST 264 TONS
EST 447 SY GEOTEXTILE
SEE DETAIL 2

**BANK STABILIZATION
AT INLET**
CLASS 'I' RIP RAP
EST 18 TONS
EST 25 SY GEOTEXTILE
SEE DETAIL 16 & 58

4' LATERAL BASE DITCH
CLASS 'I' RIP RAP
EST 230 TONS
EST 389 SY GEOTEXTILE
SEE DETAIL 7



**EXTEND EXISTING
DOUBLE 7' X 7' RCBC 26 L.F.
WITH HEADWALL & WINGWALLS
NOT BURIED**



FROM -L- STA. 63+71 TO STA. 63+81 LT
FROM -L- STA. 63+94 TO STA. 64+04 LT

FROM -L- STA. 59+00 TO STA. 63+71 LT

FROM -L- STA. 64+04 TO STA. 66+50 LT

SITE 1 - QQQ

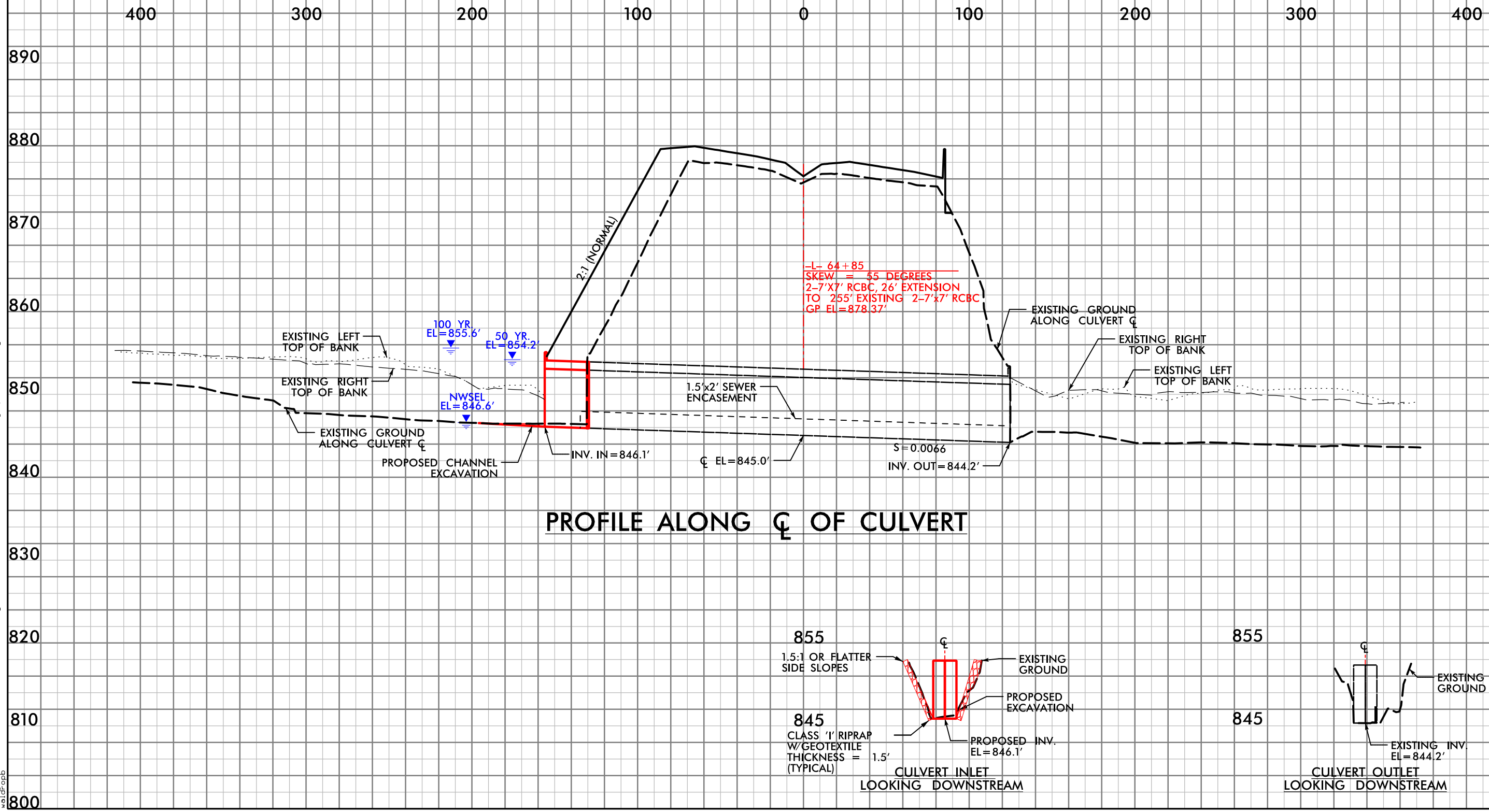
SITE 2 - PPP

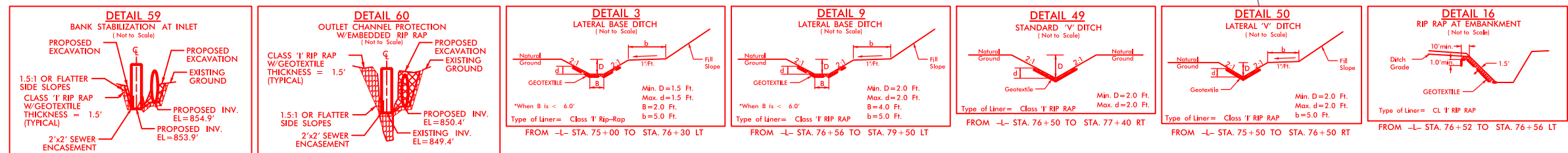
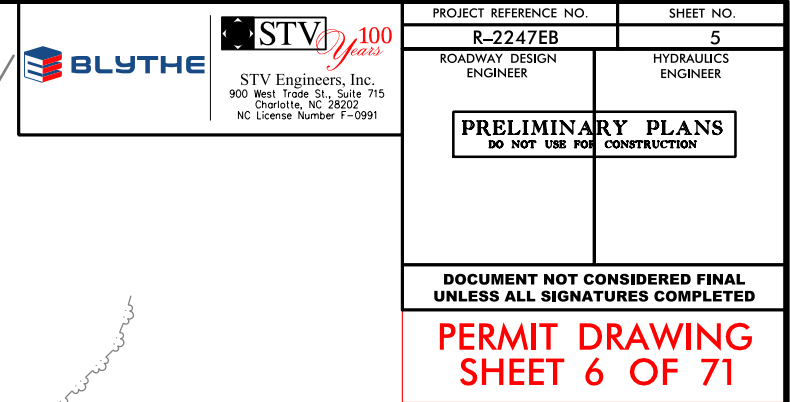
(FUTURE I-74) -L-

6/23/16
6/3/2019
R:\Hydraulics\PERMITS-Environmental\Drawings\PRM_SHT\PRM_SHT_03-xx-2019\R2247EB_hyd-prm_PSH04C.dgn
redrpb

PROJECT REFERENCE NO. R-2247EB	SHEET NO. 4C
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

SITE 1 – QQQ

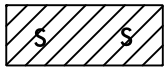




6/3/2019
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DENOTES TEMPORARY
IMPACTS IN SURFACE WATER



DENOTES IMPACTS IN
SURFACE WATER

SITE 3 - 000

SITE 4A - UU

SITE 4B - UU



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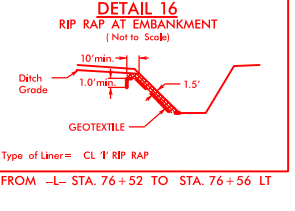
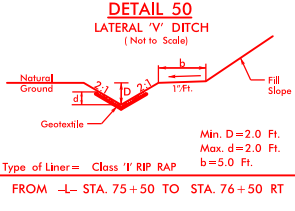
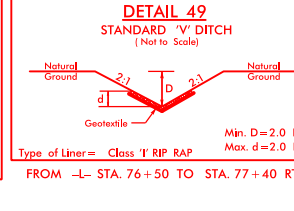
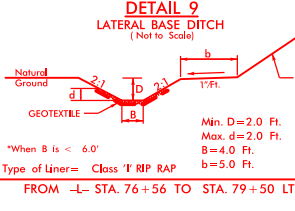
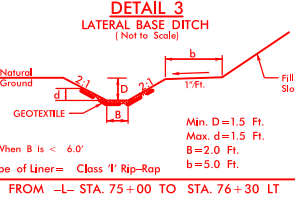
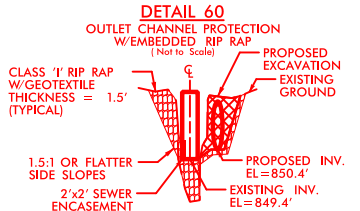
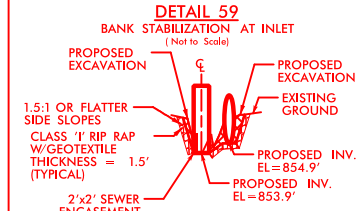
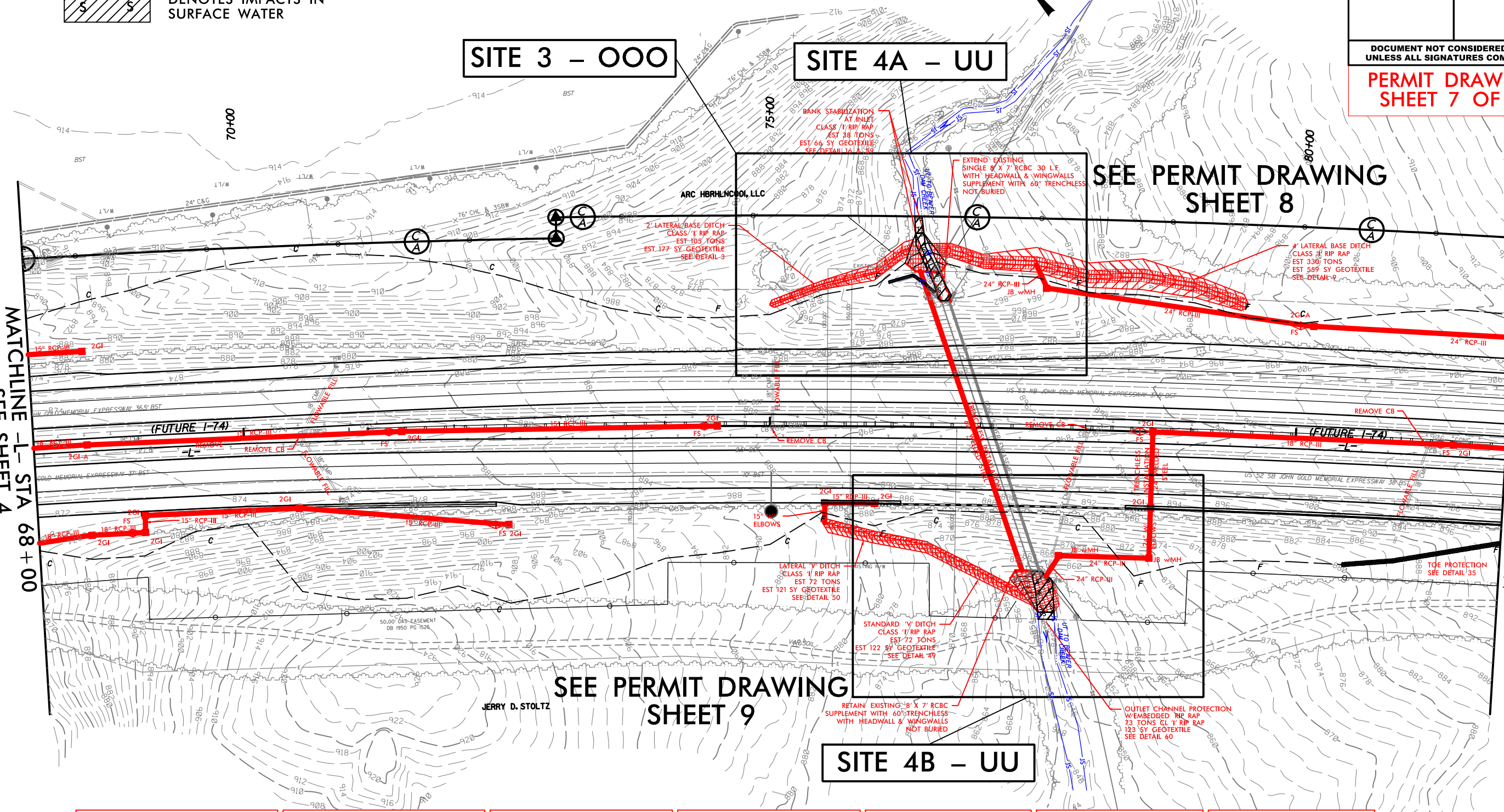
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ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

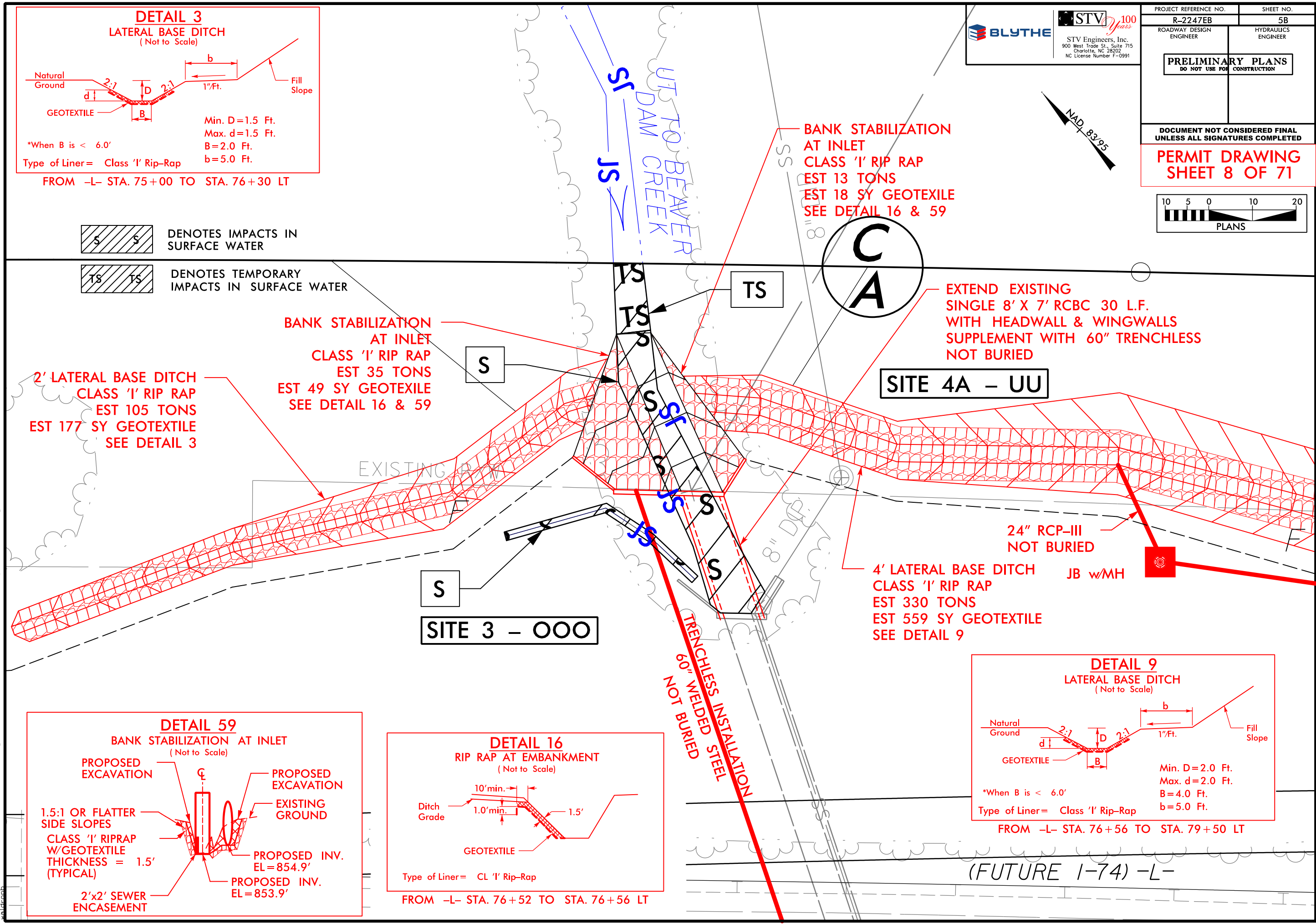
PERMIT DRAWING
SHEET 7 OF 71

MATCHLINE -L- STA 68+00
SEE SHEET 4

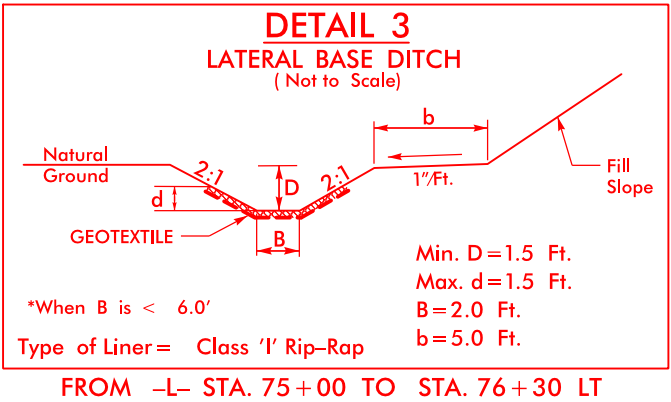
MATCHLINE -L- STA 82+00
SEE SHEET 6



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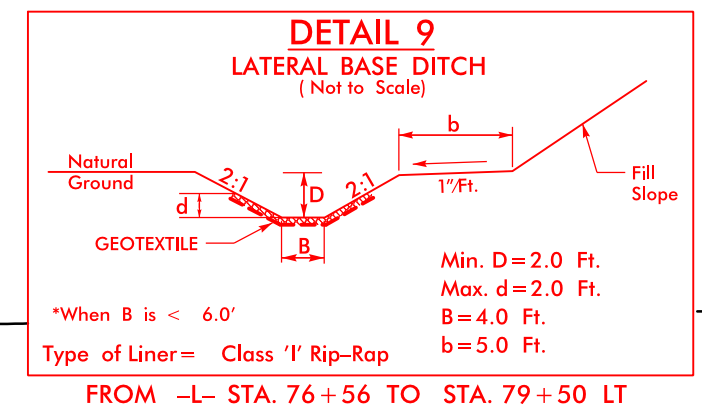
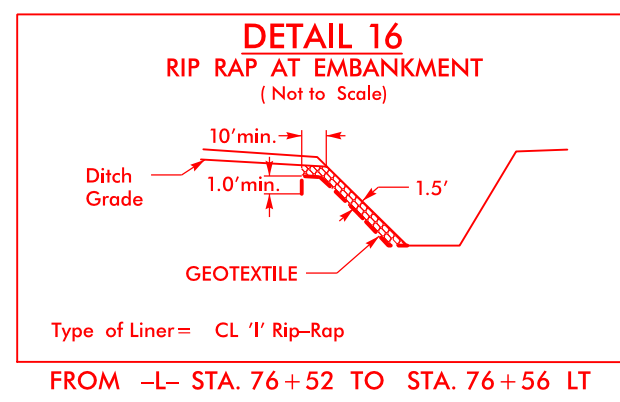
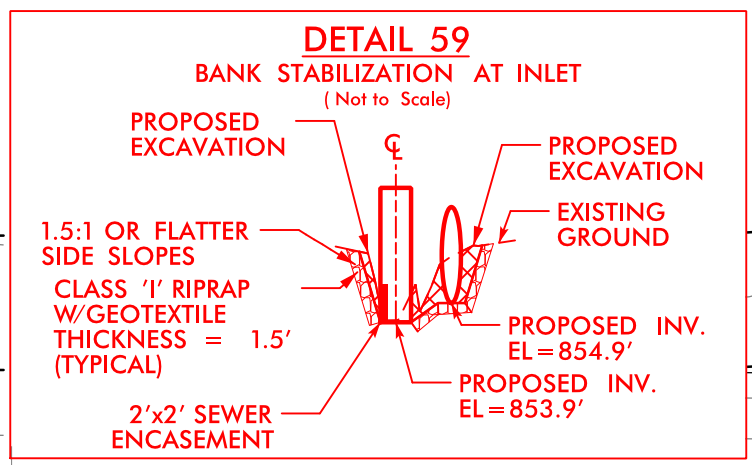


DENOTES IMPACTS IN SURFACE WATER
 DENOTES TEMPORARY IMPACTS IN SURFACE WATER

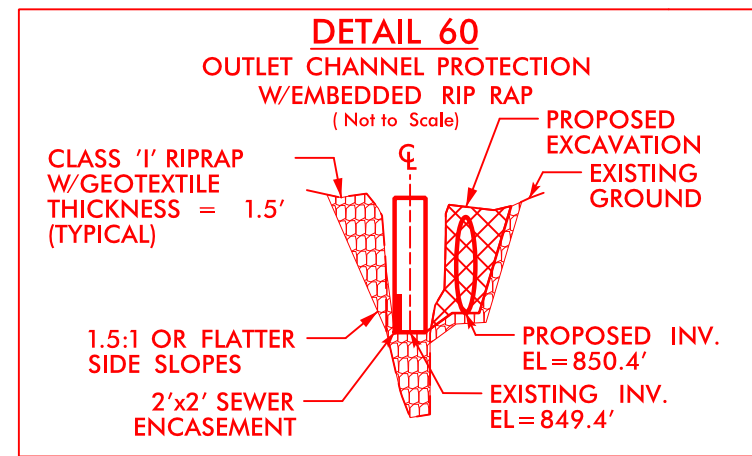
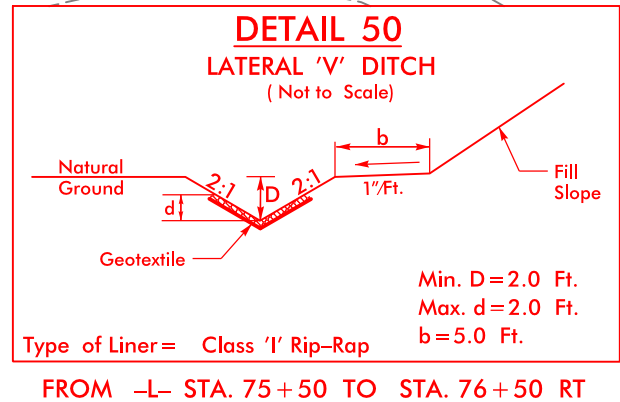
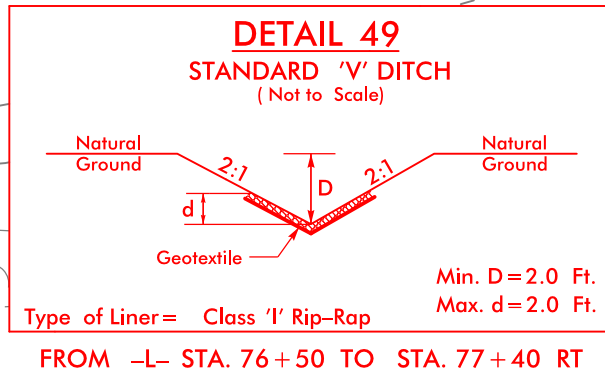
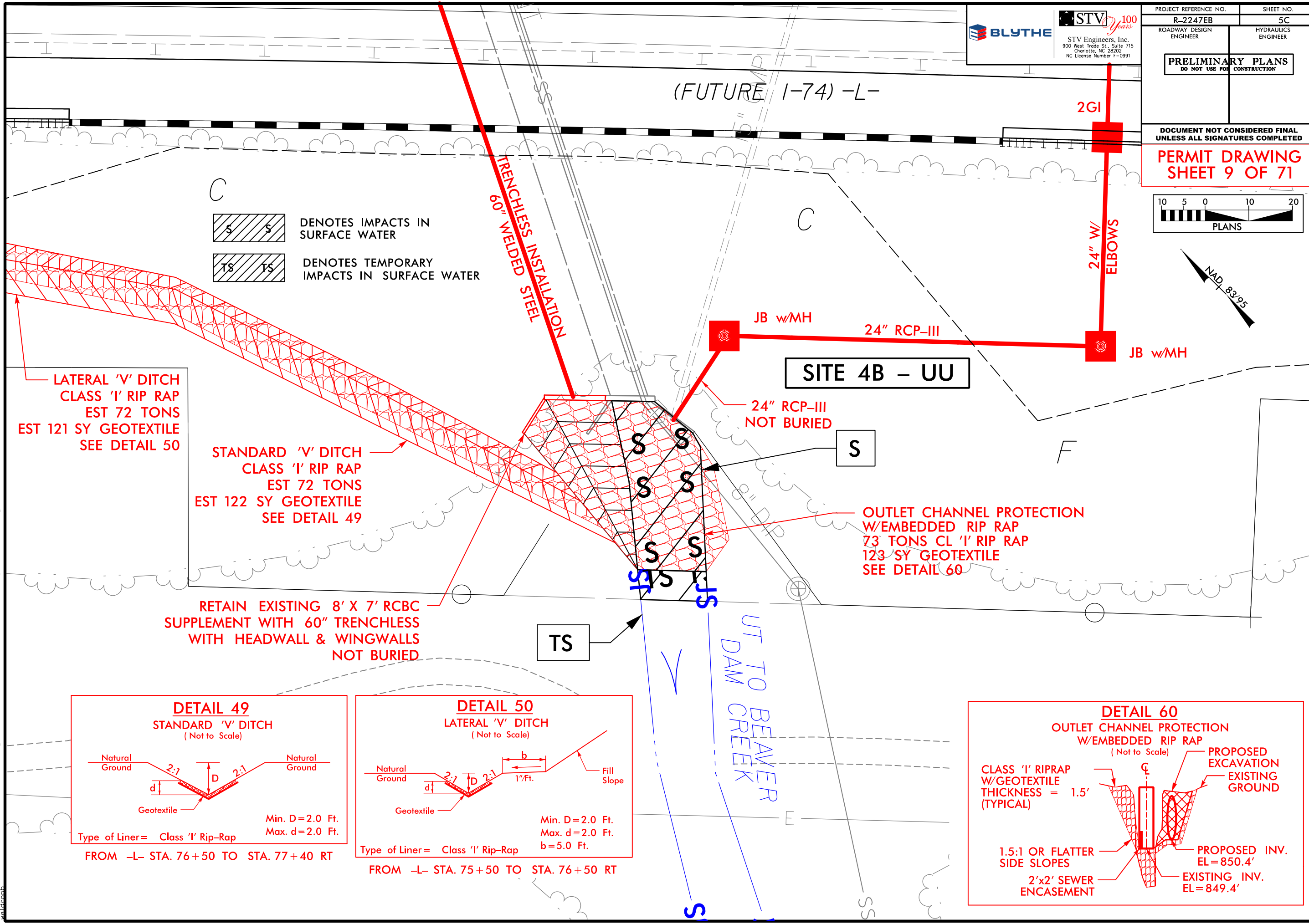
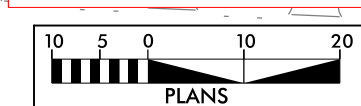
BLYTHE

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Charlotte, NC 28202
NC License Number F-0991

PROJECT REFERENCE NO. R-2247EB		SHEET NO. 5B	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			
PERMIT DRAWING SHEET 8 OF 71			
 PLANS			



(FUTURE I-74) -L-

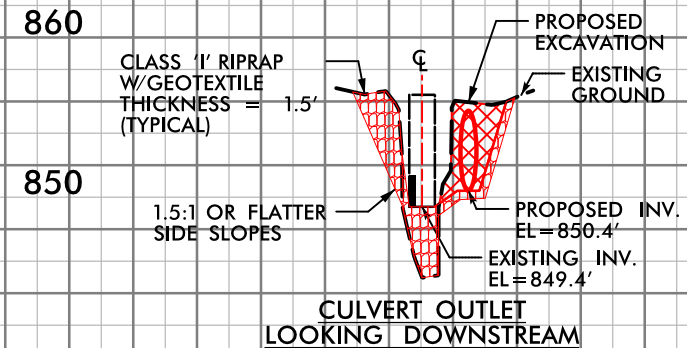
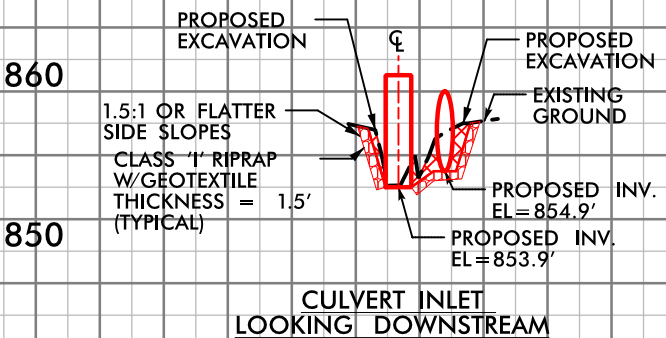
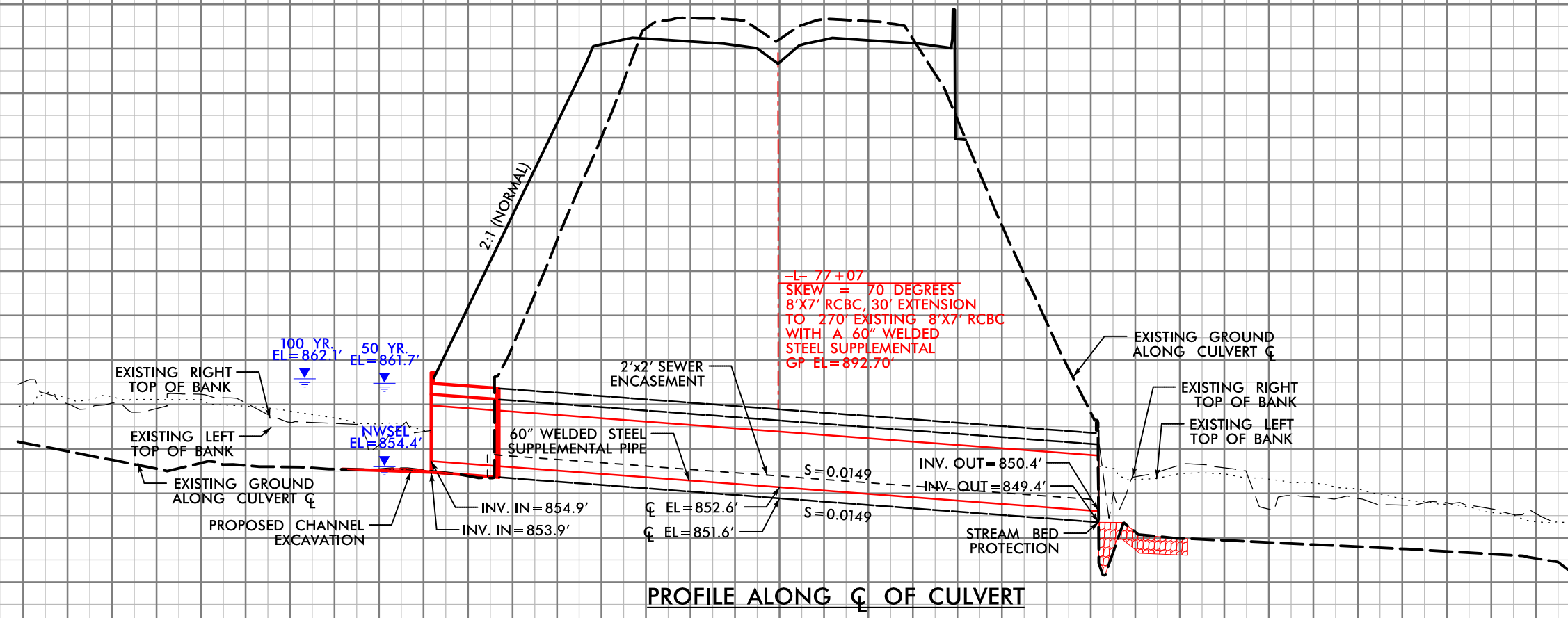


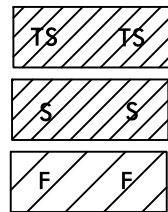
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6/23/16
6/3/2019
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SolidProp

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	5D
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
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INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

SITE 4A – UU SITE 4B – UU



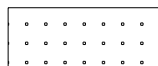


DENOTES TEMPORARY
IMPACTS IN SURFACE WATER

DENOTES IMPACTS IN
SURFACE WATER

DENOTES FILL IN
WETLAND

R-2247EC SITE #1



DENOTES EXCAVATION IN
WETLAND (R-2247EC)



DENOTES FILL IN
WETLAND (R-2247EC)



DENOTES MECHANIZED
CLEARING (R-2247EC)



DENOTES TEMPORARY IMPACTS
IN SURFACE WATER (R-2247EC)



DENOTES IMPACTS IN
SURFACE WATER (R-2247EC)



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Charlotte, NC 28202
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PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

7

ROADWAY DESIGN
ENGINEER

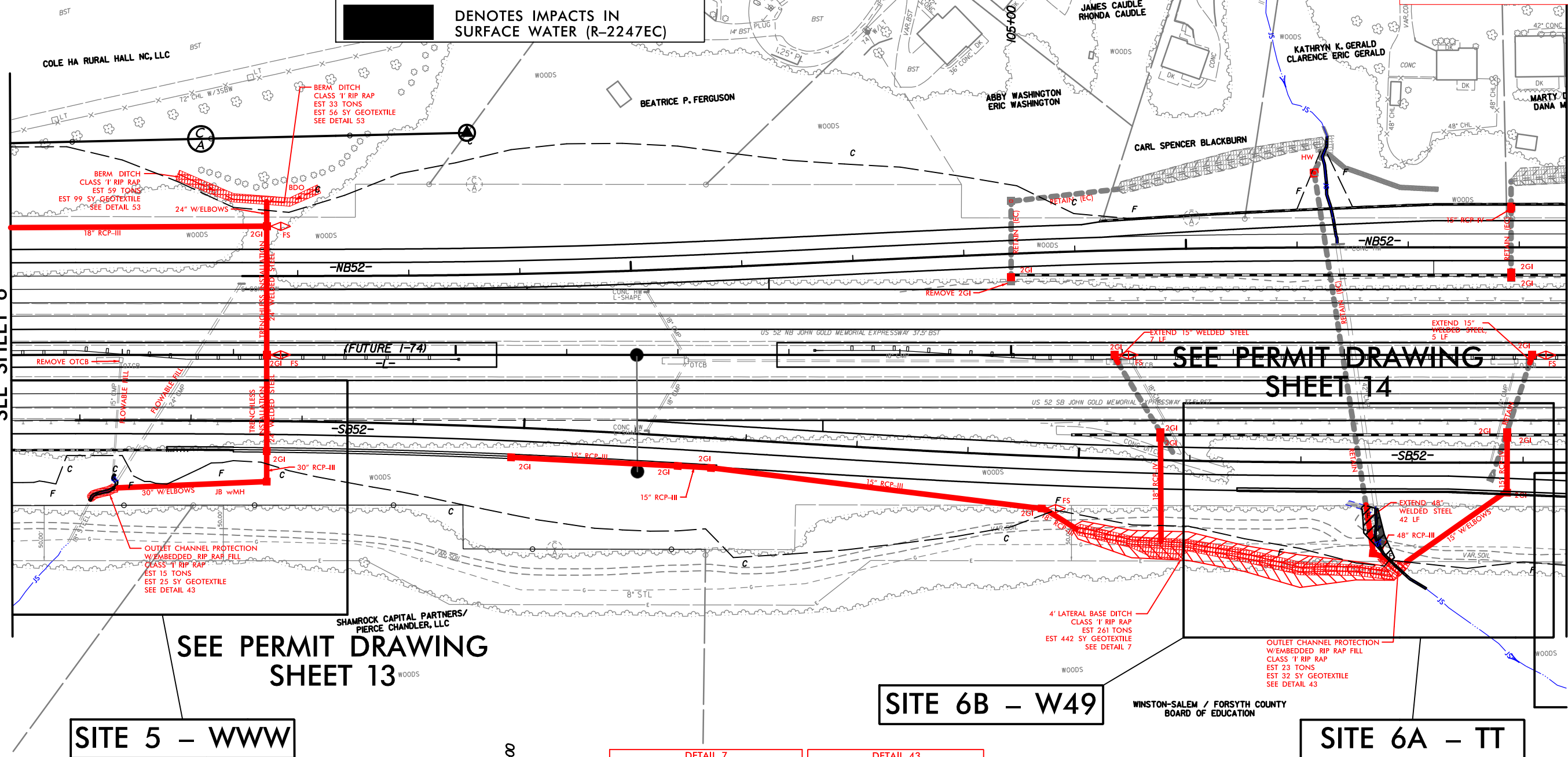
HYDRAULICS
ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 11 OF 71

MATCHLINE -L- STA 96+00
SEE SHEET 6

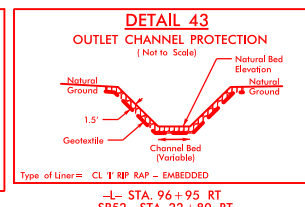
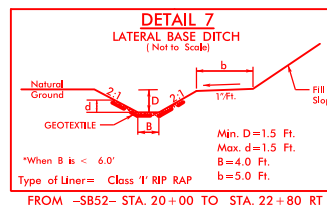


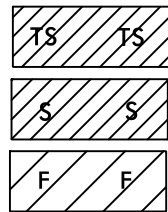
MATCHLINE -L- STA 110+00
SEE SHEET 8

SITE 5 - WWW

SITE 6B - W49

SITE 6A - TT



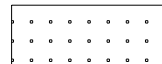


DENOTES TEMPORARY
IMPACTS IN SURFACE WATER

DENOTES IMPACTS IN
SURFACE WATER

DENOTES FILL IN
WETLAND

R-2247EC SITE #1



DENOTES EXCAVATION IN
WETLAND (R-2247EC)



DENOTES FILL IN
WETLAND (R-2247EC)



DENOTES MECHANIZED
CLEARING (R-2247EC)



DENOTES TEMPORARY IMPACTS
IN SURFACE WATER (R-2247EC)



DENOTES IMPACTS IN
SURFACE WATER (R-2247EC)

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PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

7A

ROADWAY DESIGN
ENGINEER

HYDRAULICS
ENGINEER

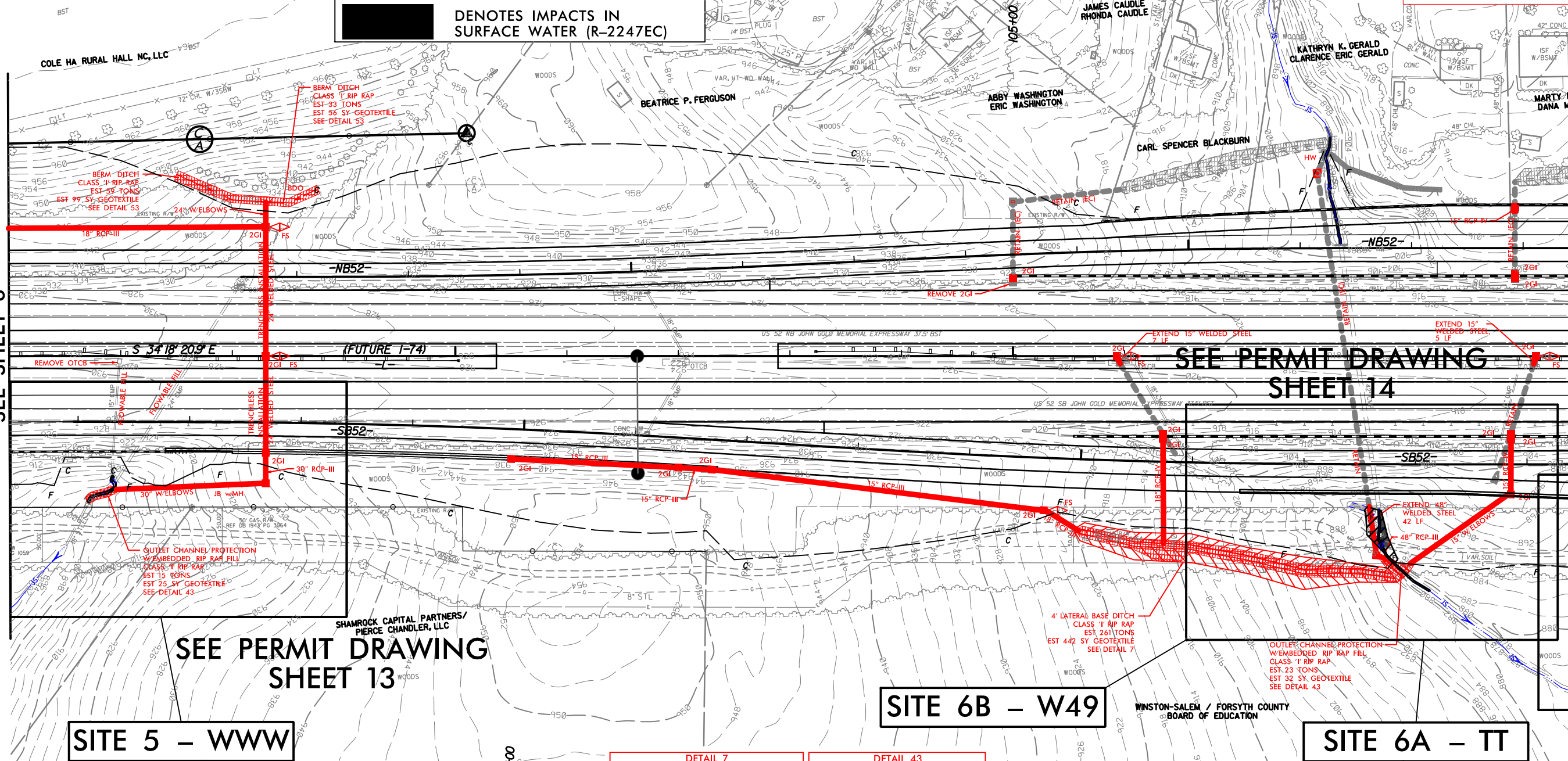
PRELIMINARY PLANS

DO NOT USE FOR CONSTRUCTION

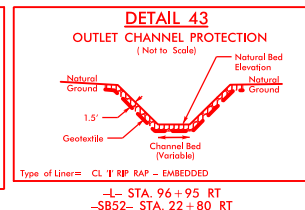
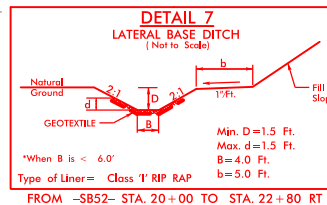
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 12 OF 71

MATCHLINE -L- STA 96+00
SEE SHEET 6



MATCHLINE -L- STA 110+00
SEE SHEET 8





BLYTHE

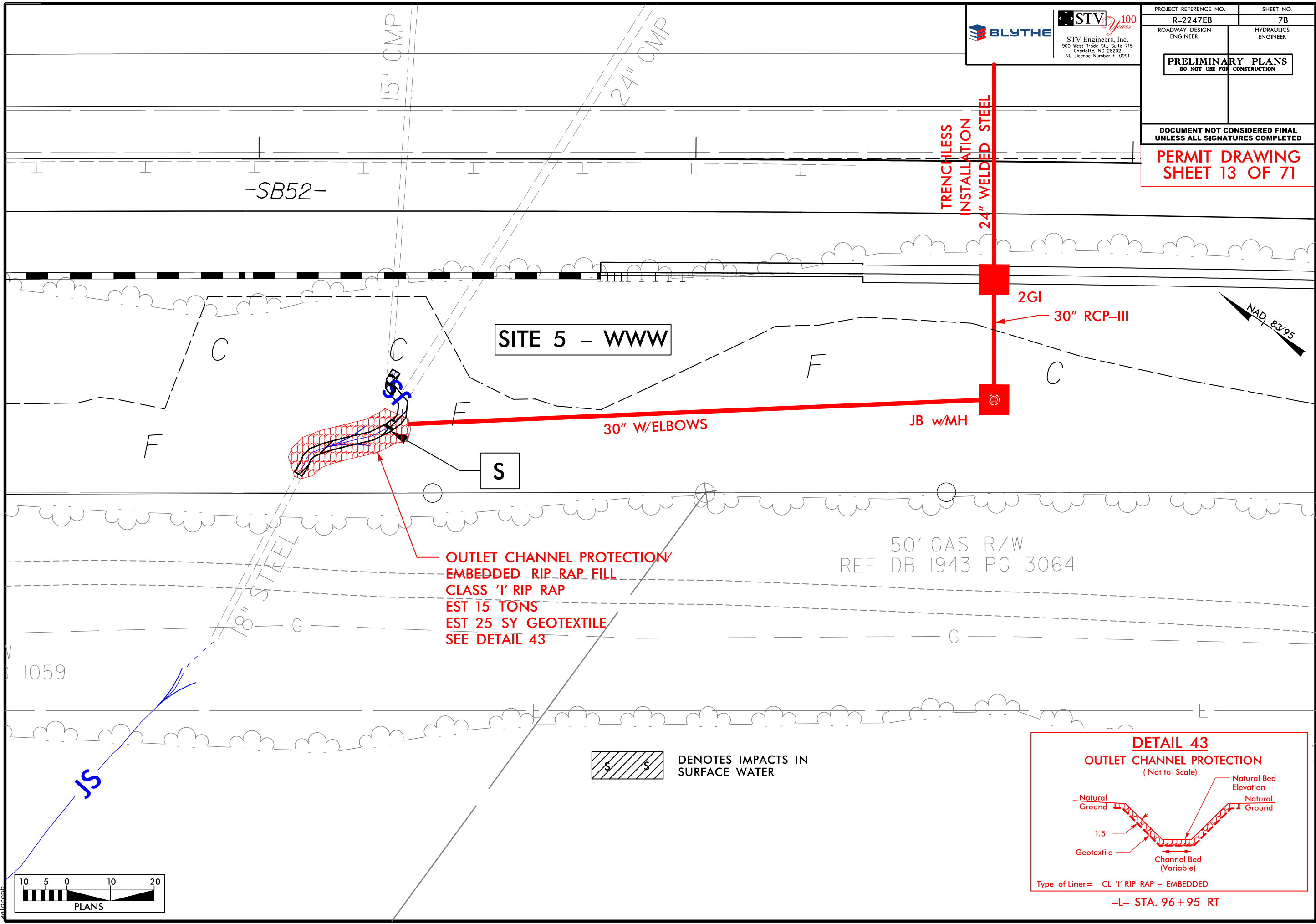


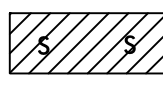
STV

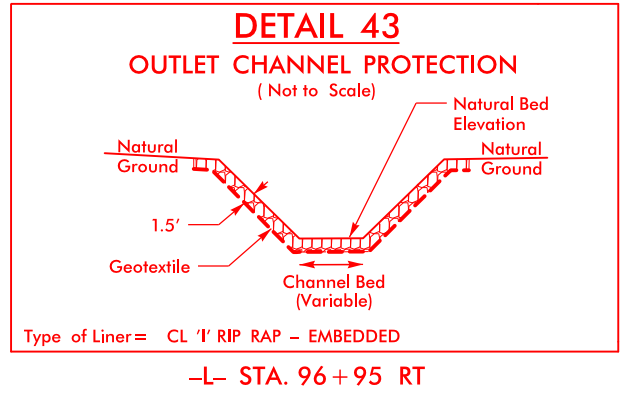
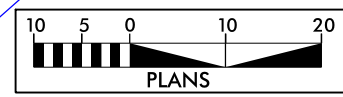
100 Years

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Charlotte, NC 28202
NC License Number F-19991

PROJECT REFERENCE NO.		SHEET NO.	
R-2247EB		7B	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			
PERMIT DRAWING SHEET 13 OF 71			



 DENOTES IMPACTS IN SURFACE WATER



**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

PERMIT DRAWING
SHEET 14 OF 71

CONTRACTOR DESIGN - 2G

15" RCP-IV
~~NOT BLIPPED~~

CONTRACTOR
DESIGN 2G|

-SB52-

$$INV = 880.93$$

RETAIL

— EXTEND 48"
WELDED STEEL
42 LF
NOT BURIED

SITE 6B – W49

— 48" RCP-III
NOT BURIED

15" W/ELBOWS

VAR. SOII

R-2247EC SITE #1

DENOTES FILL IN
WETLAND

DENOTES IMPACTS IN
SURFACE WATER

DENOTES TEMPORARY
IMPACTS IN SURFACE WATER

DENOTES EXCAVATION IN
WETLAND (R-2247EC)

DENOTES FILL IN
WETLAND (R-2247EC)

DENOTES MECHANIZED
CLEARING (R-2247EC)

DENOTES TEMPORARY IMPACTS
IN SURFACE WATER (R-2247EC)

DENOTES IMPACTS IN
SURFACE WATER (R-2247EC)

SITE 6A – TT

— OUTLET CHANNEL PROTECTION
W/EMBEDDED RIP RAP FILL
CLASS 'I' RIP RAP
EST 23 TONS
EST 32 SY GEOTEXTILE
SEE DETAIL 43

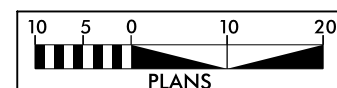
DETAIL 43

OUTLET CHANNEL PROTECTION

(Not to Scale)

Type of Liner= CL 'I' RIP RAP EMBEDDED

- SB52- STA. 22+80 RT



6/23/16

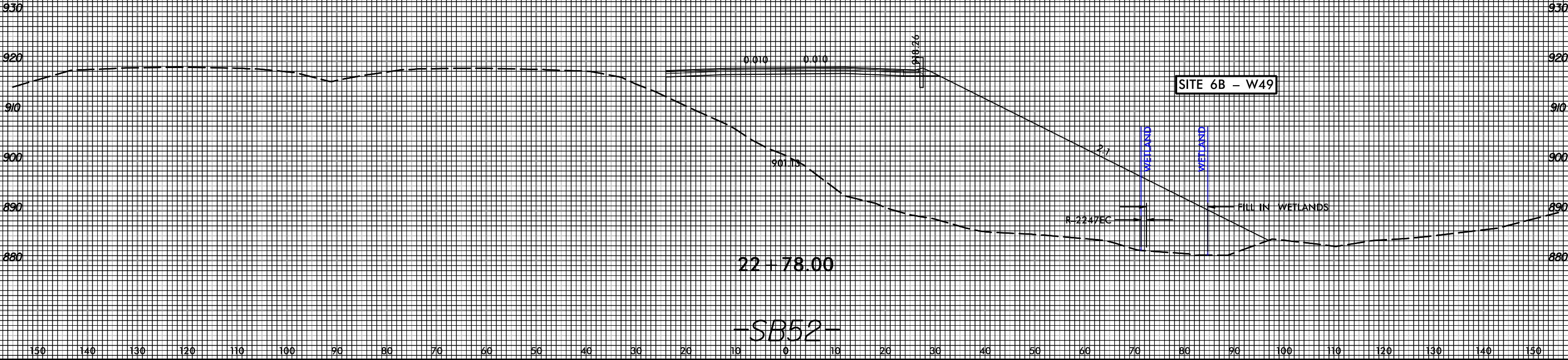
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va\arapb



PROJ. REFERENCE NO.	SHEET NO.
R-2247EB	7D

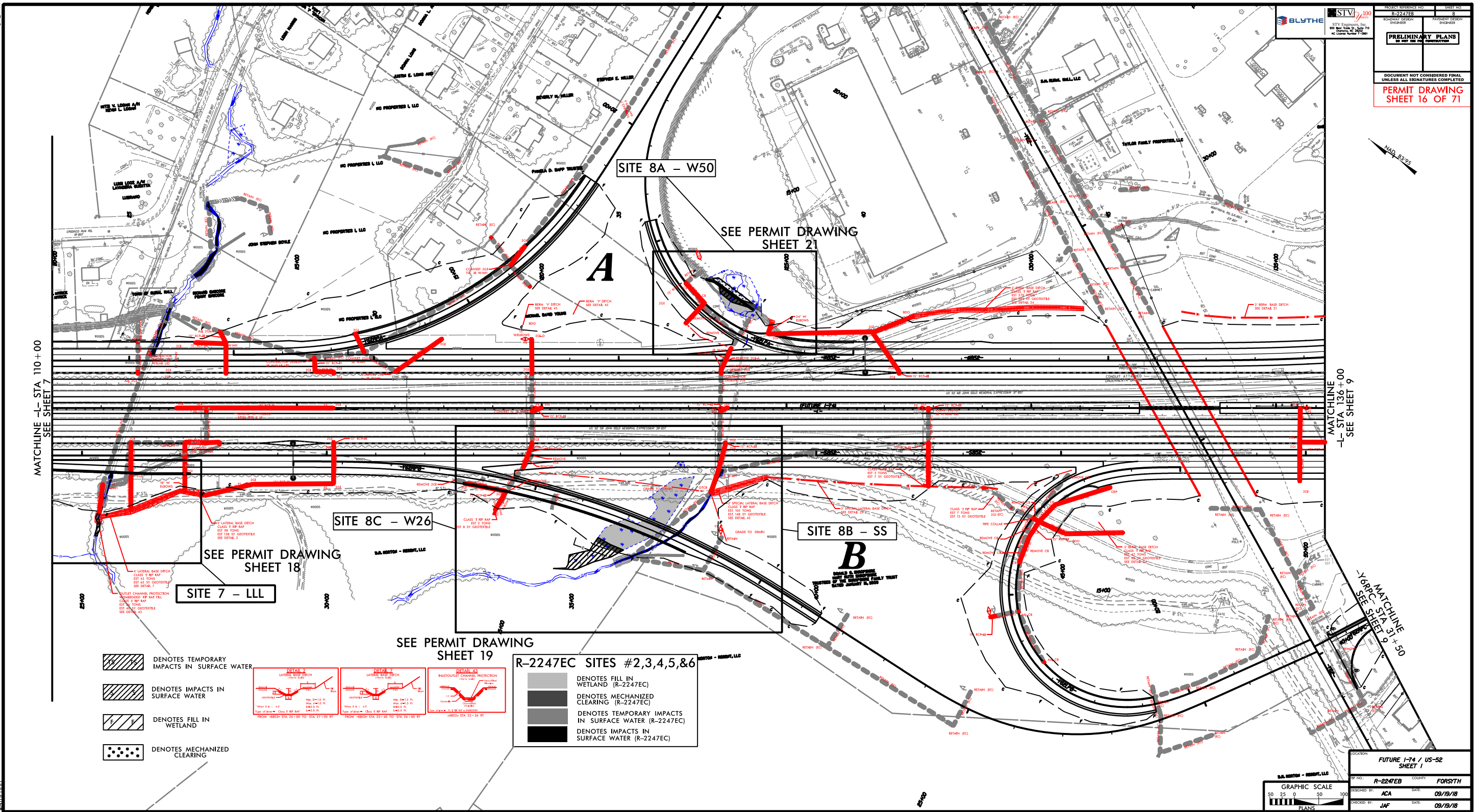
PERMIT DRAWING
SHEET 15 OF 71

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110



6/2/19

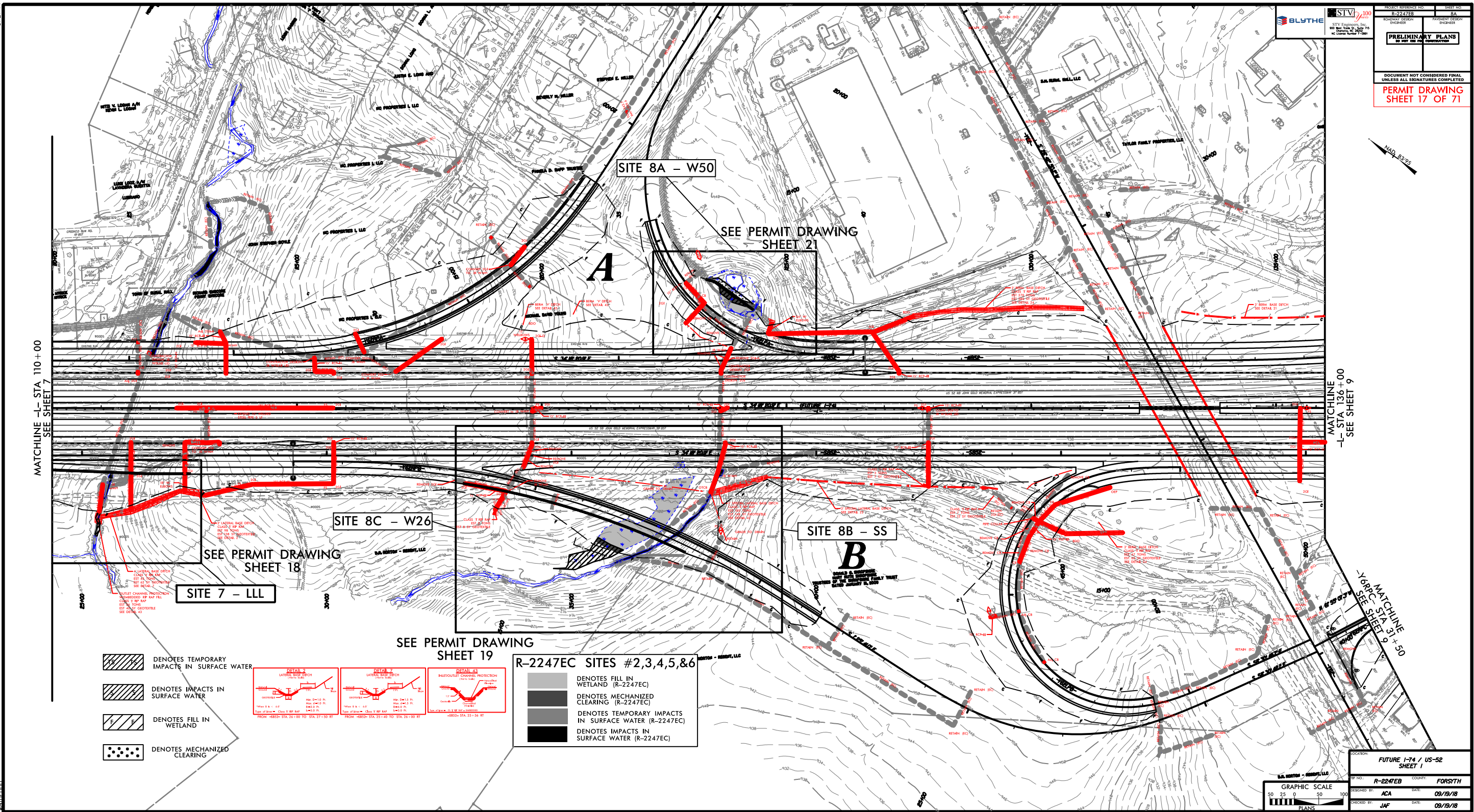
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6/2/19

6/2/19

6/3/2019
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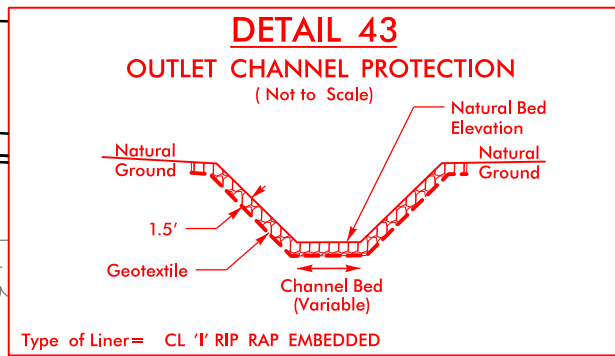


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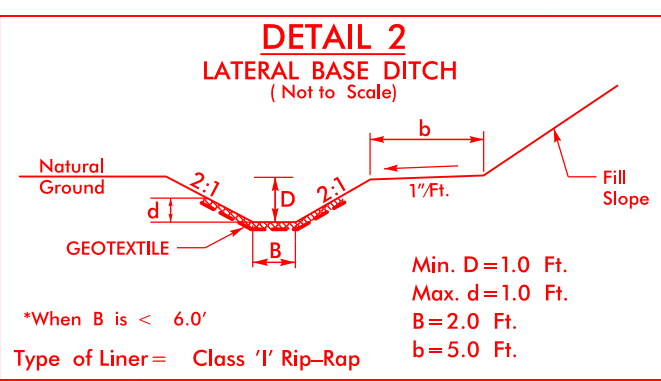
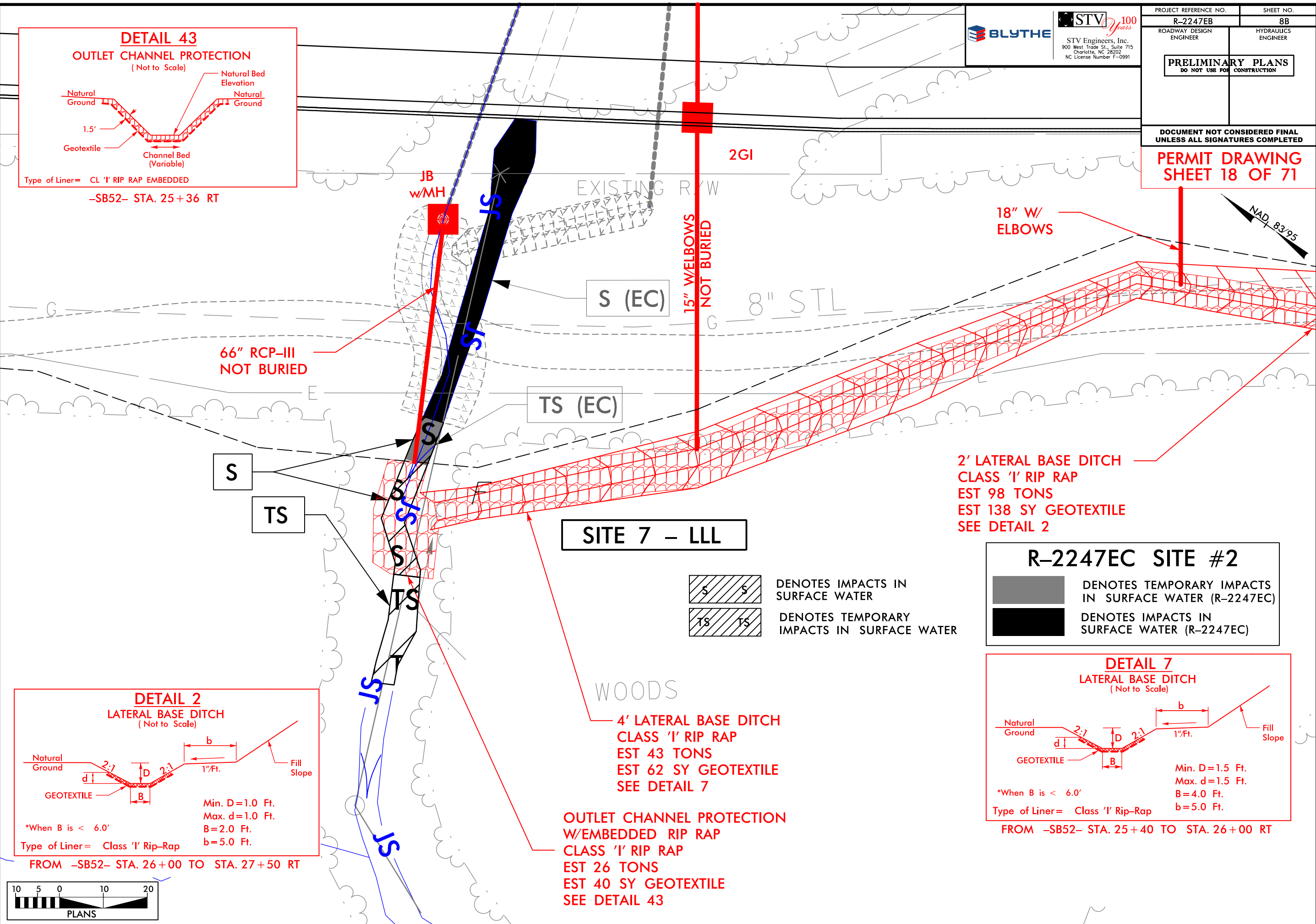
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R-2247EB	8B
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

DOCUMENT NOT CONSIDERED FINAL
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PERMIT DRAWING
SHEET 18 OF 71



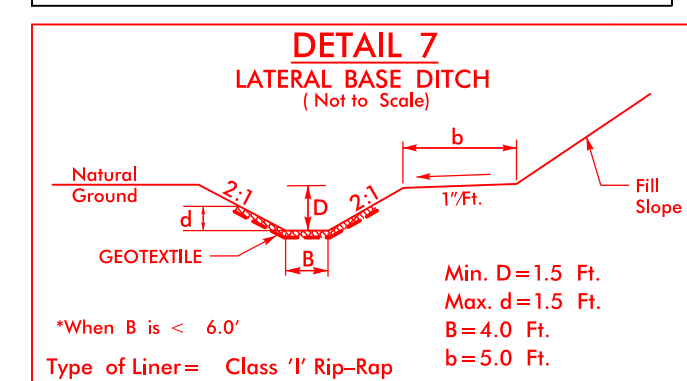
-SB52- STA. 25 + 36 RT



FROM -SB52- STA. 26 + 00 TO STA. 27 + 50 RT

R-2247EC SITE #2

	DENOTES IMPACTS IN SURFACE WATER
	DENOTES TEMPORARY IMPACTS IN SURFACE WATER
	DENOTES TEMPORARY IMPACTS IN SURFACE WATER (R-2247EC)
	DENOTES IMPACTS IN SURFACE WATER (R-2247EC)



FROM -SB52- STA. 25 + 40 TO STA. 26 + 00 RT



6/3/2019
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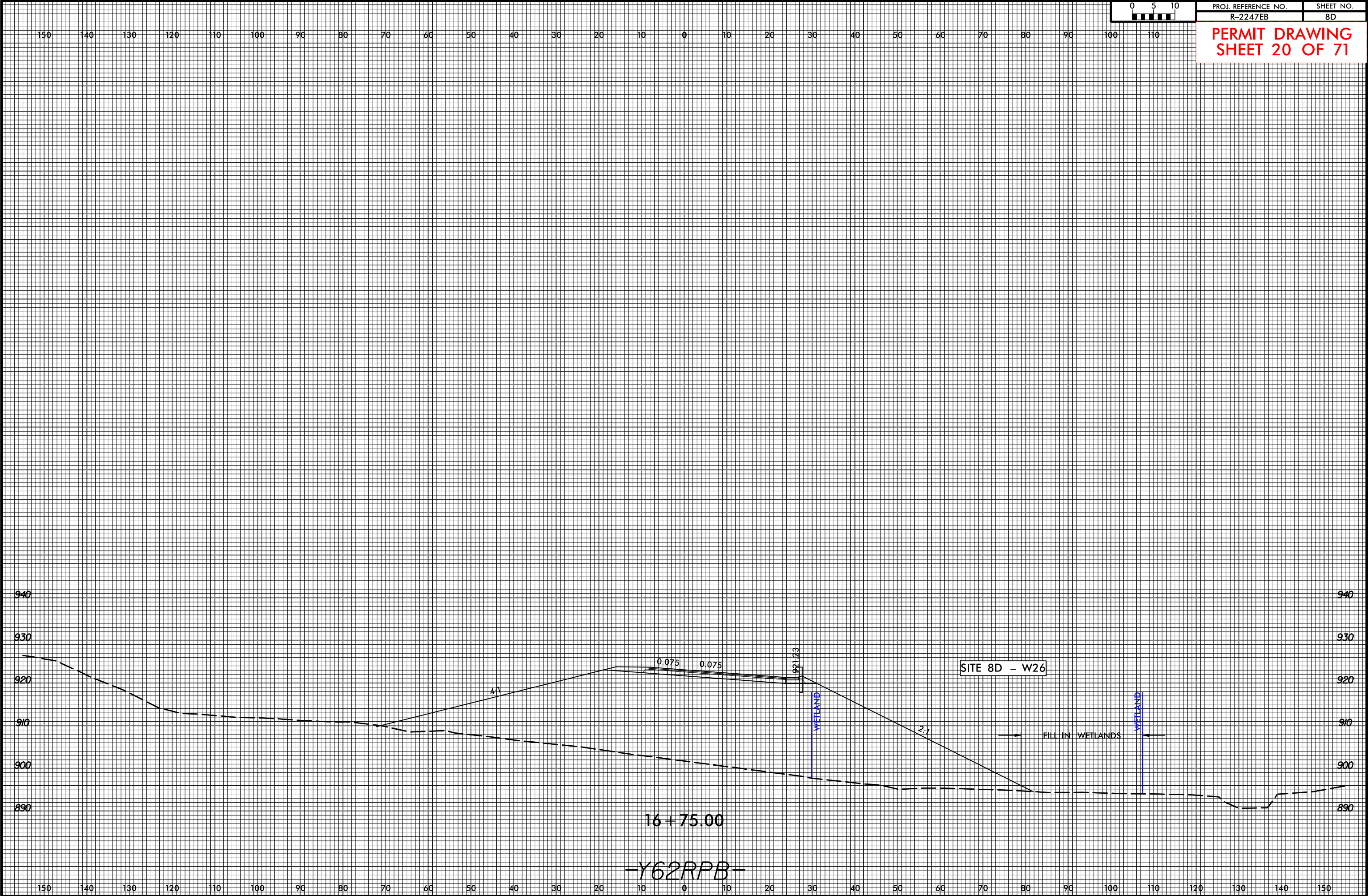
6/23/16

6/3/2019
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wa\drpb



PROJ. REFERENCE NO.	SHEET NO.
R-2247EB	8D

PERMIT DRAWING
SHEET 20 OF 71



F

F

DENOTES FILL IN WETLAND

DENOTES MECHANIZED CLEARING

R-2247EC SITE #4

DENOTES TEMPORARY IMPACTS IN SURFACE WATER (R-2247EC)

DENOTES IMPACTS IN SURFACE WATER (R-2247EC)

DENOTES FILL IN WETLAND (R-2247EC)

DENOTES MECHANIZED CLEARING (R-2247EC)

TOE PROTECTION
EST 55 TONS
EST 99 SY GEOTEXTILE
SEE DETAIL 35

SITE 8A - W50

DETAIL 35
TOE PROTECTION
(Not to Scale)

NATURAL GROUND

2:1 OR FLATTER

FILL SLOPE

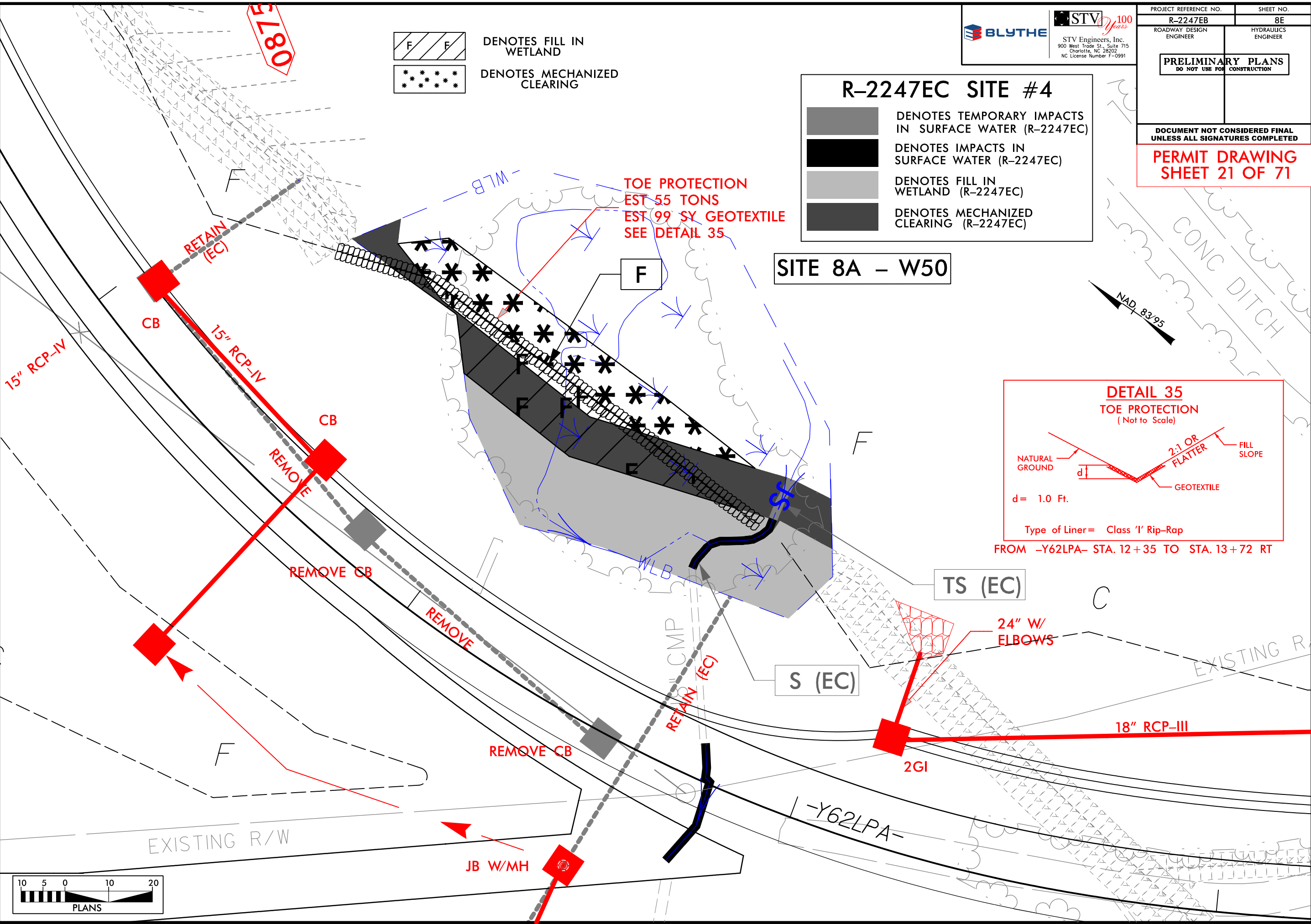
GEOTEXTILE

d

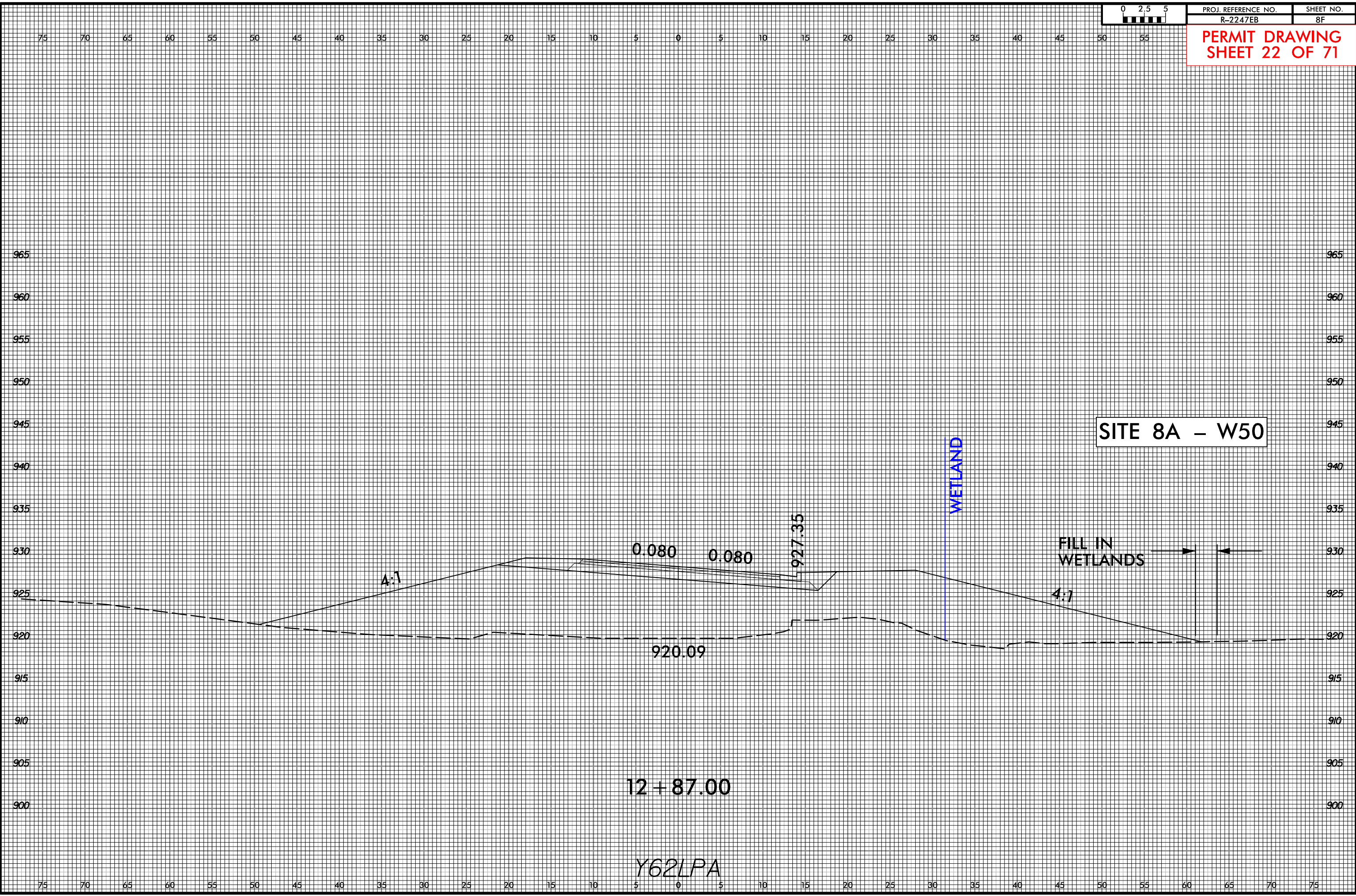
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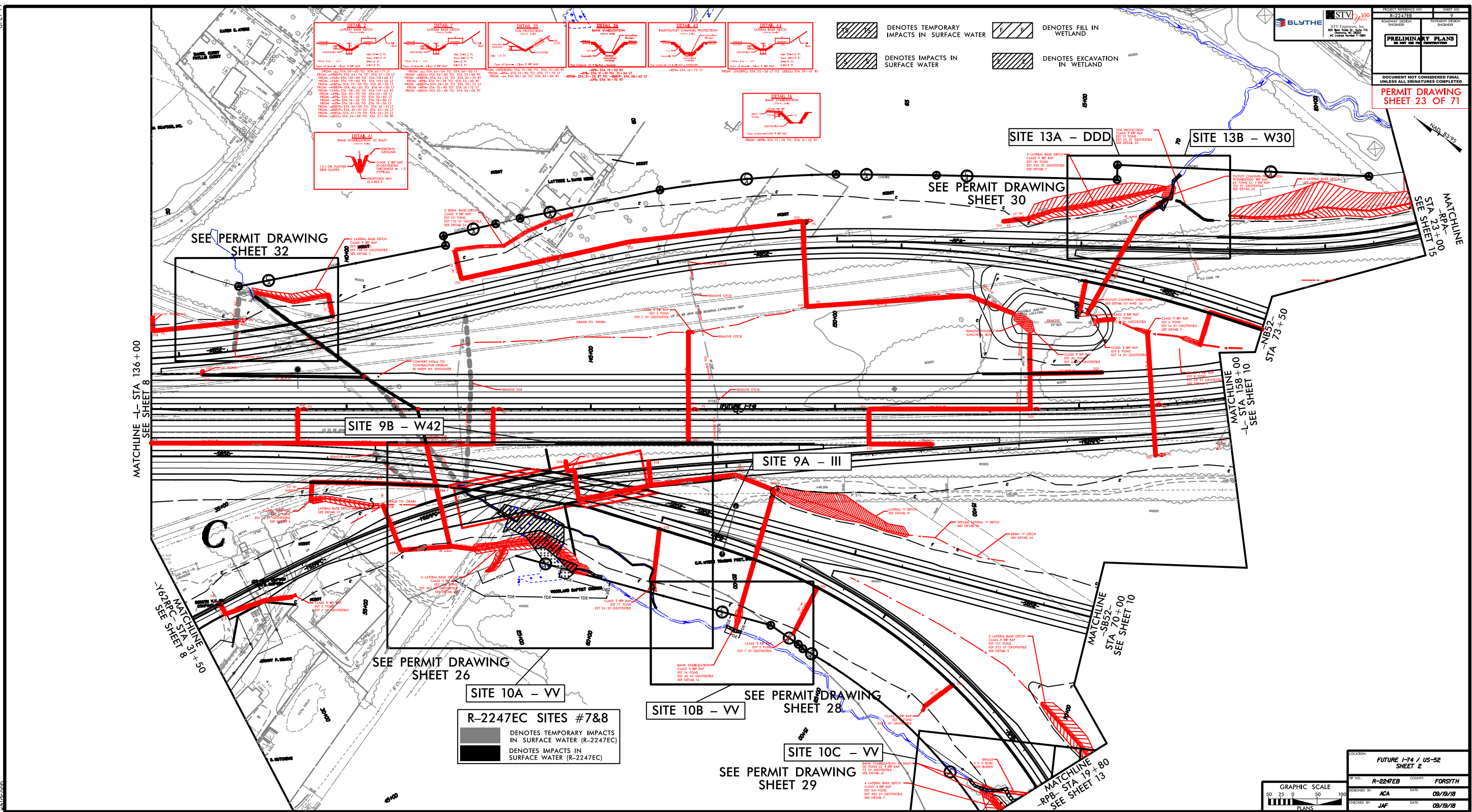
Type of Liner = Class 'I' Rip-Rap

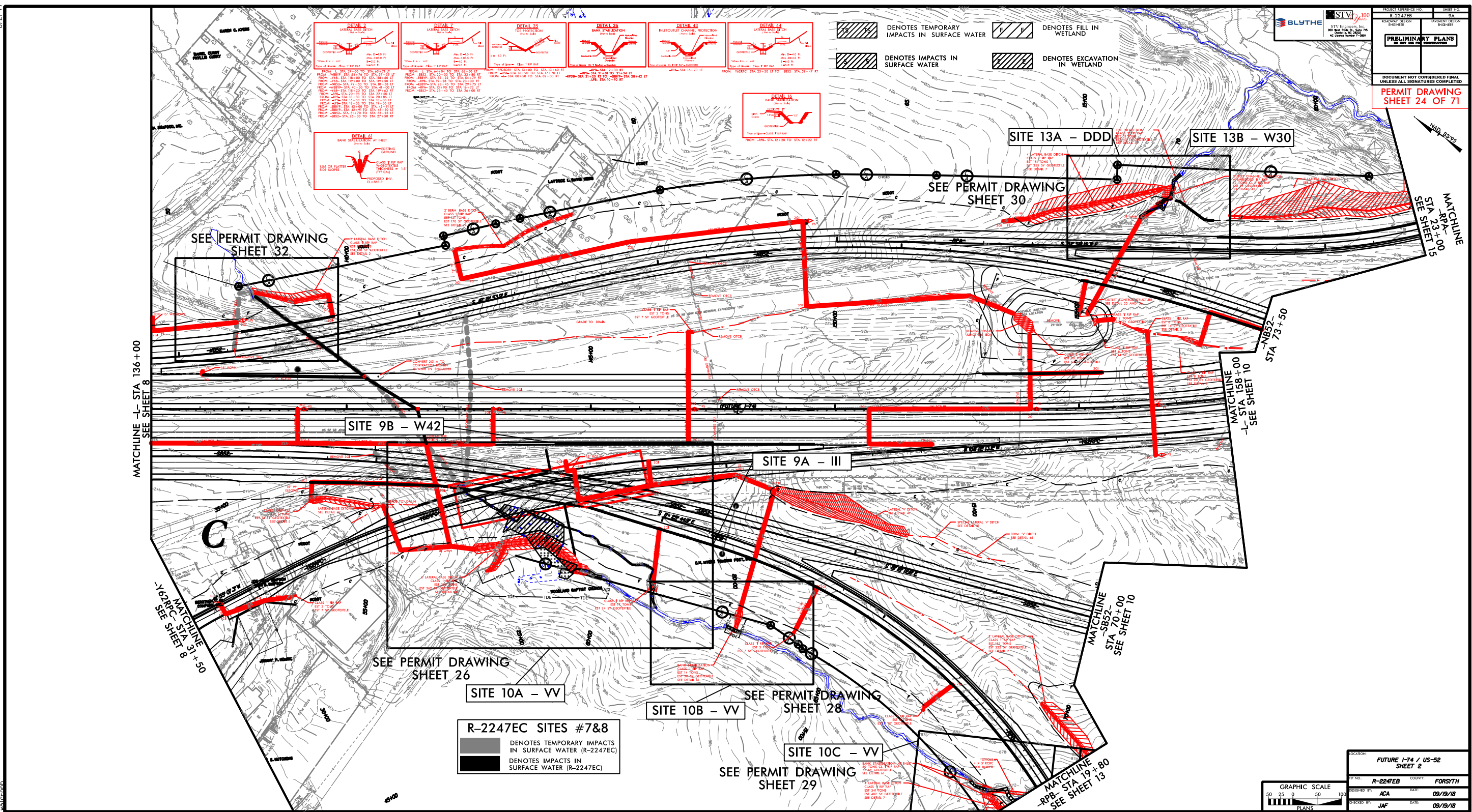
FROM -Y62LPA- STA. 12+35 TO STA. 13+72 RT



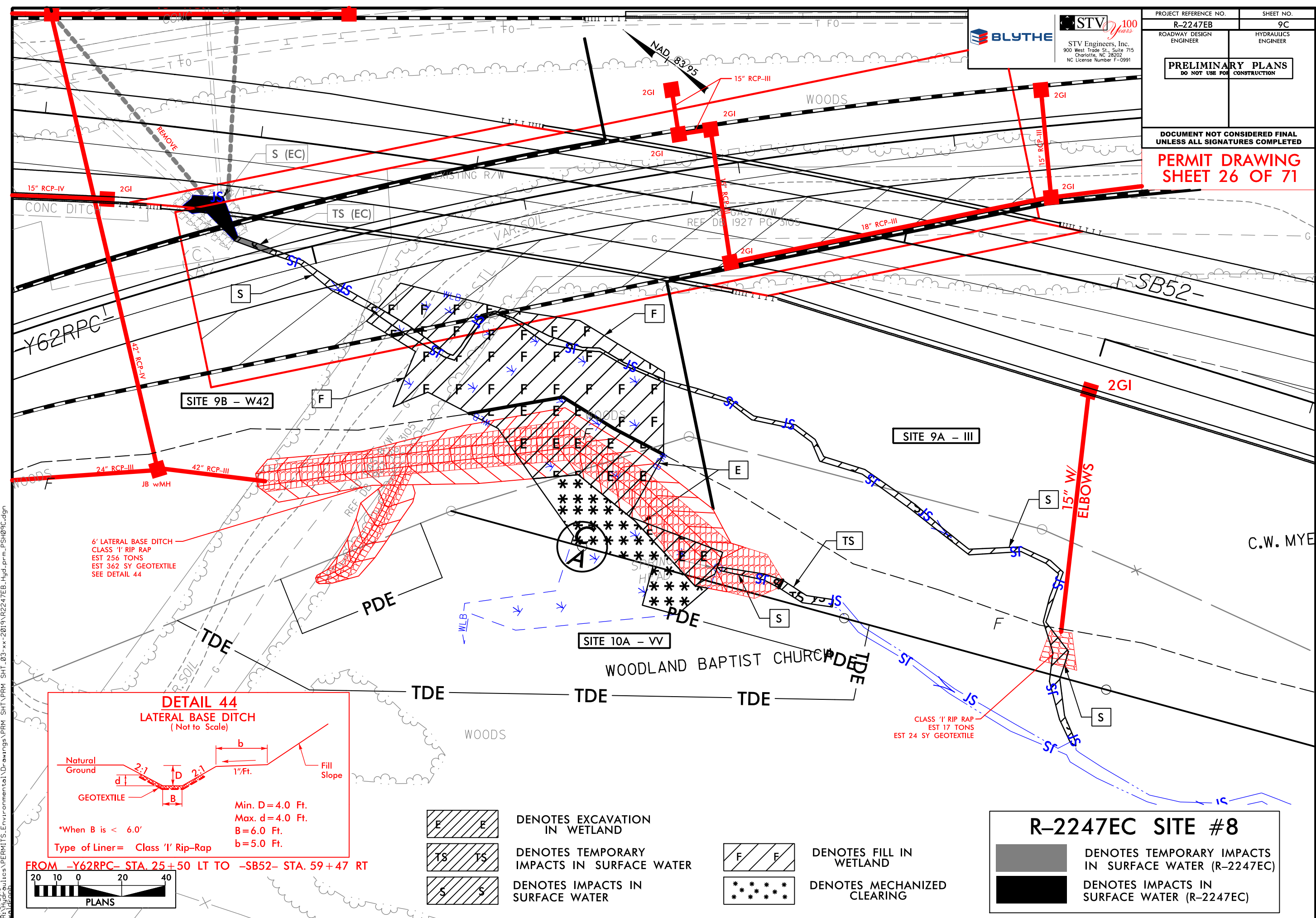
6/23/16
6/3/2019
R:\Hydro\autolics\PERMITS\Environmental\Drawings\PRM_SHT\PRM_SHT_03-xx-2019\R2247EB_Hyd-prm_PS408F.dgn
wa1d9p6b

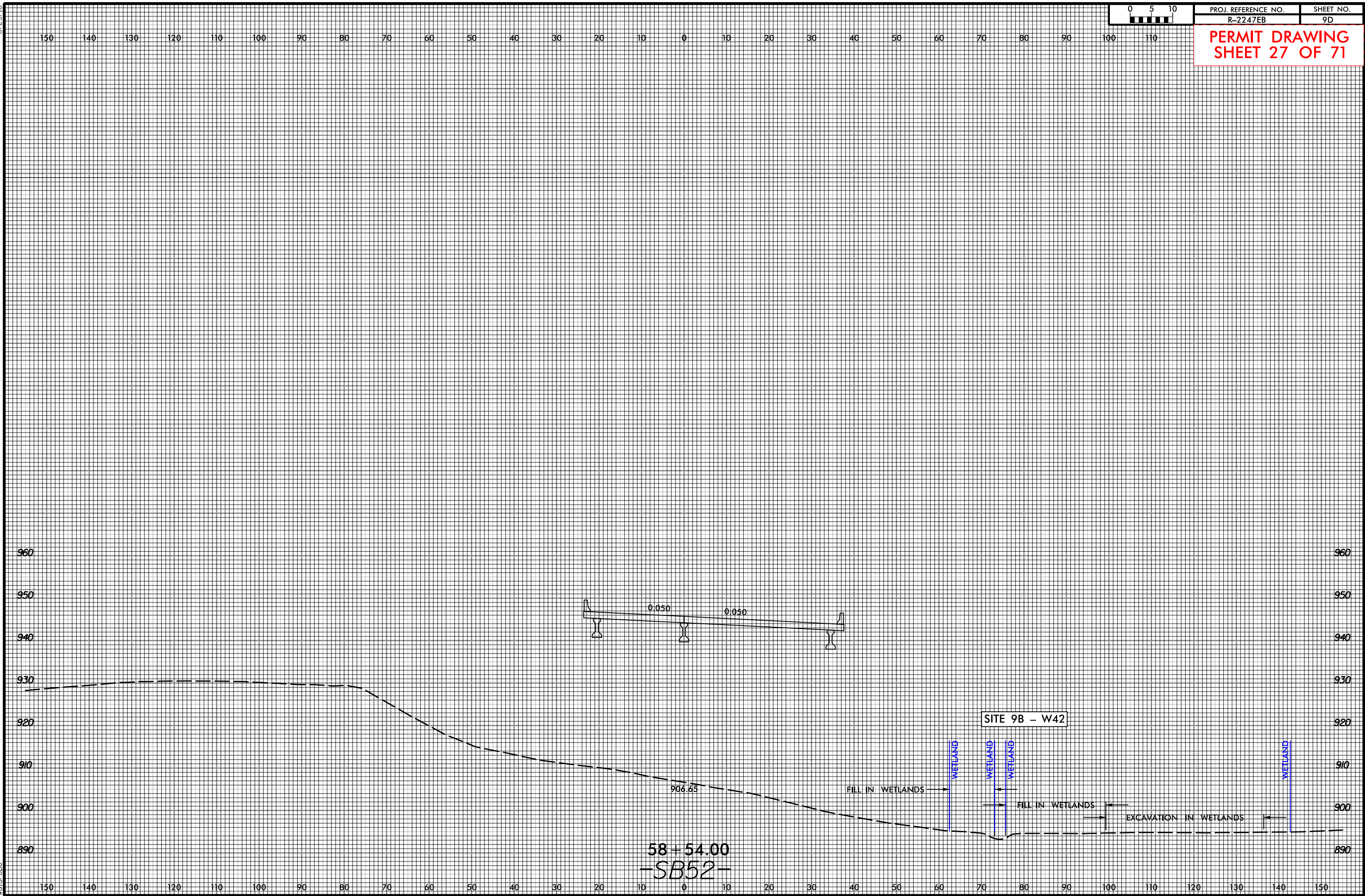






**PERMIT DRAWING
SHEET 26 OF 71**







 DENOTES TEMPORARY IMPACTS IN SURFACE WATER

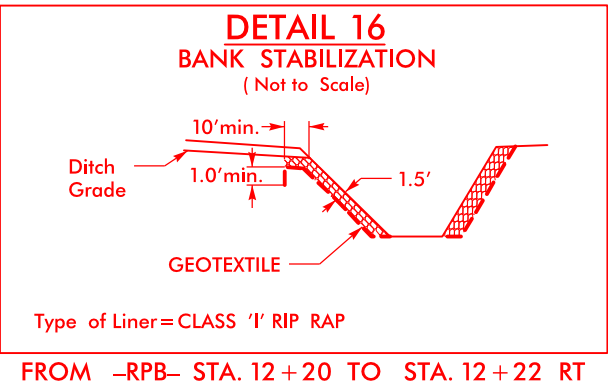
 DENOTES IMPACTS IN SURFACE WATER

CLASS 'I' RIP RAP
EST 3 TONS
EST 7 SY GEOTEXTILE

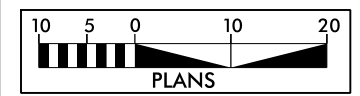
15" W/
ELBOWS

BANK STABILIZATION
CLASS 'I' RIP RAP
EST 14 TONS
EST 30 SY GEOTEXTILE
SEE DETAIL 16

SITE 10B - VV

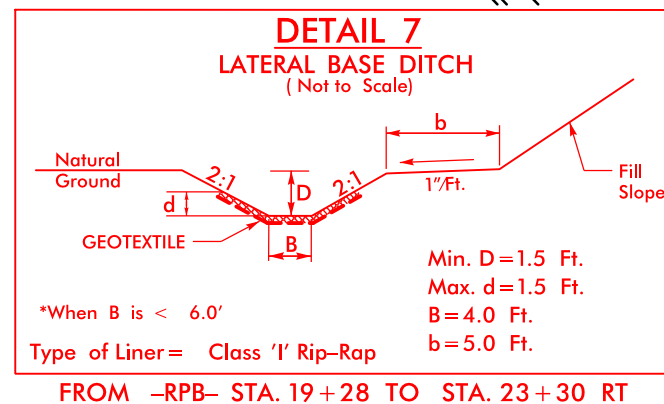


FROM -RPB- STA. 12+20 TO STA. 12+22 RT

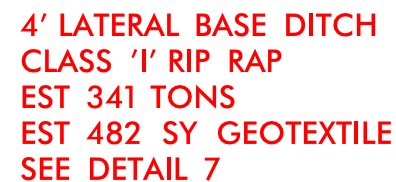


PERMIT DRAWING
SHEET 29 OF 71

MATCHLINE
SEE PERMIT DRAWING SHEET 38



SITE 10C – VV

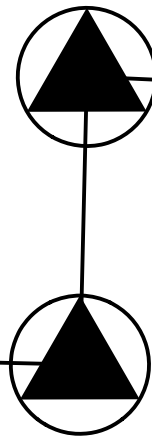


SINGLE
4' X 5' RCBC
NOT BURIED

2GI

~~15" W/ ELBOWS~~

DENOTES TEMPORARY
IMPACTS IN SURFACE WATERDENOTES IMPACTS IN
SURFACE WATER



A rectangular block with diagonal hatching (lines from top-left to bottom-right). Inside the block, there are two 'S' symbols, one on the left and one on the right.

DENOTES IMPACTS IN
SURFACE WATER



SHEET NO.

9G

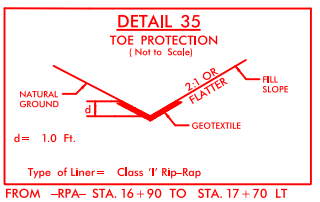
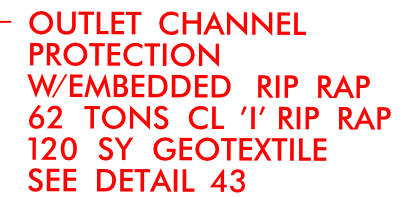
HYDRAULICS ENGINEER

**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

PERMIT DRAWING
SHEE 30 OF 71

TS

SITE 13B – W30



CONC DITCH

JB w/MH

42" WELBOWS

TOE PROTECTION
CLASS 'I' RIP RAP
EST. 21 TONS
EST. 45 SY GEOTEXTILE
SEE DETAIL 35

SITE 13A – DDD



6/3/2019
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6/23/16

6/3/2019
R:\Hydro\lics\PERMITS\Environmental\Drawings\PM SH\PM SHT_03-xx-2019\A2247EB_Hyd-prm-PS409H.dgn
adad92b5



PROJ. REFERENCE NO.	SHEET NO.
R-2247EB	9H

PERMIT DRAWING
SHEET 31 OF 71



R-2247EC SITE #7



DENOTES TEMPORARY IMPACTS
IN SURFACE WATER (R-2247EC)

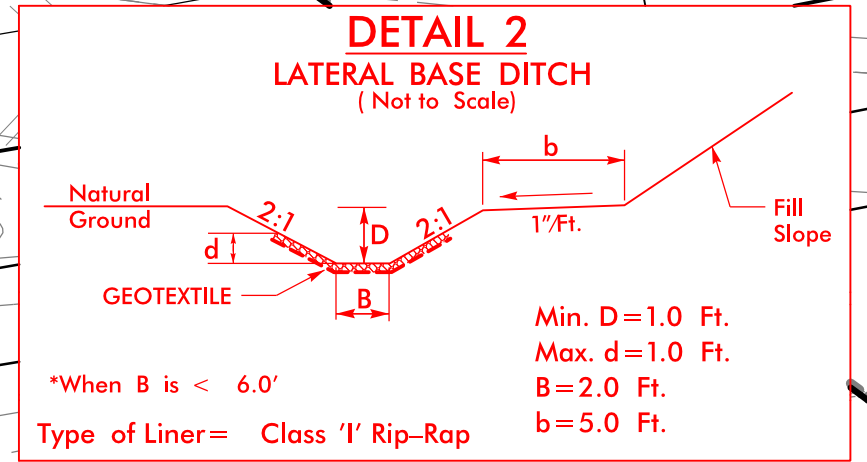
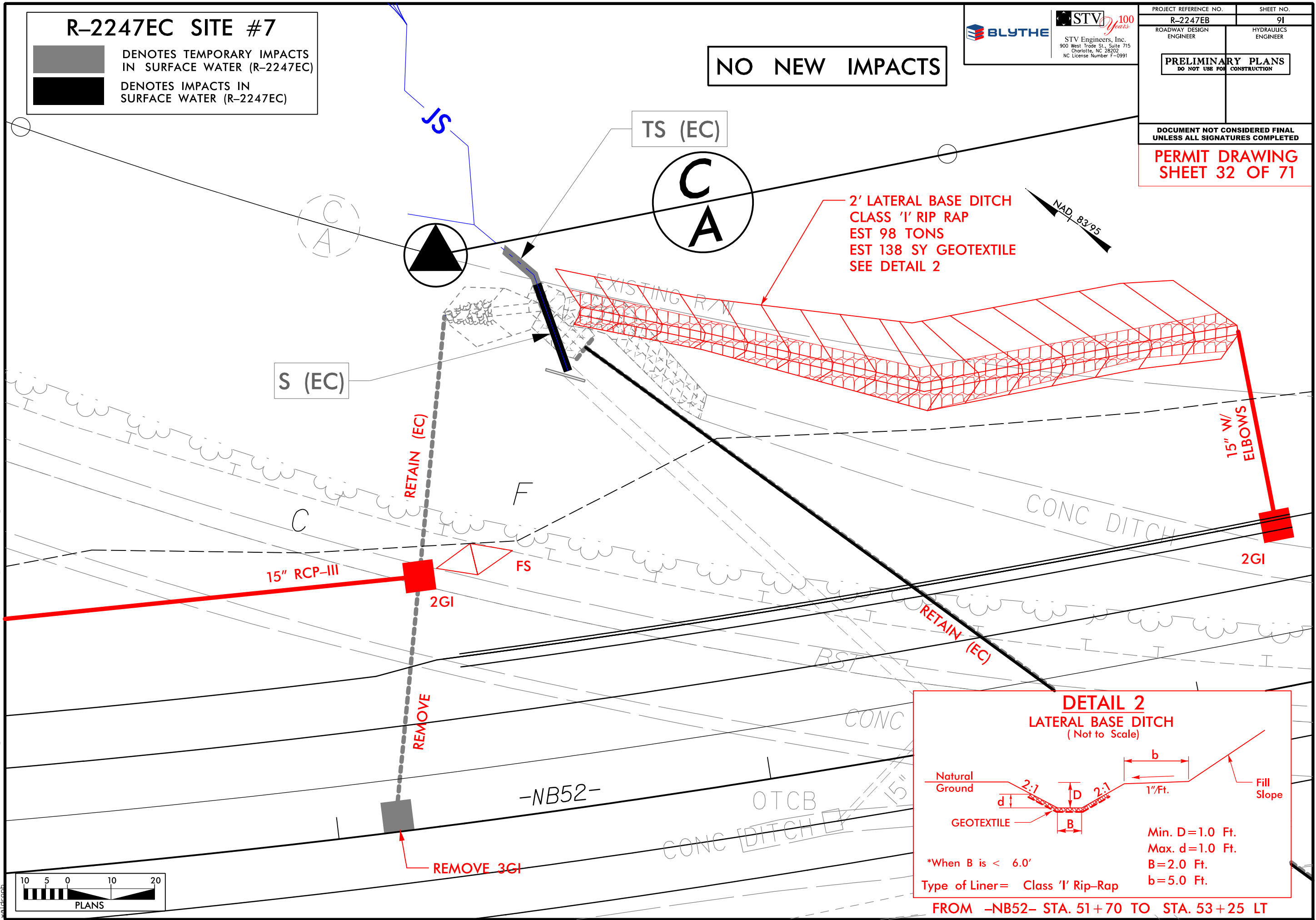
DENOTES IMPACTS IN
SURFACE WATER (R-2247EC)

NO NEW IMPACTS



PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	91
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

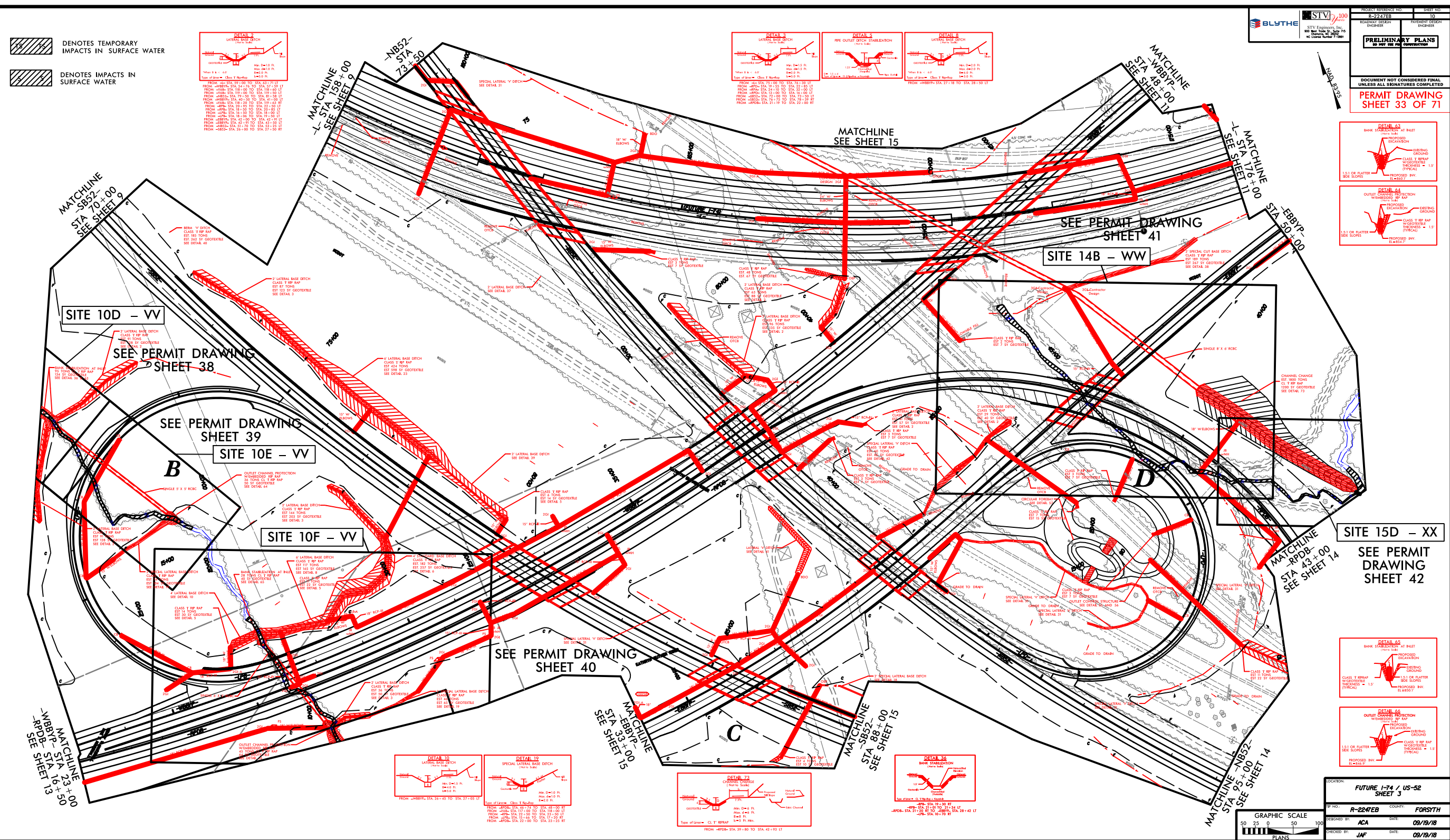
PERMIT DRAWING
SHEET 32 OF 71

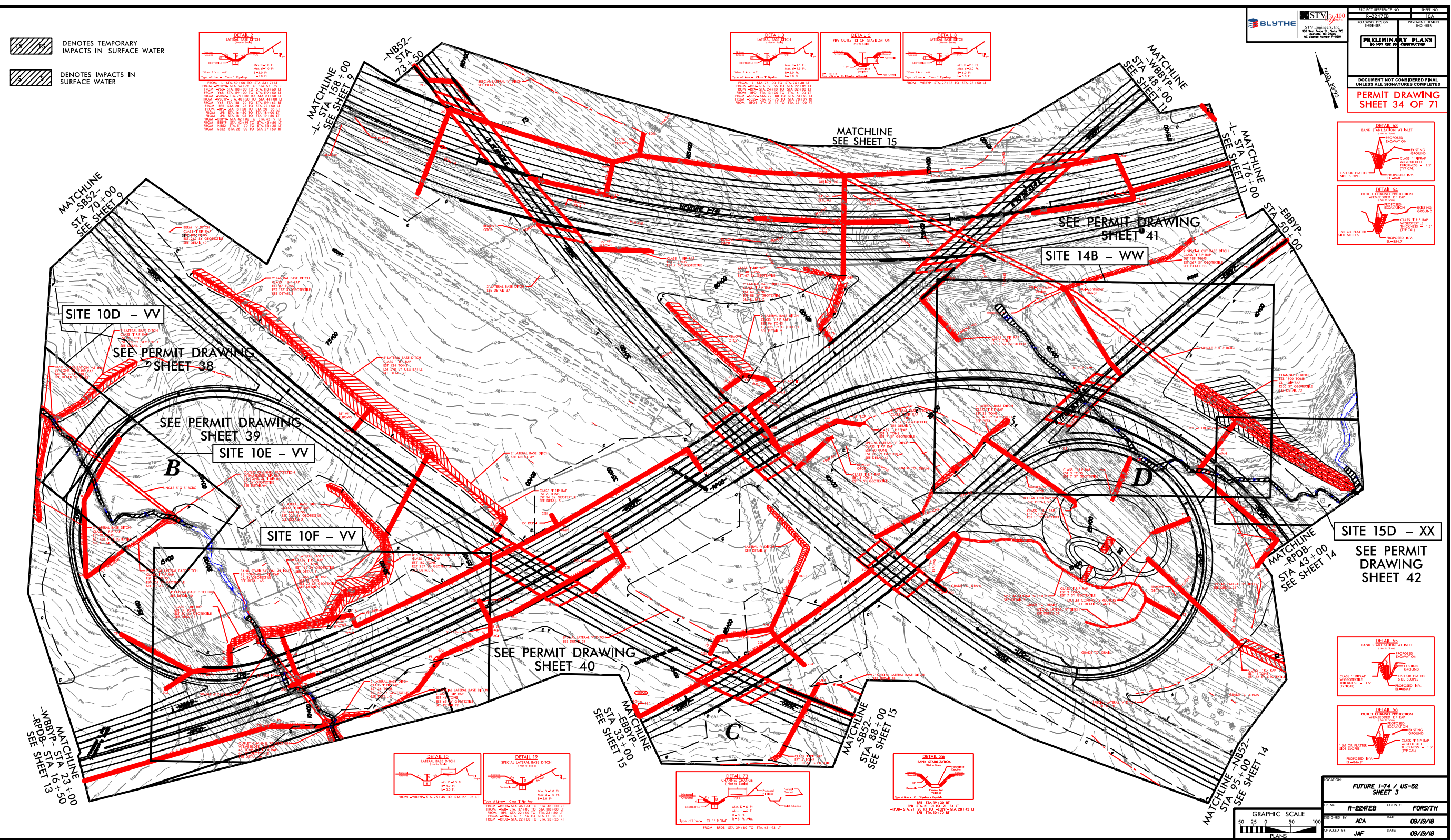


FROM -NB52- STA. 51+70 TO STA. 53+25 LT

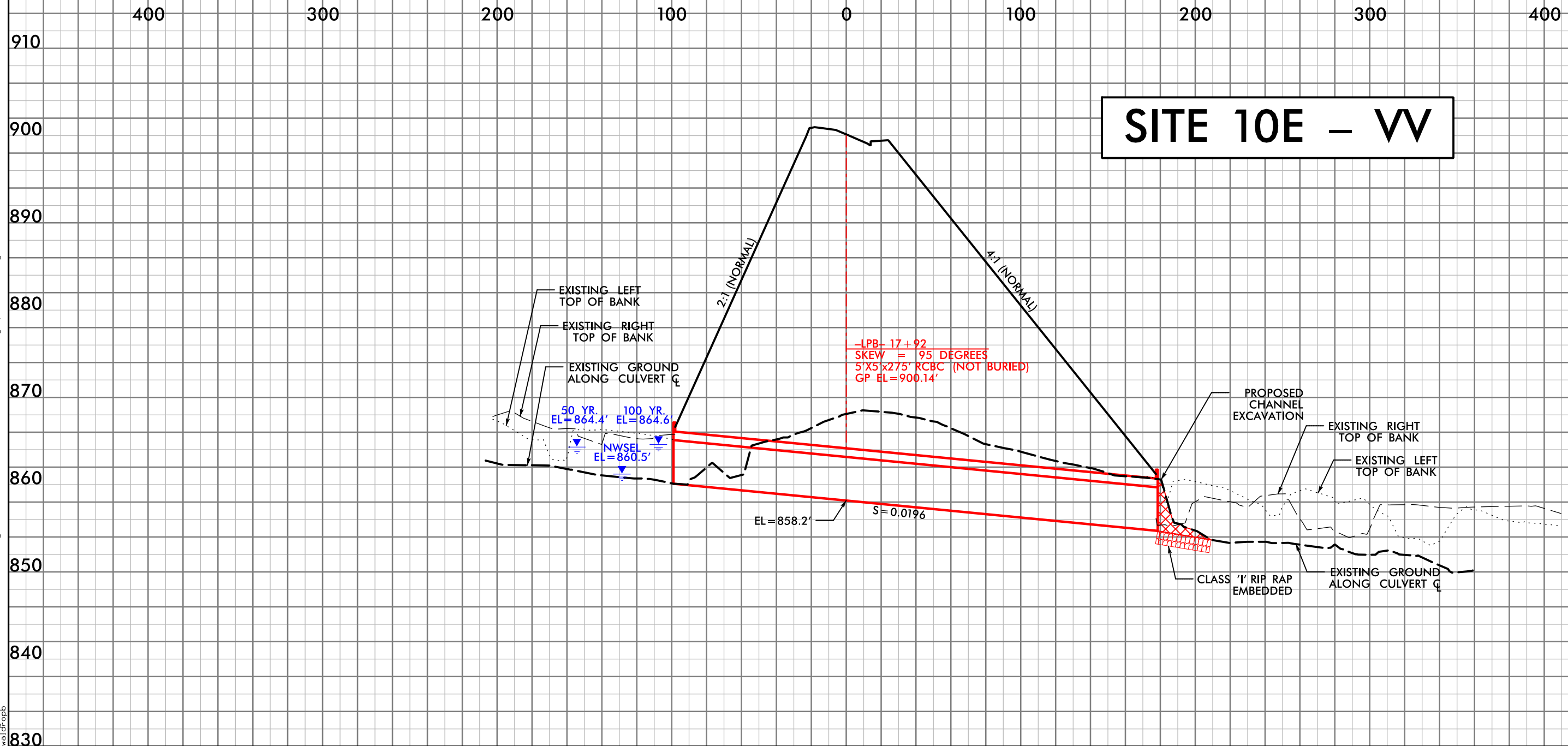
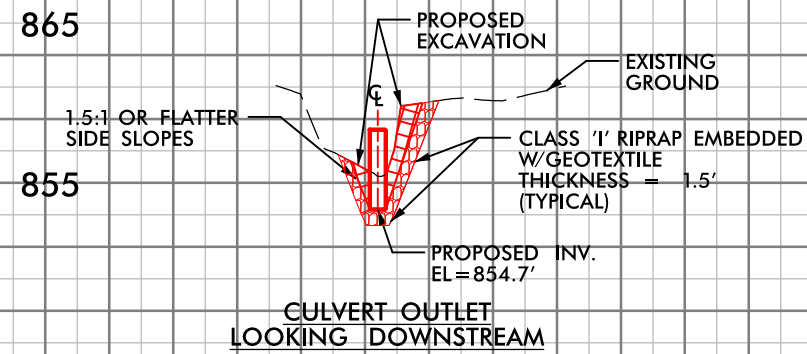
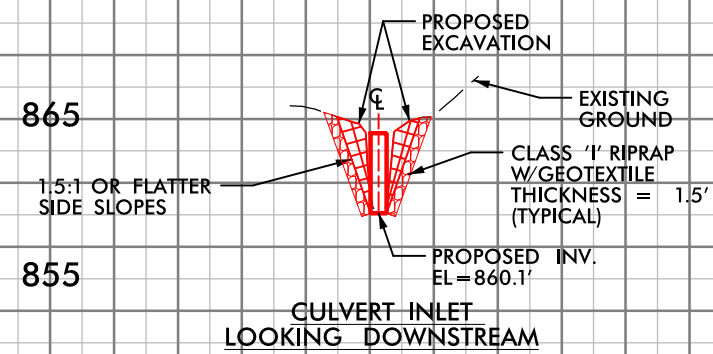


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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	10B
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

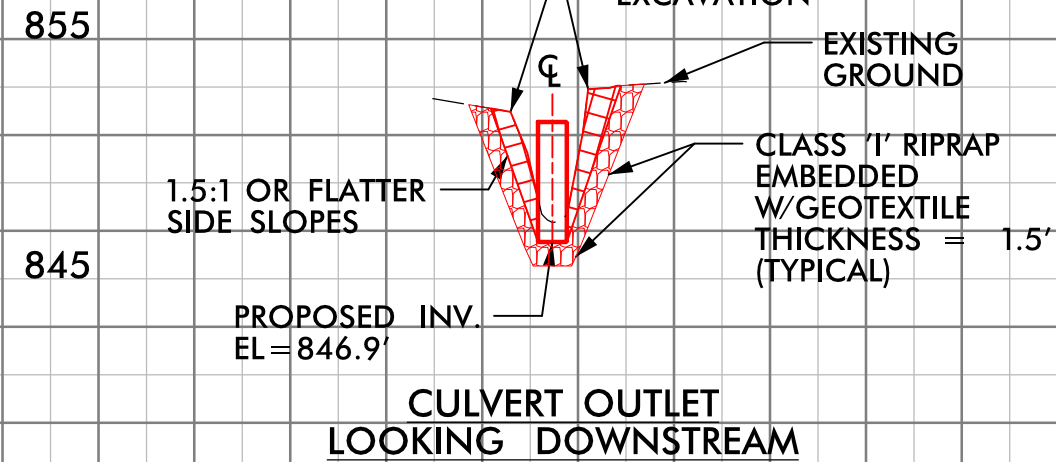
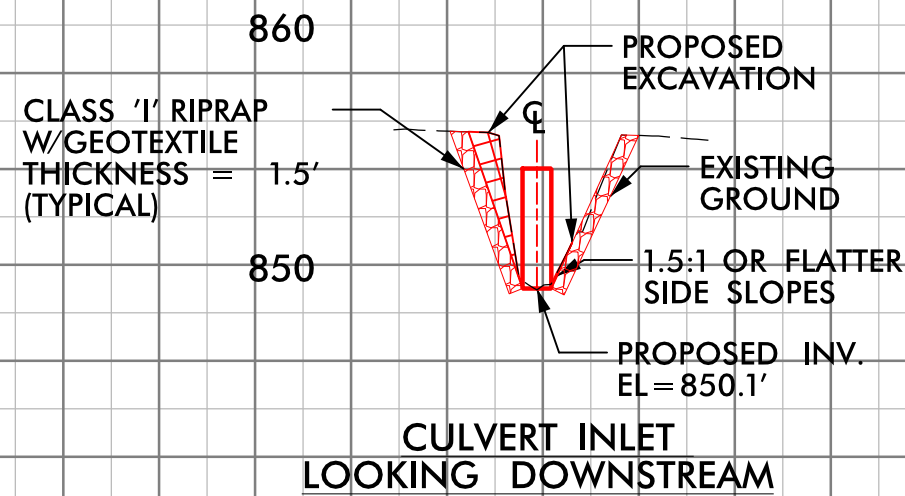


6/23/16

6/3/2019
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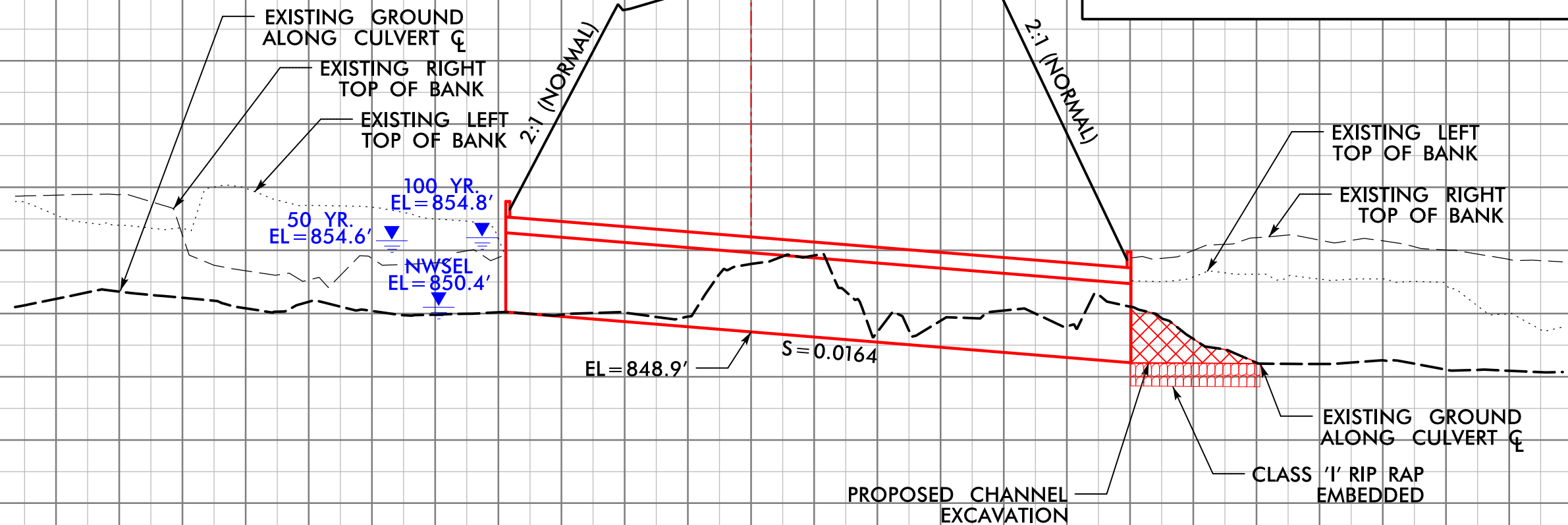
PERMIT DRAWING
SHEET 36 OF 71

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	10C
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



-WBBYP- 27+38
SKEW = 72 DEGREES
6'X5'X196' RCBC (NOT BURIED)
GP EL=871.36'

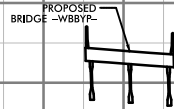
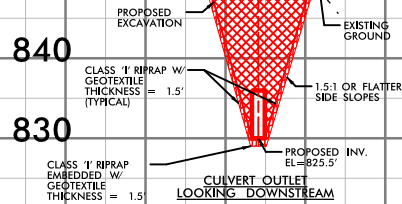
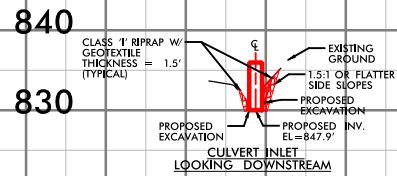
SITE 10F - VV



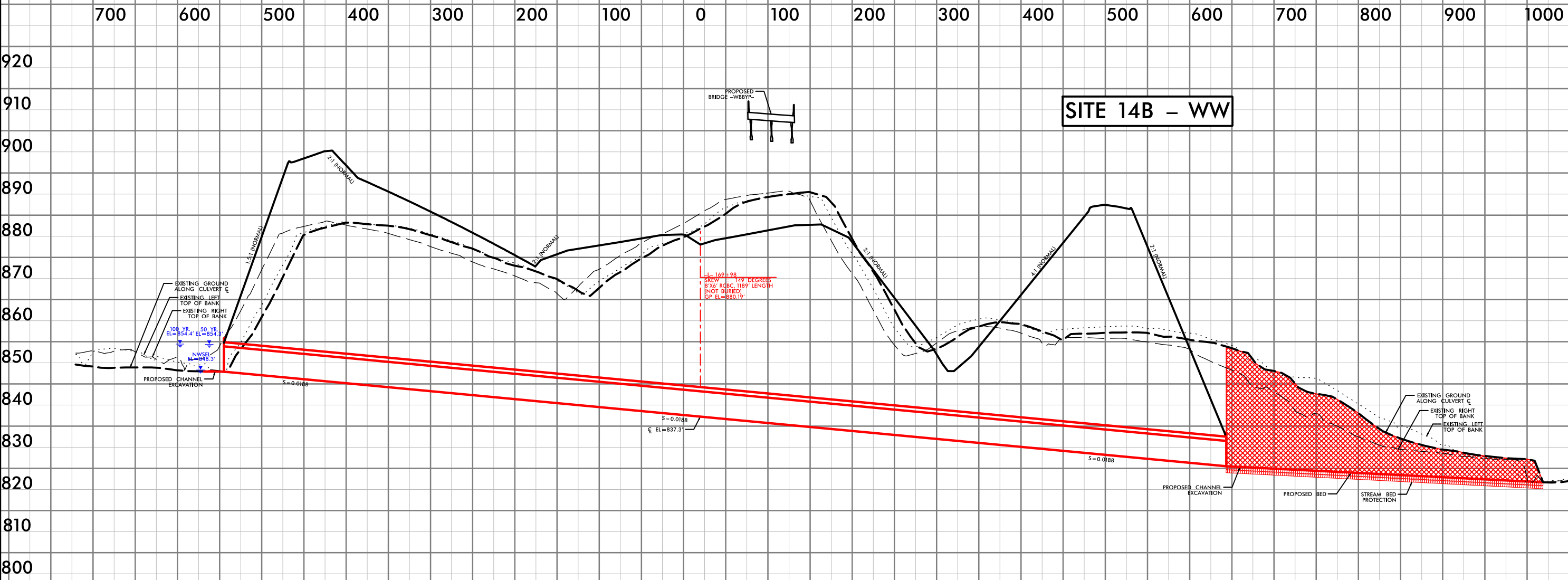
6/23/16

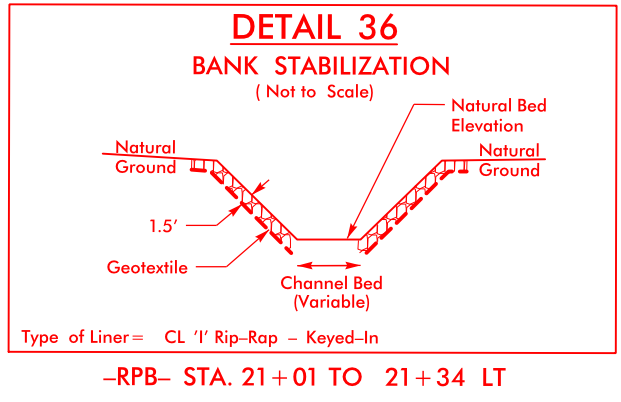
PERMIT DRAWING
SHEET 37 OF 71

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	10D
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



SITE 14B - WW





2' LATERAL BASE DITCH
CLASS '1' RIP RAP
EST 91 TONS
EST 128 SY GEOTEXTILE
SEE DETAIL 2

BANK STABILIZATION AT INLET
37 TONS CL '1' RIP RAP
52 SY GEOTEXTILE
SEE DETAIL 36 & 63

SITE 10D - VV

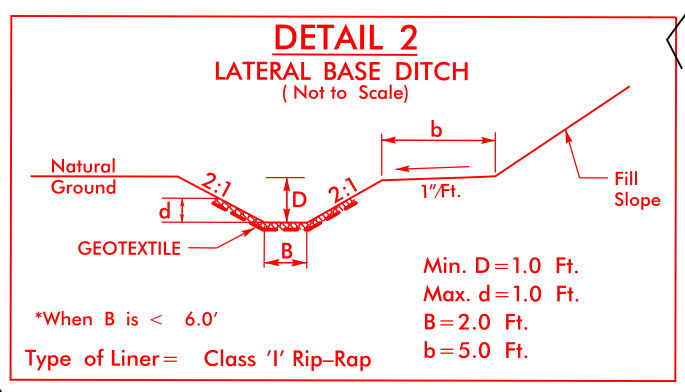
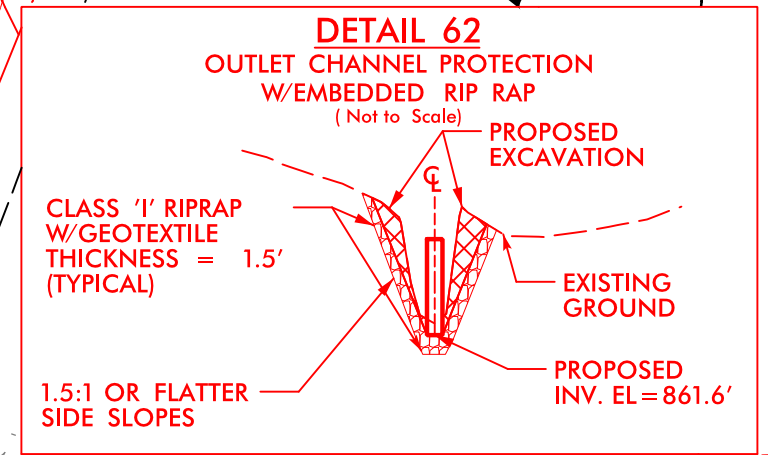
BANK STABILIZATION
95 TONS CL '1' RIP RAP
134 SY GEOTEXTILE
SEE DETAIL 36

SEE ADDITIONAL IMPACTS
TO SITE 10C ON PERMIT
DRAWING SHEET 29

2' LATERAL BASE DITCH
CLASS '1' RIP RAP
EST 157 TONS
EST 222 SY GEOTEXTILE
SEE DETAIL 2

SITE 10C - VV

SINGLE
4' X 5' RCBC
NOT BURIED



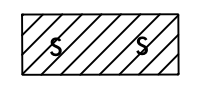
FROM -RPB- STA. 20+95 TO STA. 22+50 LT
FROM -RPB- STA. 18+50 TO STA. 20+85 LT

OUTLET CHANNEL
PROTECTION W/
EMBEDDED RIP RAP
36 TONS CL '1' RIP RAP
50 SY GEOTEXTILE
SEE DETAIL 62

2' LATERAL BASE DITCH
CLASS '1' RIP RAP
EST 91 TONS
EST 128 SY GEOTEXTILE
SEE DETAIL 2

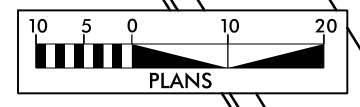
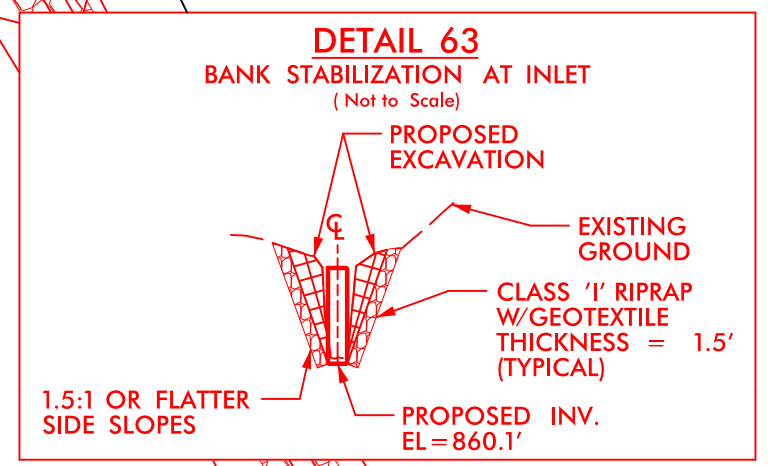
2' LATERAL BASE DITCH
CLASS '1' RIP RAP
EST 55 TONS
EST 78 SY GEOTEXTILE
SEE DETAIL 2

SITE 10E - VV



DENOTES IMPACTS IN
SURFACE WATER

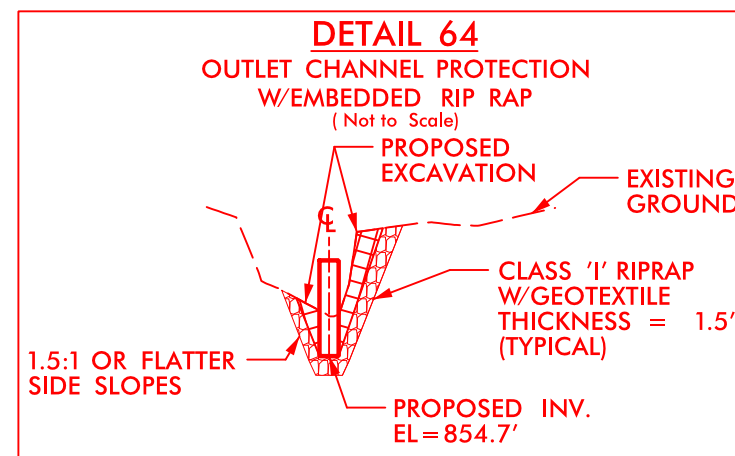
SEE ADDITIONAL IMPACTS
TO SITE 10E ON PERMIT
DRAWING SHEET 39



MATCHLINE
SEE PERMIT DRAWING SHEET 29

MATCHLINE
SEE PERMIT DRAWING SHEET 39

PERMIT DRAWING
SHEET 39 OF 71



 DENOTES TEMPORARY IMPACTS IN SURFACE WATER
 DENOTES IMPACTS IN SURFACE WATER

SITE 10E – VV

SEE ADDITIONAL IMPACTS
TO SITE 10E ON PERMIT
DRAWING SHEET 38

**MATCHLINE
SEE PERMIT DRAWING SHEET 38**

-1PB-

15" RCP-11

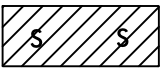
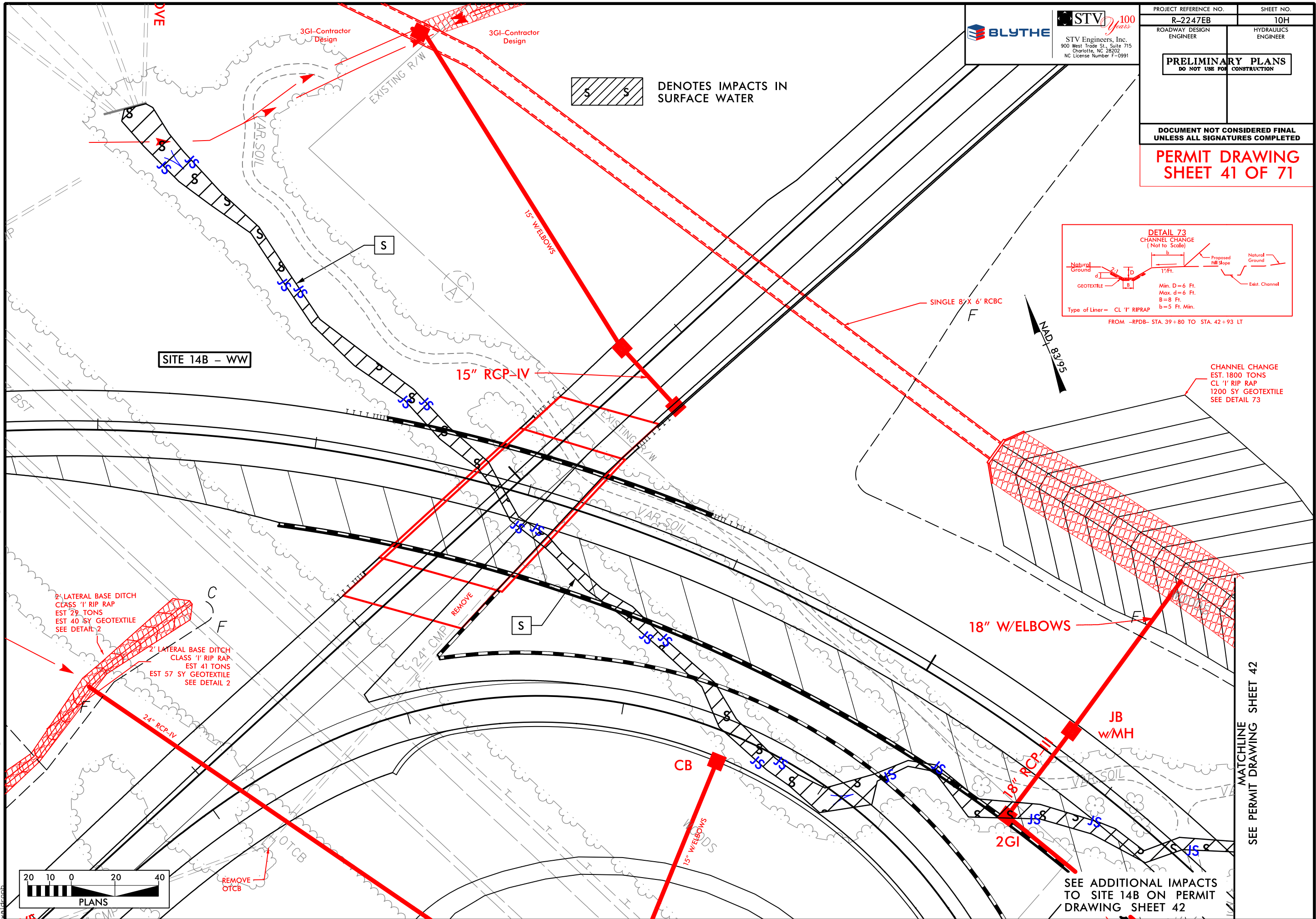
**SINGLE 5' X 5' RCBC
NOT BURIED**

TS

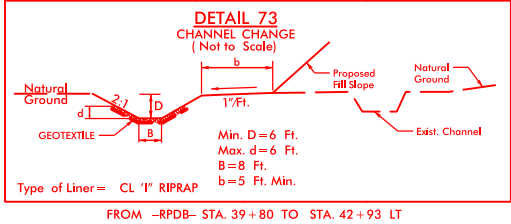
— 2' SPECIAL LATERAL BASE DITCH
CLASS 'I' RIP RAP
EST 74 TONS
EST 104 SY GEOTEXTILE
SEE DETAIL 19



6/3/2019 8:11 AM C:\Users\Blythe\Documents\Drawings\PRM_SHT_03-xx-2019\2247EB_Hyd.prm.PSH10H.dgn
Blythe Hydraulic PERMITS Environmental\Drawings\PRM_SHT_03-xx-2019\2247EB_Hyd.prm.PSH10H.dgn
valid for



DENOTES IMPACTS IN
SURFACE WATER



CHANNEL CHANGE
EST. 1800 TONS
CL 'I' RIP RAP
1200 SY GEOTEXTILE
SEE DETAIL 73

PROJECT REFERENCE NO. R-2247EB		SHEET NO. 10H	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			
PERMIT DRAWING SHEET 41 OF 71			

BLYTHE

STV 100 Years

STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number F-1991

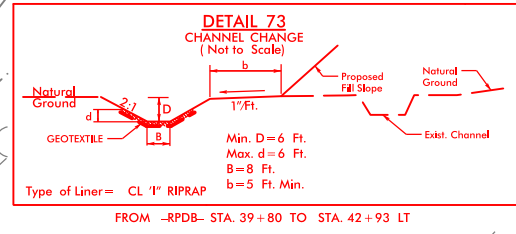
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MATCHLINE
SEE PERMIT DRAWING SHEET 41

SITE 14B - WW

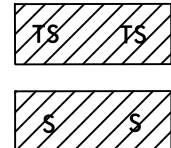
SEE ADDITIONAL IMPACTS
TO SITE 14B ON PERMIT
DRAWING SHEET 41

CHANNEL CHANGE
EST. 1800 TONS
CL '1' RIP RAP
1200 SY GEOTEXTILE
SEE DETAIL 73



STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number F-1991

PROJECT REFERENCE NO. R-2247EB		SHEET NO. 101	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			
PERMIT DRAWING SHEET 42 OF 71			

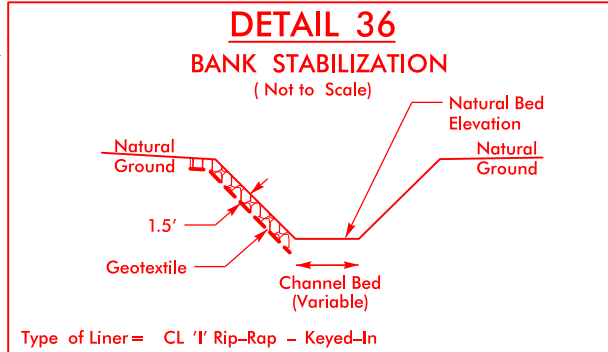


TS
DENOTES TEMPORARY
IMPACTS IN SURFACE WATER

S
DENOTES IMPACTS IN
SURFACE WATER

SITE 15D - XX

BANK STABILIZATION
SEE DETAIL 36

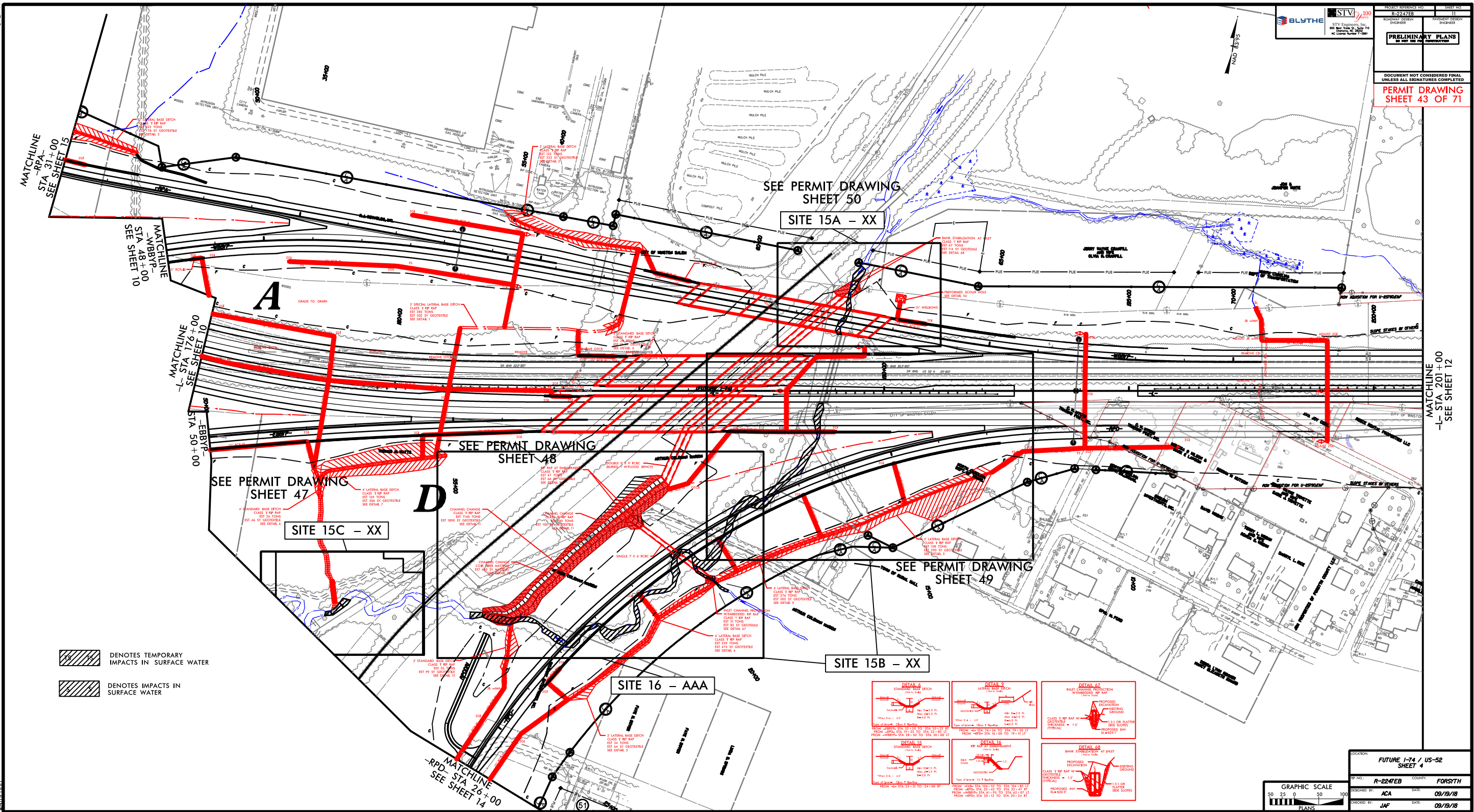


GRASSY CREEK

VAR. SOIL

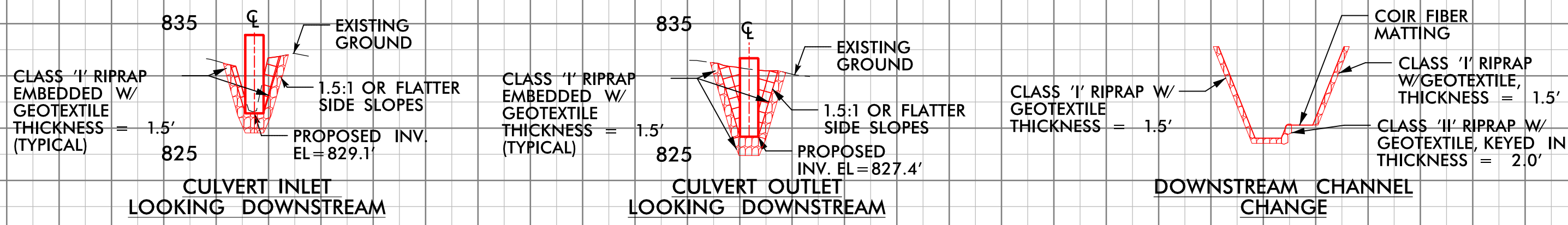
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6/3/2019
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-RPD- 19 + 90
SKEW = 72 DEGREES
7'X6' RCBC, 172' LENGTH
(NOT BURIED)
GP EL=862.31'



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6/3/2019
wldrpopb 6/23/16

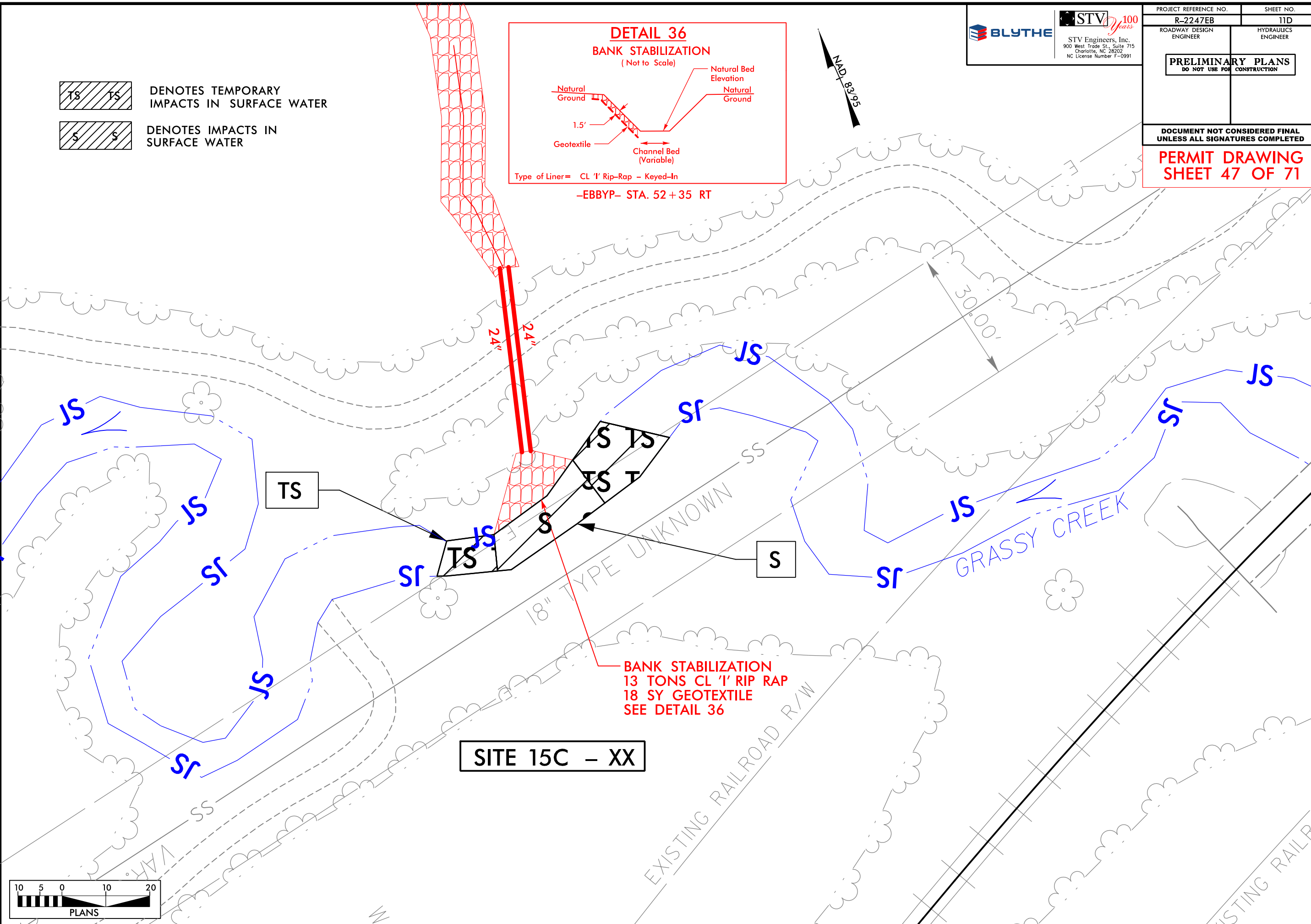
**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

PERMIT DRAWING
SHEET 47 OF 71



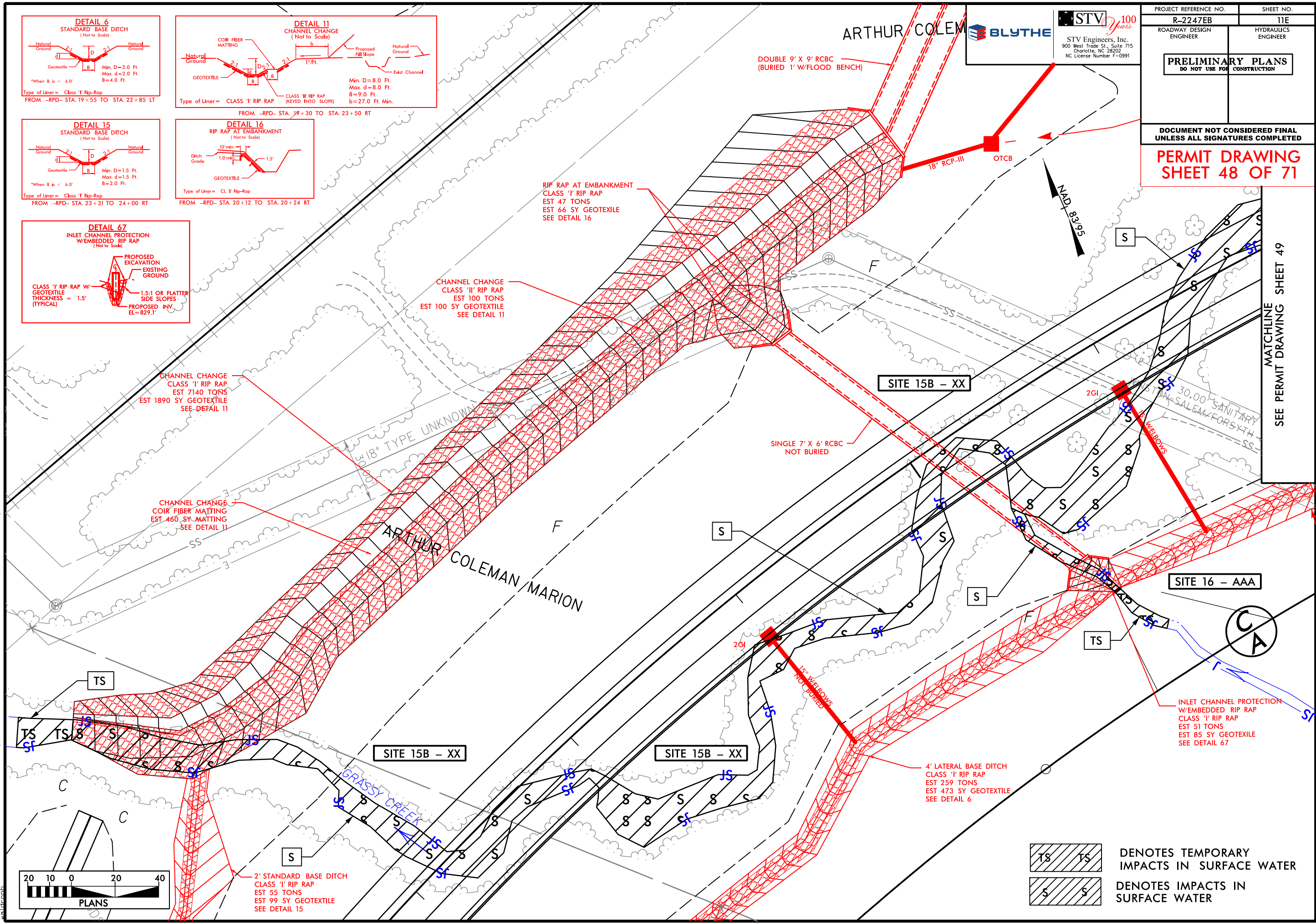
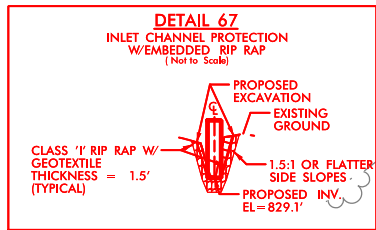
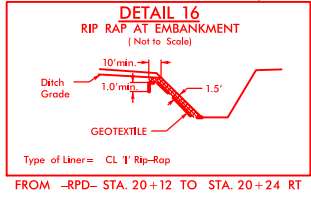
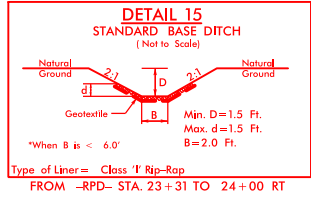
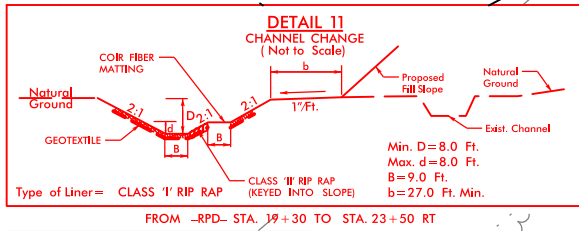
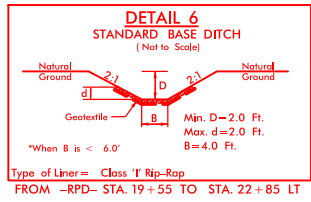
 DENOTES TEMPORARY IMPACTS IN SURFACE WATER

 DENOTES IMPACTS IN SURFACE WATER



SITE 15C – XX



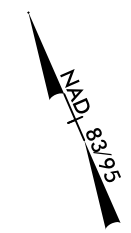


PROJECT REFERENCE NO. R-2247EB		SHEET NO. 11E	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			
PERMIT DRAWING SHEET 48 OF 71			

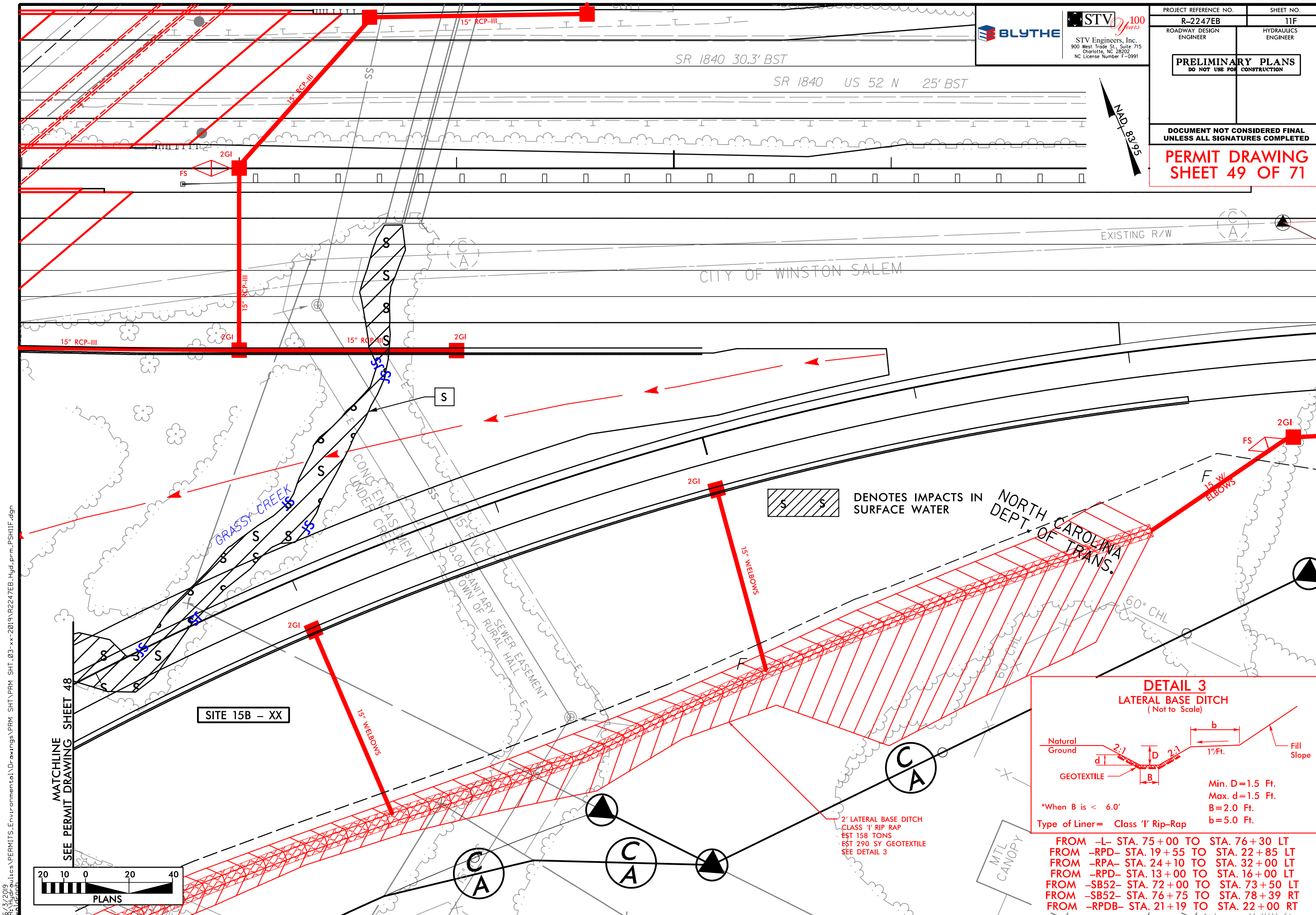
DENOTES TEMPORARY
IMPACTS IN SURFACE WATER

DENOTES IMPACTS IN
SURFACE WATER

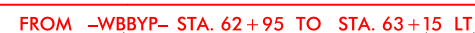
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PERMIT DRAWING
SHEET 49 OF 71



PERMIT DRAWING
SHEET 50 OF 71



3/08

~~-WBBYP-~~

SITE 15A – XX

— PREFORMED SCOUR HOLE
SEE DETAIL 54

- 15" W/ELBOWS

2G

2GI

15" RCP-III

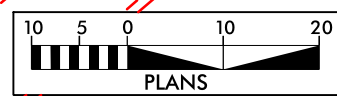
- DOUBLE 9' X 9' RCBC
(BURIED 1' W/FLOOD BENCH)

DETAIL 68
BANK STABILIZATION AT INLET
(Not to Scale)

CLASS 'I' RIPRAP W/
GEOTEXTILE
THICKNESS = 1.5'
(TYPICAL)

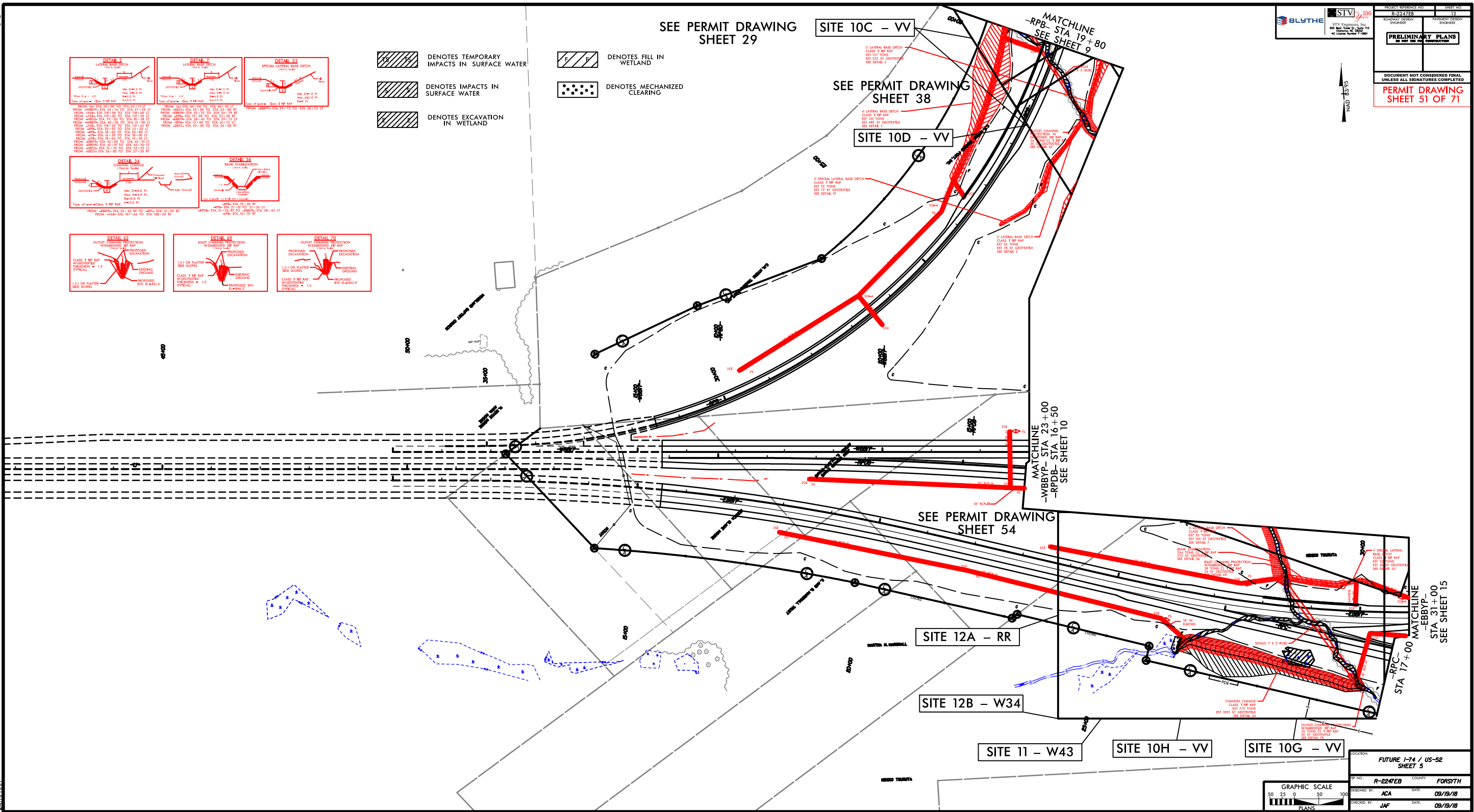
PROPOSED INV.
EL = 830.9'

— 1.5:1 OR
FLATTER
SIDE SLOPES



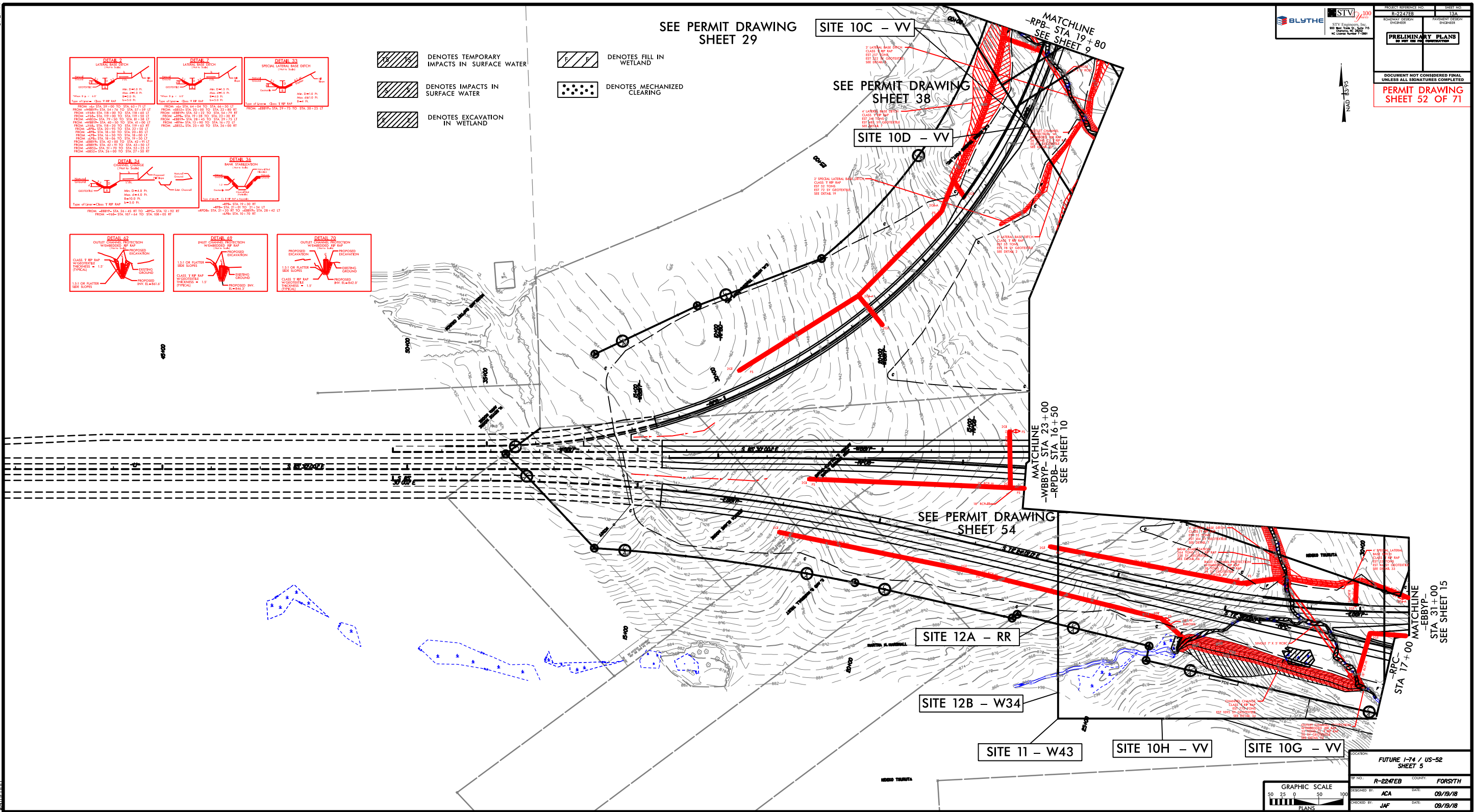
6/2/99

6/3/2019
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6/3/2019
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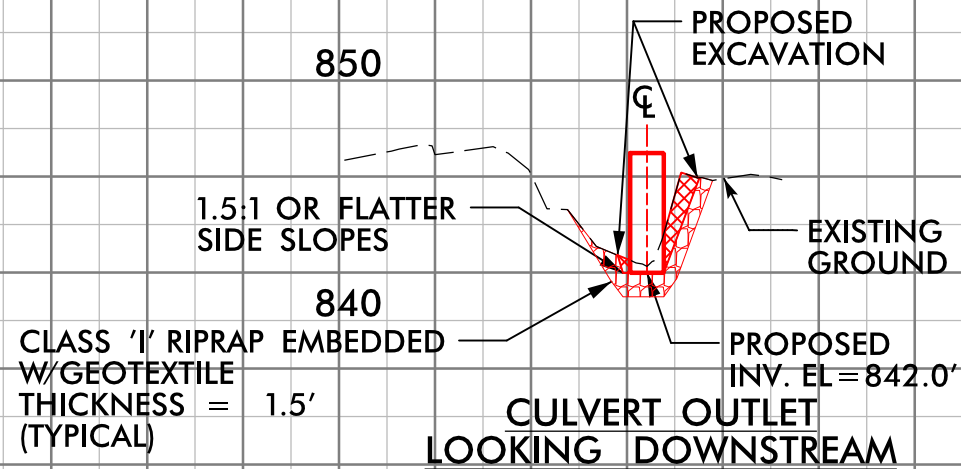
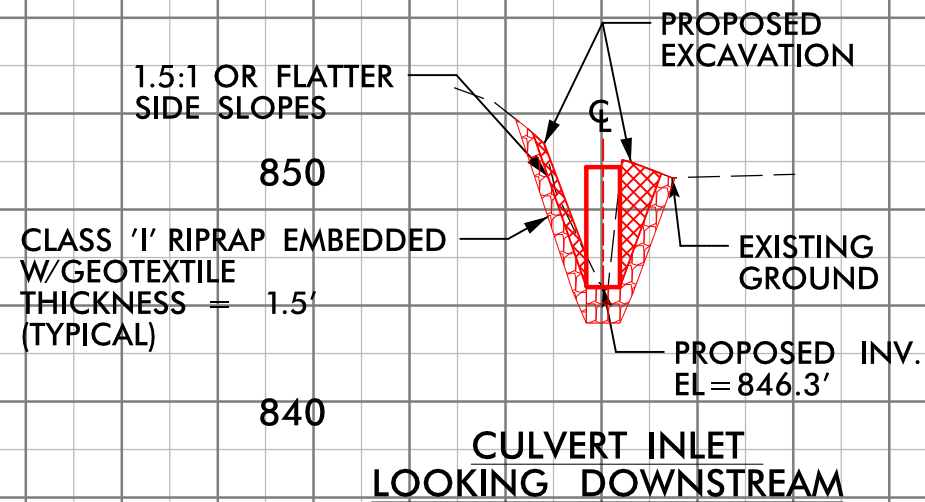


6/23/16

6/3/2019
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redrpb

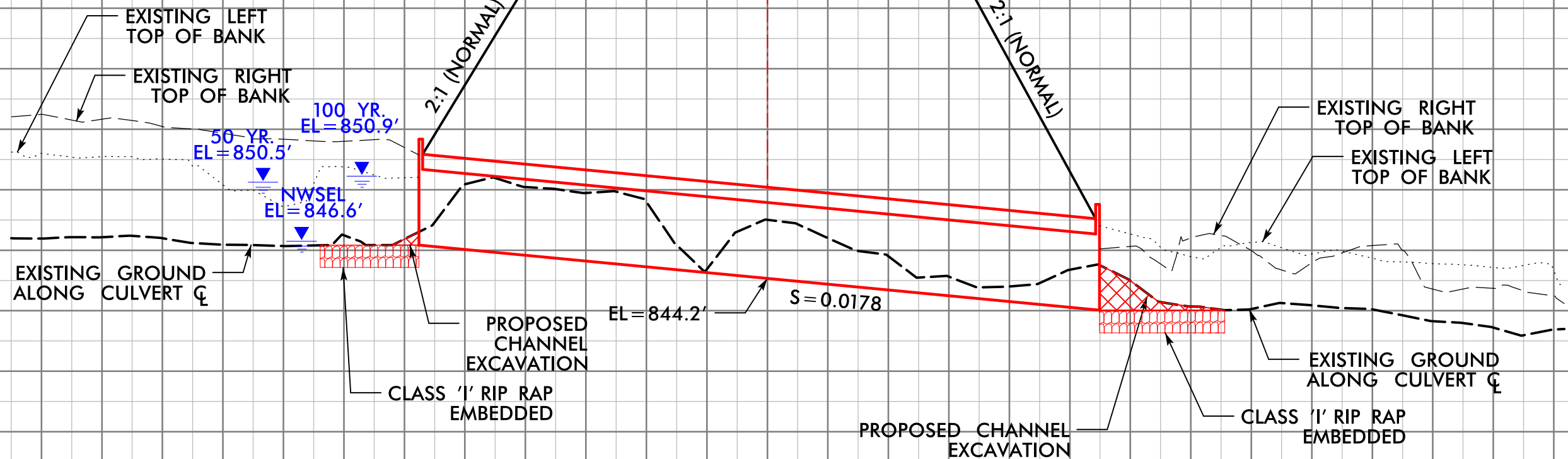
PERMIT DRAWING
SHEET 53 OF 71

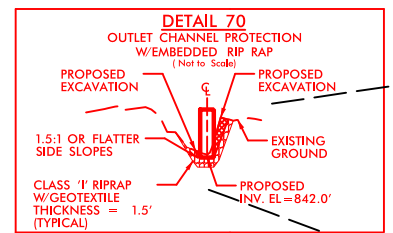
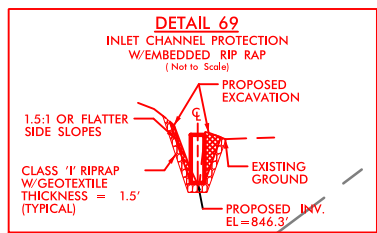
PROJECT REFERENCE NO. R-2247EB	SHEET NO. 13B
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
INCOMPLETE PLANS DO NOT USE FOR A/W ACQUISITION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



+RPC- 12+01
SKEW = 41 DEGREES
7'X5'x240' RCBC, (NOT BURIED)
GP EL=867.99'

SITE 10H - VV





SEE ADDITIONAL IMPACTS
TO SITE 10G ON PERMIT
DRAWING SHEET 40

BANK STABILIZATION
264 TONS CL 'I' RIP RAP
372 SY GEOTEXTILE
SEE DETAIL 36

SITE 10G - VV

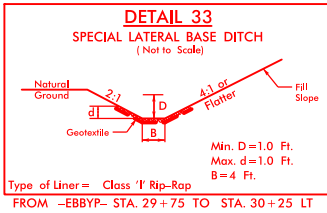
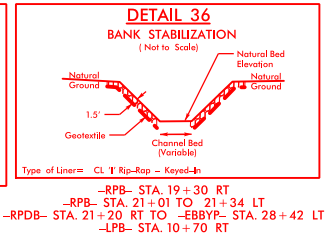
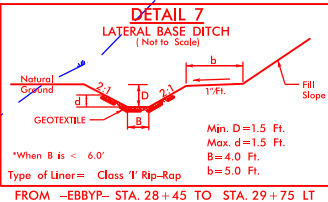
INLET CHANNEL PROTECTION
W/EMBEDDED RIP RAP
38 TONS CL 'I' RIP RAP
54 SY GEOTEXTILE
SEE DETAIL 69

HIDEKO TSURUTA

4' LATERAL BASE DITCH
CLASS 'I' RIP RAP
EST 55 TONS
EST 104 SY GEOTEXTILE
SEE DETAIL 7

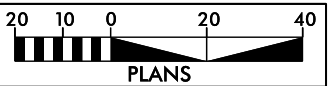
4' SPECIAL LATERAL
BASE DITCH
CLASS 'I' RIP RAP
EST 33 TONS
EST 46 SY GEOTEXTILE
SEE DETAIL 33

- DENOTES MECHANIZED CLEARING
- DENOTES TEMPORARY IMPACTS IN SURFACE WATER
- DENOTES IMPACTS IN SURFACE WATER
- DENOTES FILL IN WETLAND
- DENOTES EXCAVATION IN WETLAND



CHANNEL CHANGE
CLASS 'I' RIP RAP
EST 775 TONS
EST 1095 SY GEOTEXTILE
SEE DETAIL 34

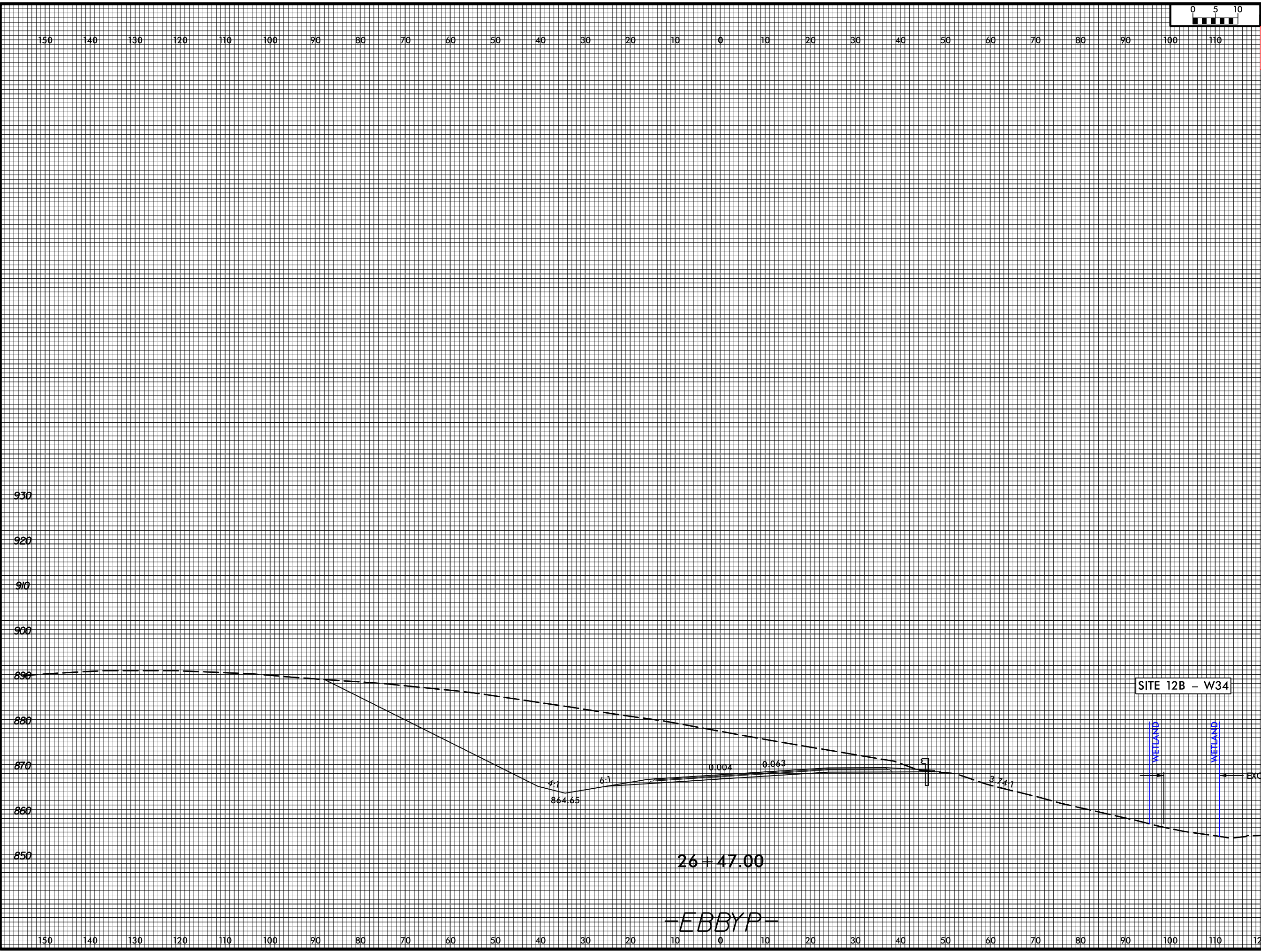
OUTLET CHANNEL PROTECTION
W/EMBEDDED RIP RAP
35 TONS CL 'I' RIP RAP
50 SY GEOTEXTILE
SEE DETAIL 70



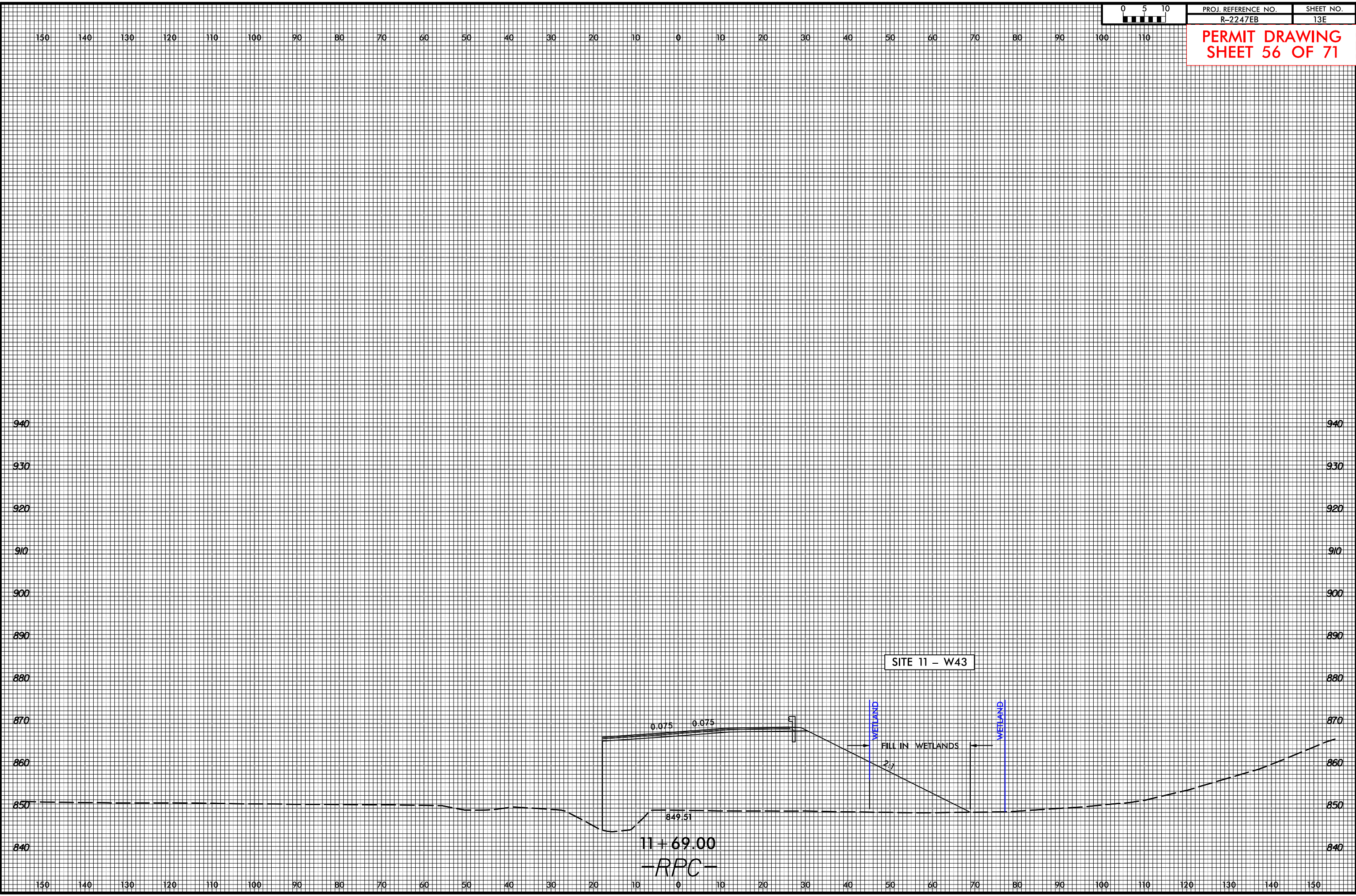
PLANS

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6/23/16
6/3/2019
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wadapb



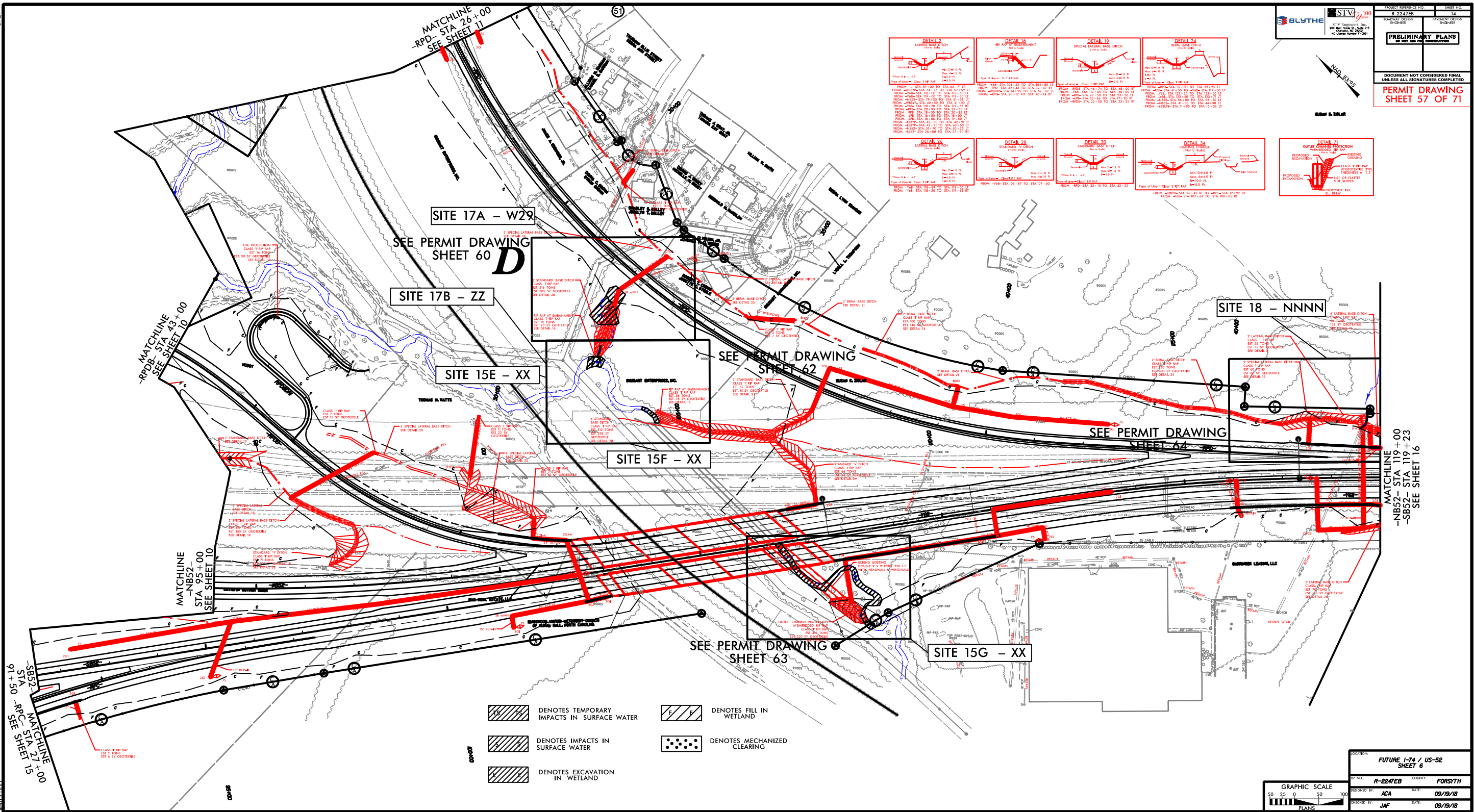
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PROJ. REFERENCE NO.	SHEET NO.
R-2247EB	13E

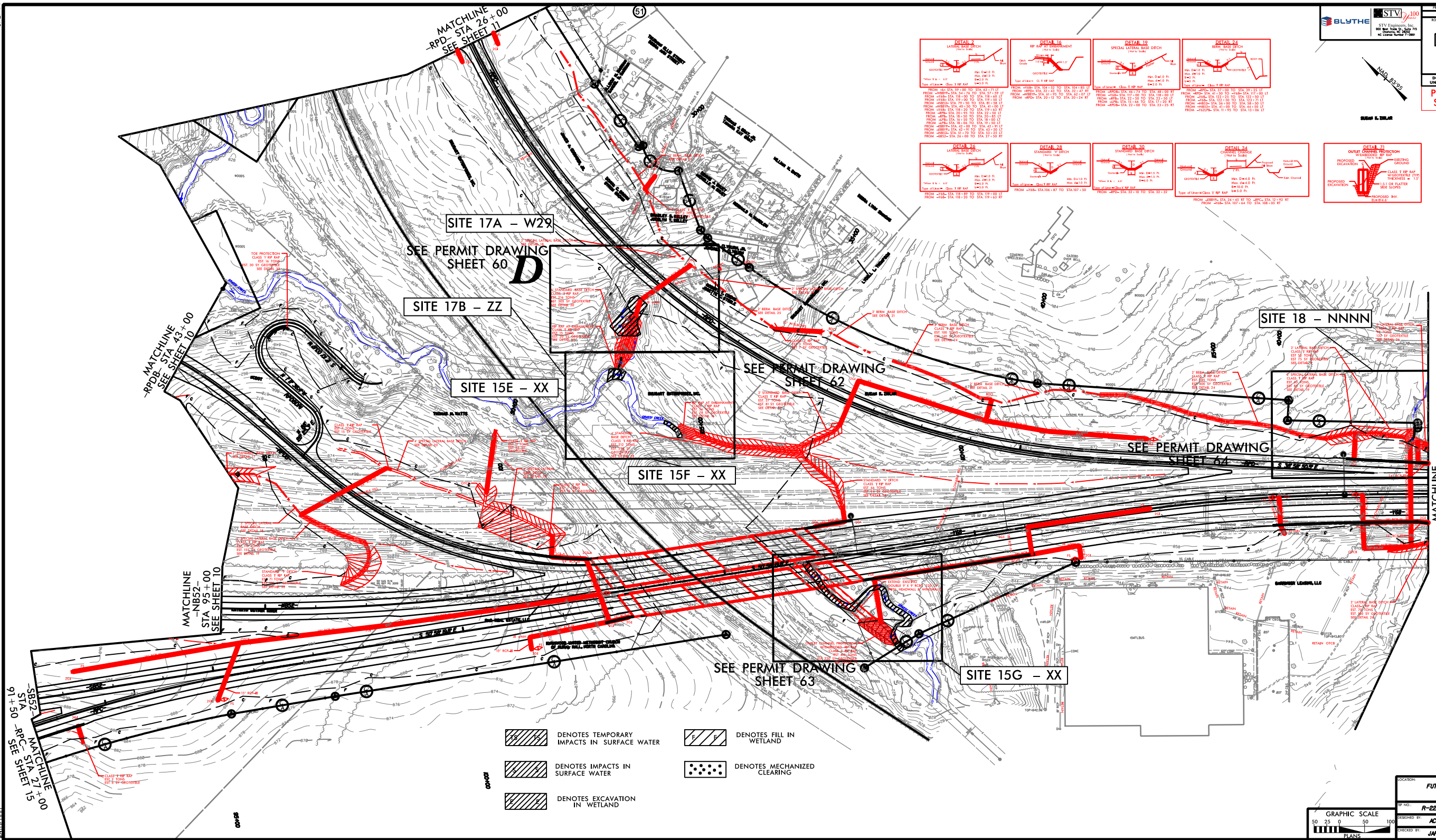
PERMIT DRAWING
SHEET 56 OF 71

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6/2/99

6/3/2019
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BLYTEH **STV** **2000**
STV Engineering, Inc.
900 West 10th St., Suite 715
Fargo, ND 58103
ND License Number 17099

PROJECT NUMBER: R-2247EB SHEET NO: 14A
ROADWAY DESIGN: ENGINEER
PAYMENT DESIGN: ENGINEER
PRELIMINARY PLANS
NO IMP OR POC
CONSTRUCTION
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING
SHEET 58 OF 71

GRAPHIC SCALE
0 25 50 100
PLANS

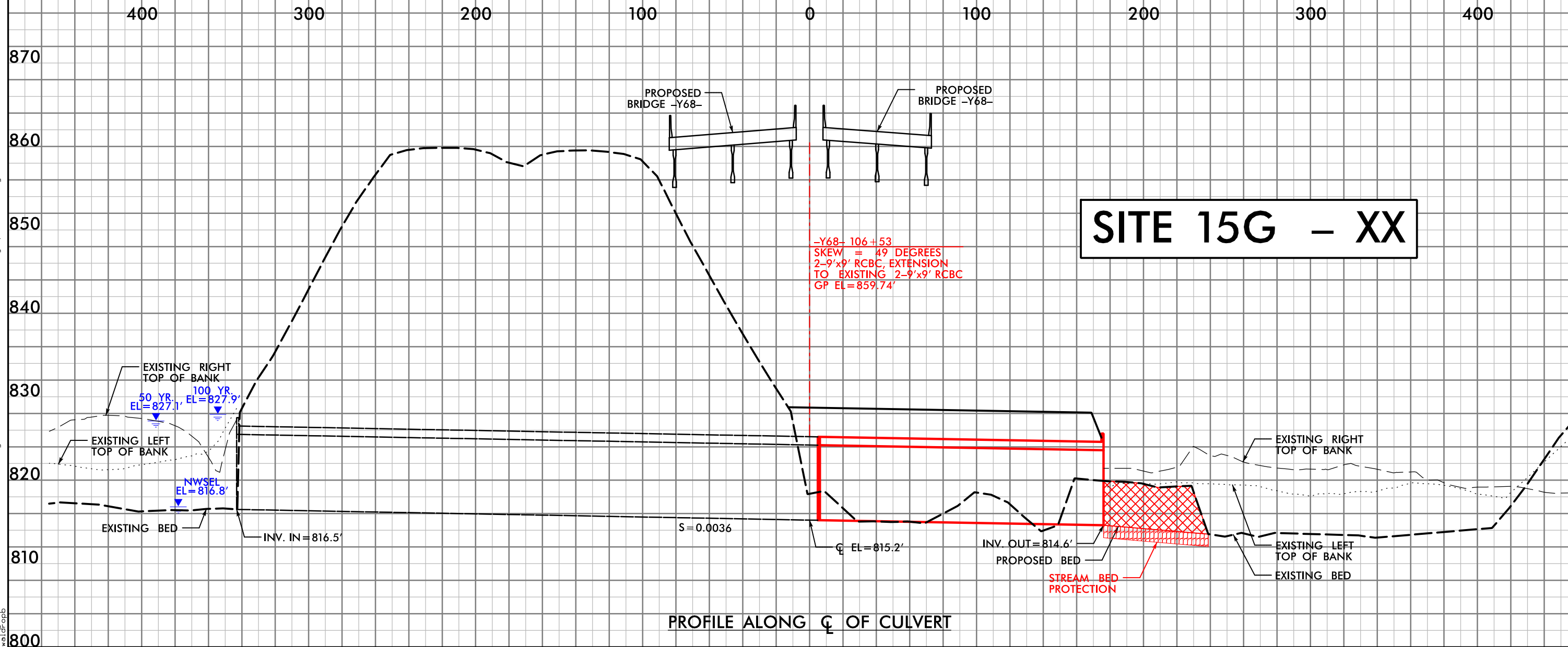
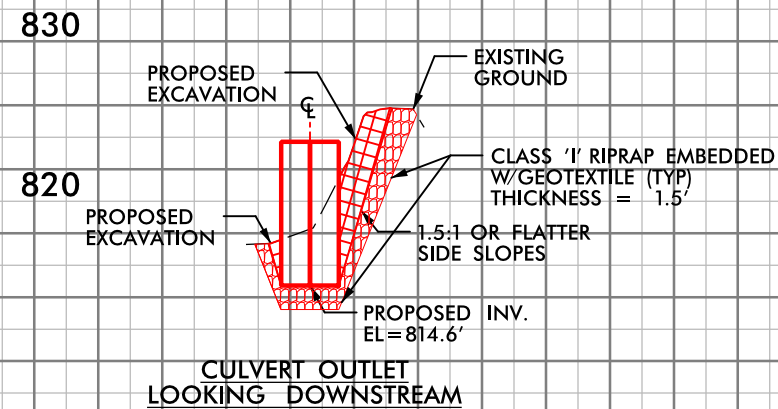
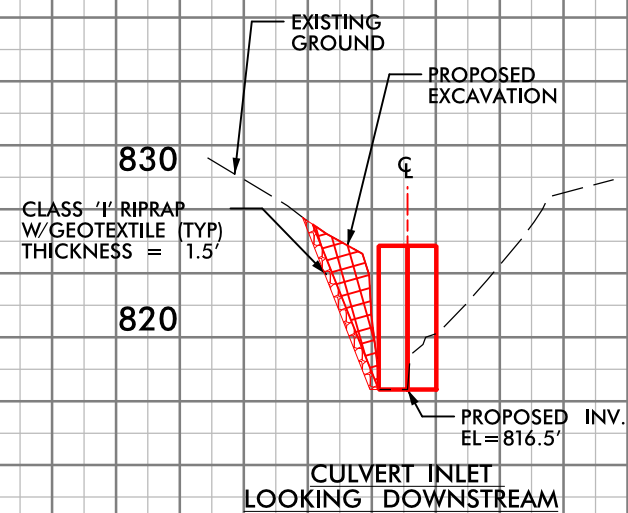
LOCATION: FUTURE I-74 / US-52
SHEET 6
TP NO: R-2247EB COUNTY: FORSYTH
DESIGNED BY: ACA DATE: 09/19/18
CHECKED BY: JAF DATE: 09/19/18

6/23/16

6/3/2019
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PSH14B

PERMIT DRAWING
SHEET 59 OF 71

PROJECT REFERENCE NO.		SHEET NO.	
R-2247EB		14B	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			



SITE 15G - XX

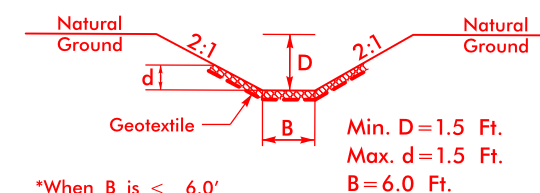
-Y68+ 106 + 53
SKEW = 49 DEGREES
2-9'x9' RCBC, EXTENSION
TO EXISTING 2-9'x9' RCBC
GP EL=859.74'

PROFILE ALONG $\mathcal{C}$ OF CULVERT

**PERMIT DRAWING
SHEET 60 OF 71**

SITE 17A – W29

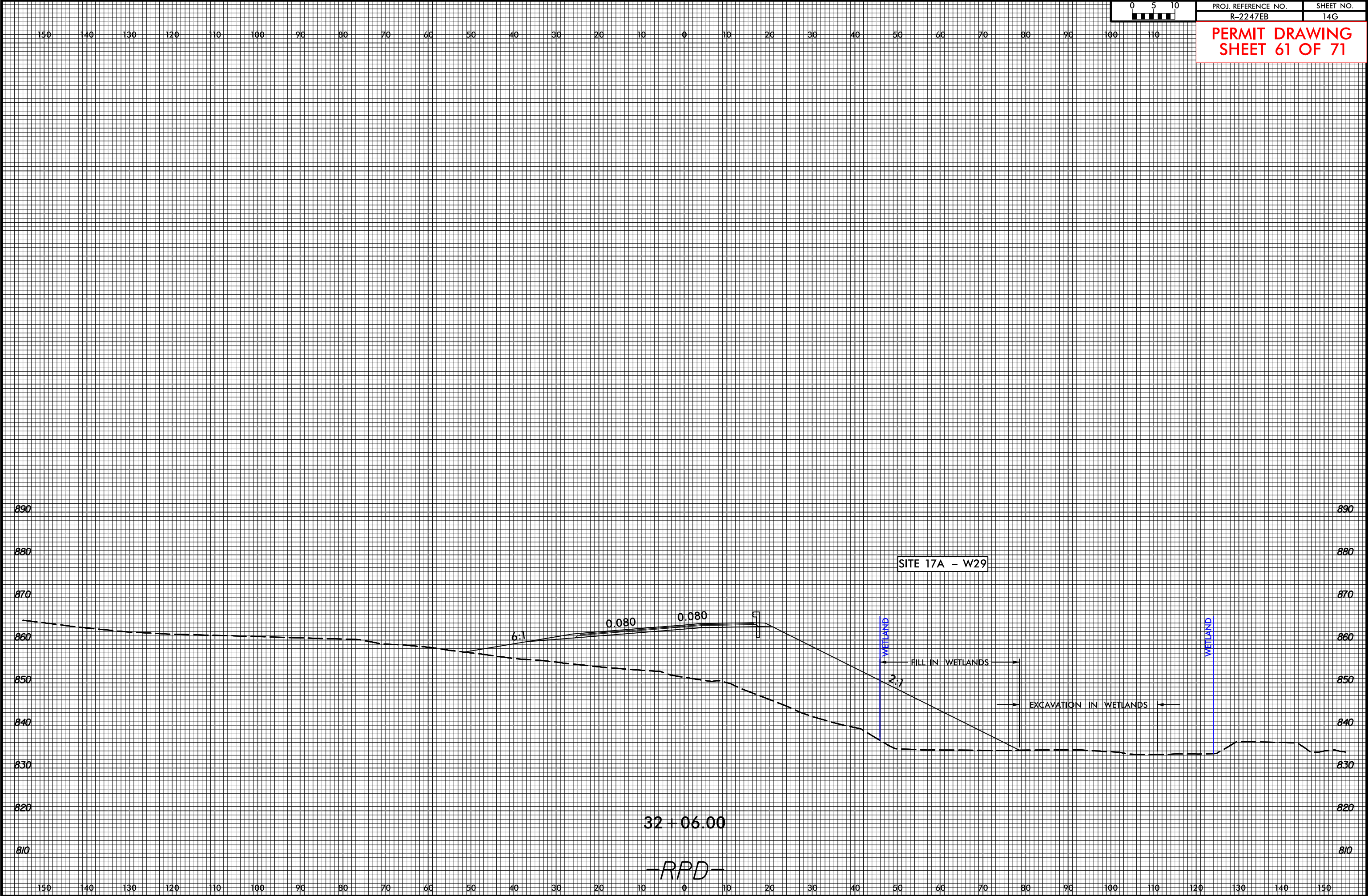
DETAIL 30
STANDARD BASE DITCH
(Not to Scale)



Type of Liner= Class 'I' Rip-Rap
FROM -RPD- STA. 32+10 TO STA. 32+32

6/23/16

6/3/2019
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valid.pds





DENOTES TEMPORARY
IMPACTS IN SURFACE WATER

SITE 15E – XX

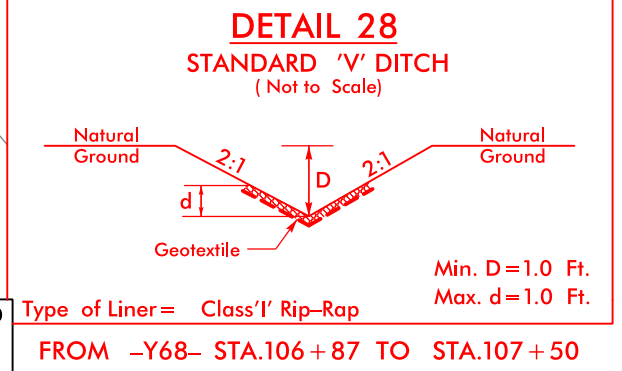
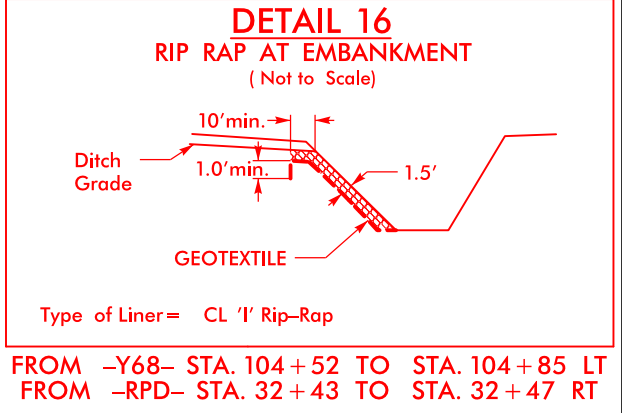
BANK STABILIZATION
CLASS 'I' RIP RAP
EST. 15 TONS
EST. 20 SY GEOTEXTILE
SEE DETAIL 16

SHUGART ENTERPRISES, INC.

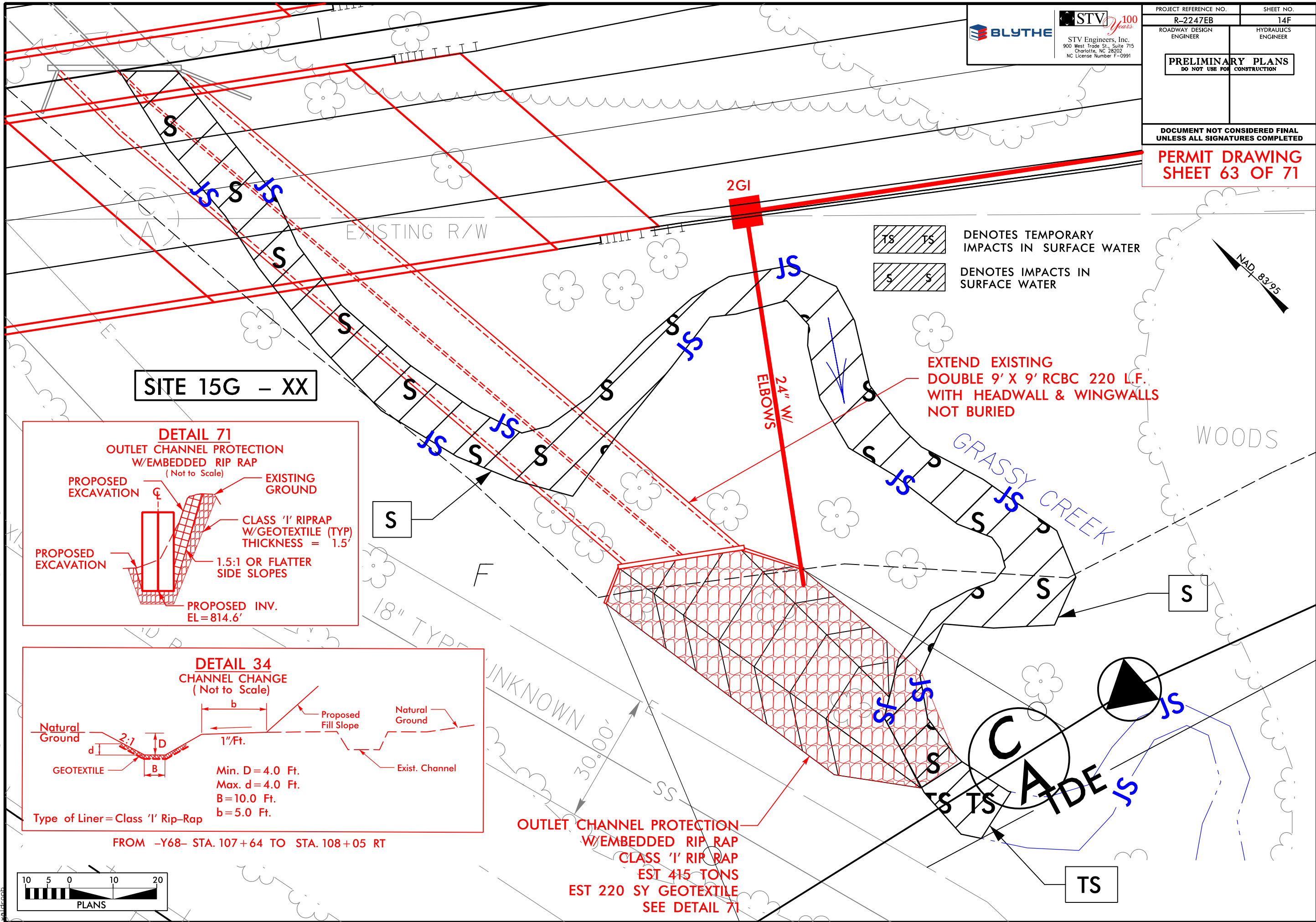
SITE 15F – XX

BANK STABILIZATION
CLASS 'I' RIP RAP
EST. 56 TONS
EST. 78 SY GEOTEXTILE
SEE DETAIL 16

4' STANDARD
BASE DITCH
CLASS 'I' RIP RAP
EST. 212 TONS
EST. 298 SY
GEOTEXTILE
SEE DETAIL 28



6/3/2019
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valid.mdb



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PROJECT REFERENCE NO. R-2247EB

SHEET NO. 14G

ROADWAY DESIGN ENGINEER

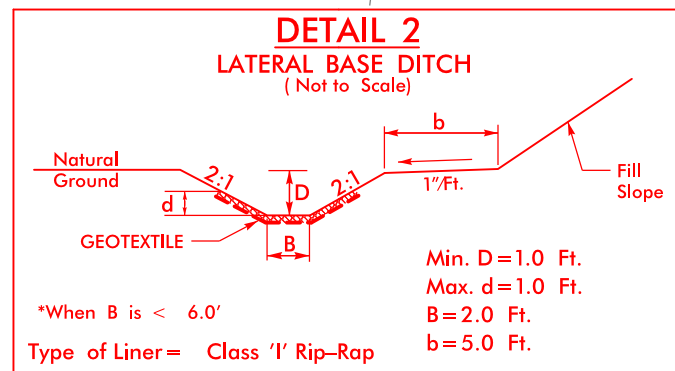
HYDRAULICS ENGINEER

PRELIMINARY PLANS

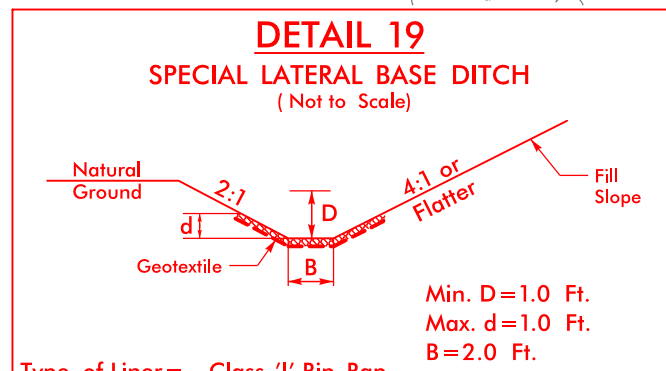
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

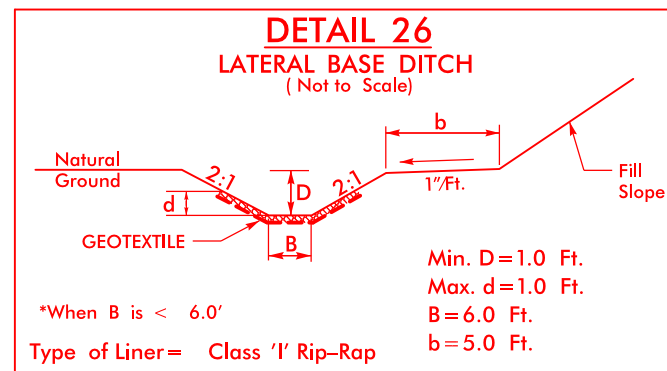
PERMIT DRAWING SHEET 64 OF 71



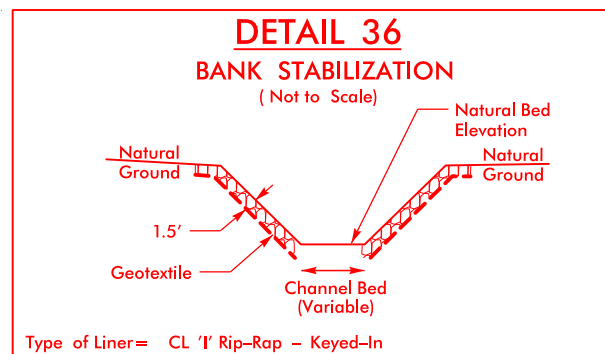
FROM -Y68- STA. 118+00 TO STA. 118+60 LT
FROM -Y68- STA. 119+00 TO STA. 119+50 LT



FROM -Y68- STA. 117+00 TO STA. 118+00 LT



FROM -Y68- STA. 118+89 TO STA. 119+00 LT



-Y68- STA. 118+65 LT

TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S DENOTES IMPACTS IN SURFACE WATER

BANK STABILIZATION
CLASS 'I' RIP RAP
EST 25 TONS
EST 36 SY GEOTEXTILE
SEE DETAIL 36

6' LATERAL BASE DITCH
CLASS 'I' RIP RAP
95 TONS
132 SY GEOTEXTILE
SEE DETAIL 26

SITE 18 - NNNN

2' SPECIAL LATERAL BASE DITCH
CLASS 'I' RIP RAP
EST 60 TONS
EST 85 SY GEOTEXTILE
SEE DETAIL 19

2' LATERAL BASE DITCH
CLASS 'I' RIP RAP
EST 55 TONS
EST 75 SY GEOTEXTILE
SEE DETAIL 2

15" W/ ELBOWS

2GI

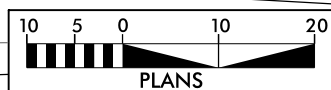
24" W/ ELBOWS

2GI-A

24" RCP-III

TRENCHLESS INSTALLATION

48" WELDED STEEL



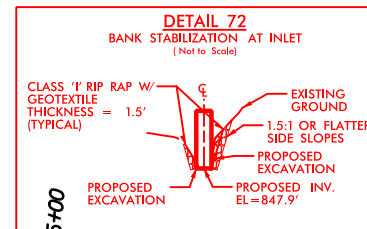
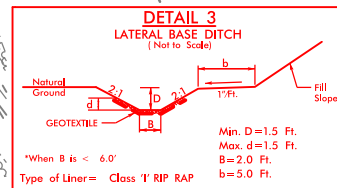
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DENOTES TEMPORARY
IMPACTS IN SURFACE WATER

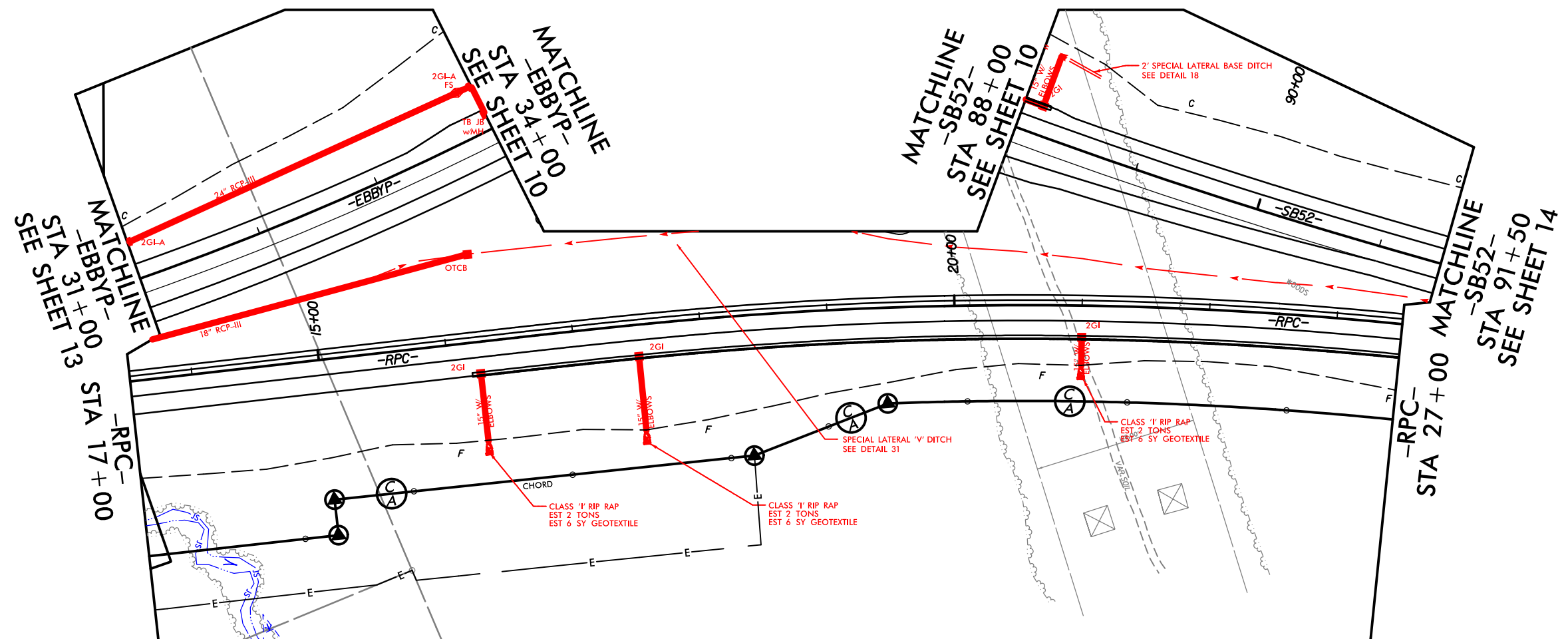
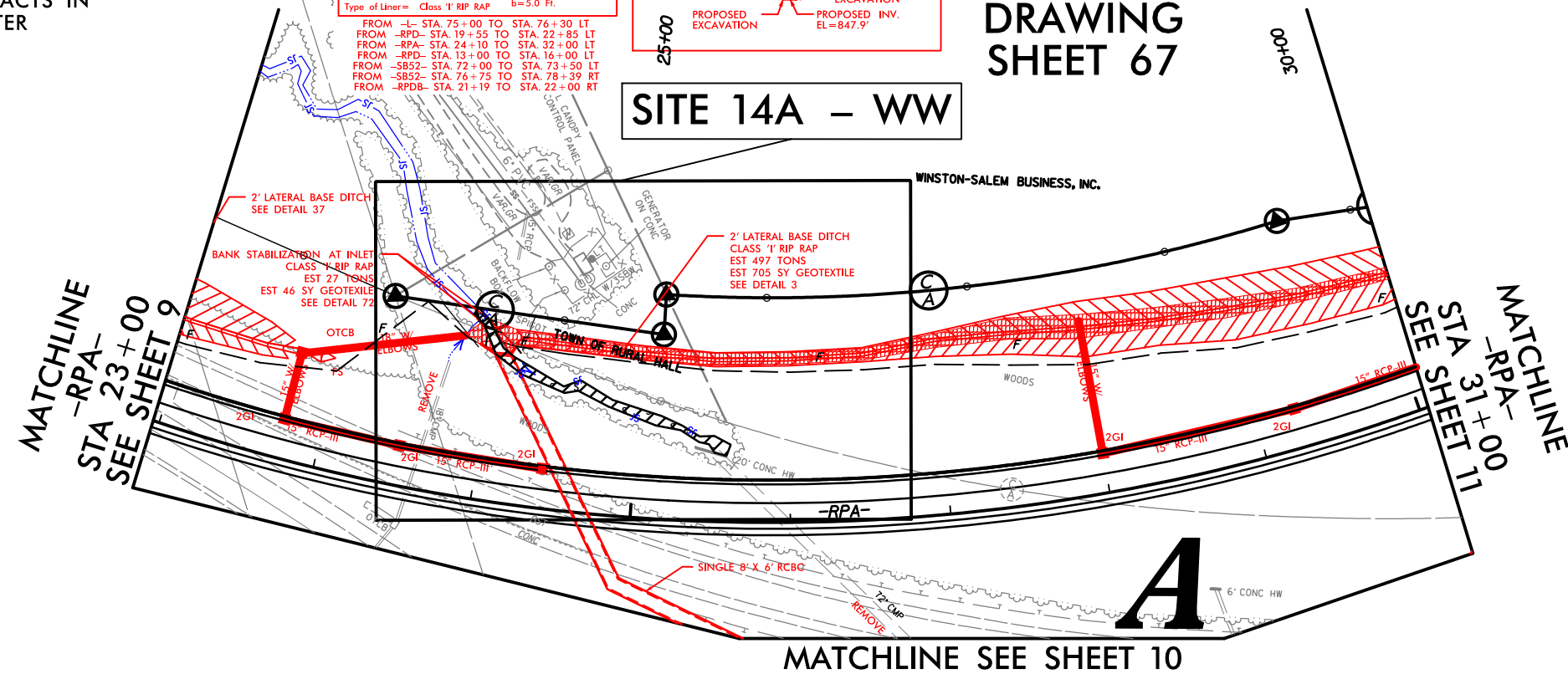


DENOTES IMPACTS IN
SURFACE WATER



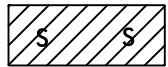
SEE PERMIT
DRAWING
SHEET 67

SITE 14A – WW

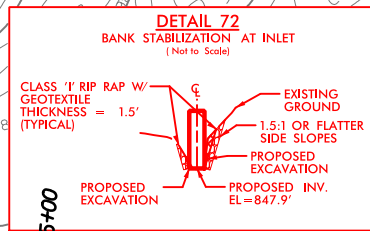
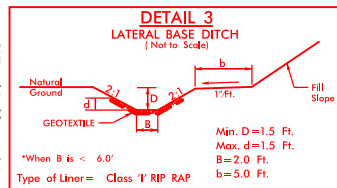




DENOTES TEMPORARY
IMPACTS IN SURFACE WATER



DENOTES IMPACTS IN
SURFACE WATER



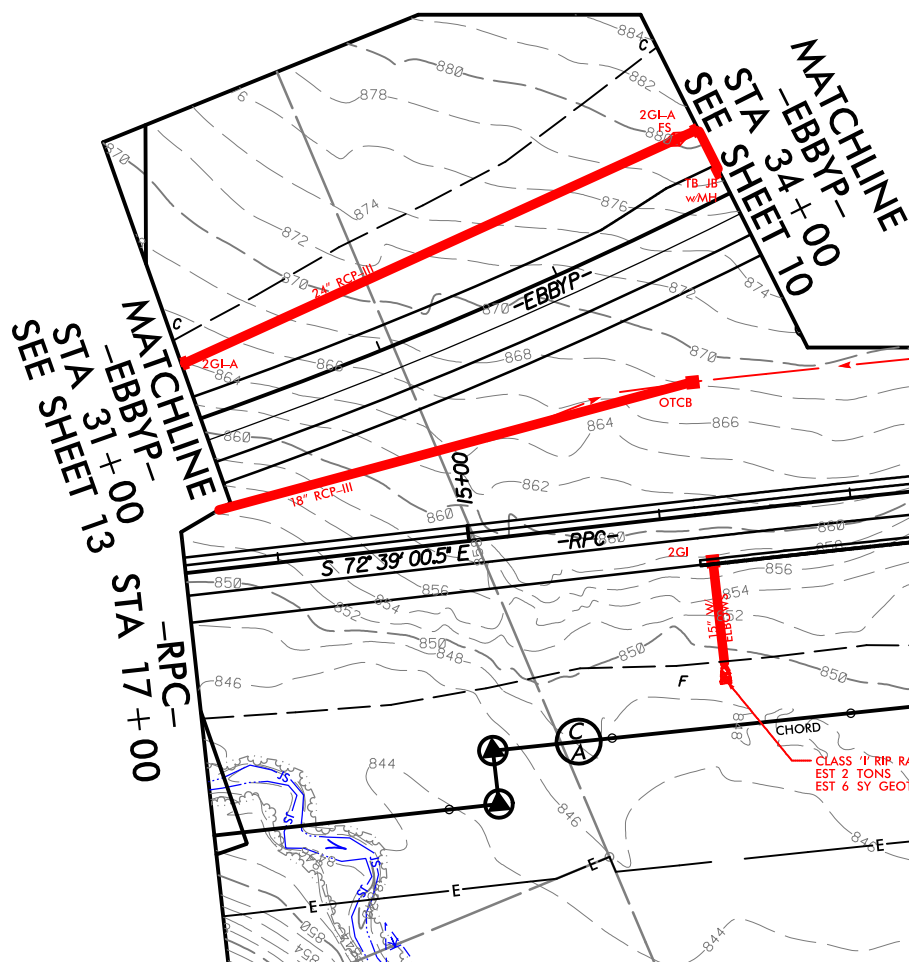
SITE 14A - WW

SEE PERMIT
DRAWING
SHEET 67

MATCHLINE
-RPA-
STA 23+00
SEE SHEET 9

MATCHLINE
-RPA-
STA 31+00
SEE SHEET 11

MATCHLINE SEE SHEET 10



STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number F-0991

PROJECT REFERENCE NO.		SHEET NO.	
R-2247EB		15A	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			
PERMIT DRAWING SHEET 66 OF 71			

PROJECT REFERENCE NO. R-2247EB

SHEET NO. 15B

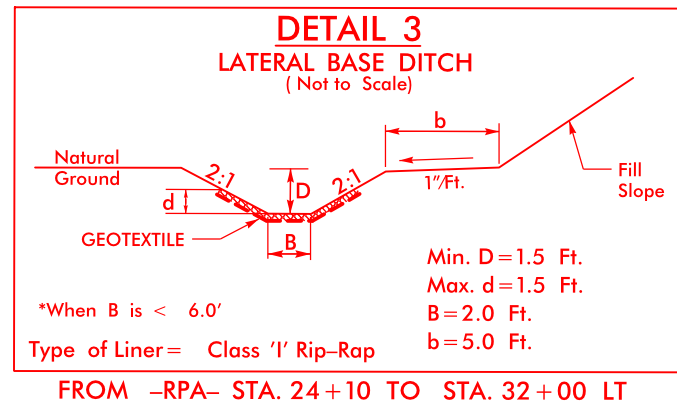
ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

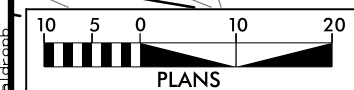
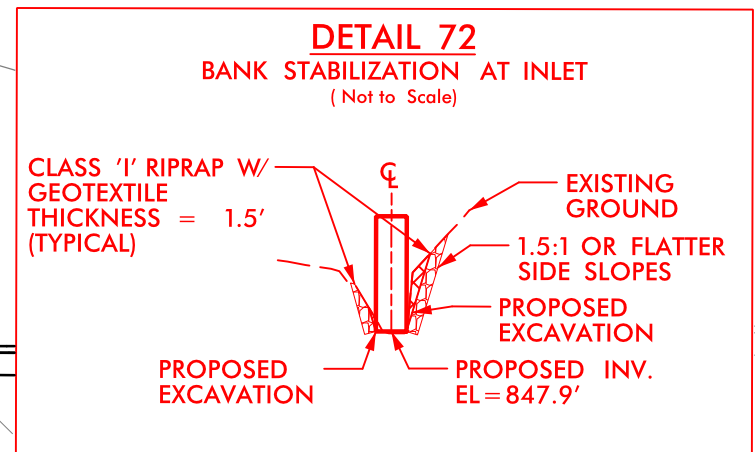
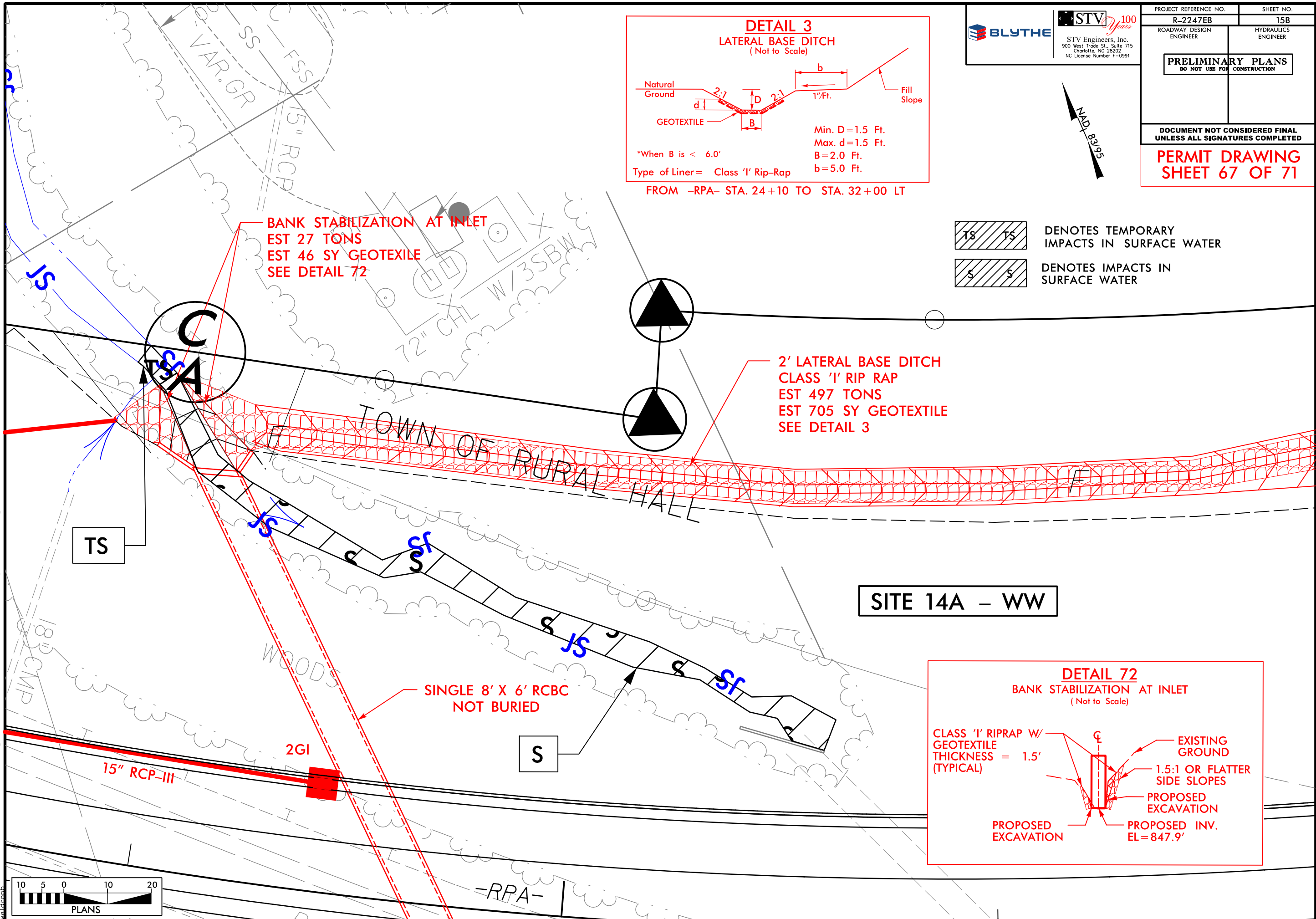
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 67 OF 71



DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES IMPACTS IN SURFACE WATER



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WETLAND AND SURFACE WATER IMPACTS SUMMARY												
			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
1	-L- 63+69 to 64+24 LT	2 @ 7' x 7' RCBC EXTENSION						< 0.01	< 0.01	23	17	
1	-L- 63+69 to 64+24 LT	BANK STABILIZATION ONLY						0.01		43		
2	-L- 64+21 to 65+97 LT	ROADWAY FILL						< 0.01		85		
3	-L- 76+12 to 76+55 LT	ROADWAY FILL						< 0.01		50		
4A	-L- 76+36 to 76+31 LT	8' x 7' RCBC EXTENSION						< 0.01	< 0.01	30	16	
4A	-L- 76+36 to 76+31 LT	BANK STABILIZATION ONLY						< 0.01		39		
4B	-L- 77+51 to 77+72 RT	OUTLET CHANNEL PROTECTION						0.01	< 0.01	40	7	
5	-L- 96+77 to 96+96 RT	30" ALTERNATE PIPE						< 0.01		12		
5	-L- 96+77 to 96+96 RT	OUTLET CHANNEL PROTECTION						< 0.01		29		
6A	-L- 108+27 to 108+77 RT	48" RCP-III/ROADWAY FILL						< 0.01	< 0.01	15	25	
6A	-L- 108+27 to 108+77 RT	OUTLET CHANNEL PROTECTION						< 0.01		16		
6A	-L- 108+27 to 108+77 RT	CHANGE FROM TEMPORARY IMPACTS IN EC TO PERMANENT IMPACTS IN EB						< 0.01		10		
6B***	-SB52- 22+78 RT	ROADWAY FILL	< 0.01									
6B**	-SB52- 22+78 RT	CHANGE FROM EXCAVATION IN WETLANDS IN EC TO FILL IN WETLANDS IN EB	< 0.01									
6B**	-SB52- 22+78 RT	CHANGE FROM MECHANIZED CLEARING IN EC TO FILL IN WETLANDS IN EB	< 0.01									
TOTALS*:			0.01	0	0	0	0	0.06	0.01	392	65	0

*Rounded totals are sum of actual impacts

NOTES:

**Mechanized Clearing and Excavation impacts previously mitigated through Project R-2247EC

*** Wetland W49 is a total take

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
6/4/2019
FORSYTH COUNTY
R-2247 EB
34409.3.17
SHEET 68 OF 71

WETLAND AND SURACE WATER IMPACTS SUMMARY												
Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER IMPACTS				
			Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
7	-L- 110+89 to 111+03 RT	OUTLET CHANNEL PROTECTION/RIP RAP FILL						< 0.01	< 0.01	27	25	
7	-L- 110+89 to 111+03 RT	CHANGE FROM TEMPORARY IMPACTS IN EC TO PERMANENT IMPACTS IN EB						< 0.01		11		
8A	-Y62LPA- 12+87 RT	ROADWAY FILL	< 0.01			0.02						
8A**	-Y62LPA- 12+87 RT	CHANGE FROM MECHANIZED CLEARING IN EC TO FILL IN WETLAND IN EB	0.02									
8B	-Y62LPA- 12+87 RT	CHANGE FROM TEMPORARY IMPACTS IN EC TO PERMANENT IMPACTS IN EB						< 0.01		33		
8C***	-Y62RPB- 16+75 RT	ROADWAY FILL	0.06									
8C**	-Y62RPB- 16+75 RT	CHANGE FROM MECHANIZED CLEARING IN EC TO FILL IN WETLAND IN EB	0.01									
9A	-SB52- 56+93 to 61+16 RT	ROADWAY FILL						0.03		504		
9A	-SB52- 56+93 to 61+16 RT	CHANGE FROM TEMPORARY IMPACTS IN EC TO PERMANENT IMPACTS IN EB						< 0.01		17		
9B	-SB52- 58+54 RT	ROADWAY FILL	0.12									
9B	-SB52- 58+54 RT	DITCH EXCAVATION			0.06	0.04						
10A	-SB52- 59+43 to 59+62 RT	RIP RAP FILL						< 0.01	< 0.01	30	26	
10B	-SB52- 63+03 RT	BANK STABILIZATION ONLY						< 0.01	< 0.01	8	23	
10C	-SB52- 68+58 to 71+57 RT	4' x 5' RCBC						0.03	< 0.01	281	28	
10C	-SB52- 68+58 to 71+57 RT	OUTLET CHANNEL PROTECTION/RIP RAP FILL						< 0.01		33		
10C	-SB52- 68+58 to 71+57 RT	BANK STABILIZATION ONLY						< 0.01		30		
10D	-SB52- 71+57 to 72+19 RT	BANK STABILIZATION ONLY						< 0.01		47		
TOTALS*:			0.23	0.00	0.06	0.05	0.00	0.14	0.02	1413	167	0
*Rounded totals are sum of actual impacts NOTES: **Mechanized Clearing impacts previously mitigated through Project R-2247EC ***Wetland W26 is a total take												
										NC DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS 6/4/2019 FORSYTH COUNTY R-2247 EB 34409.3.17		
Revised 2018 Feb										SHEET	69	OF 71

WETLAND AND SURACE WATER IMPACTS SUMMARY												
			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
10E	-SB52- 72+19 to 75+11 RT	5' x 5' RCBC						0.04	< 0.01	343	25	
10E	-SB52- 72+19 to 75+11 RT	OUTLET CHANNEL PROTECTION/RIP RAP FILL						< 0.01		29		
10E	-SB52- 72+19 to 75+11 RT	BANK STABILIZATION ONLY						< 0.01		24		
10F	-SB52- 77+21 to 79+59 RT	6' x 5' RCBC						0.03	< 0.01	215	27	
10F	-SB52- 77+21 to 79+59 RT	BANK STABILIZATION ONLY						< 0.01		33		
10F	-SB52- 77+21 to 79+59 RT	OUTLET CHANNEL PROTECTION/RIP RAP FILL						< 0.01		47		
10G	-SB52- 79+59 to 80+39 RT	BANK STABILIZATION ONLY						0.01		97		
10H	-SB52- 80+39 to 83+09 RT	7' x 5' RCBC						0.04	< 0.01	273	27	
10H	-SB52- 80+39 to 83+09 RT	RIP RAP FILL						< 0.01		75		
11**	-RPC- 11+69 RT	ROADWAY FILL	0.03			< 0.01						
11**	-RPC- 11+69 RT	DITCH EXCAVATION			< 0.01							
12A	EBBYP- 26+40 to 28+84 R	ROADWAY FILL/LOSS OF WATER DUE TO CHANNEL CHANGE						0.03	< 0.01	282	11	
12B	-EBBYP- 26+47 RT	DITCH EXCAVATION			< 0.01	< 0.01						
13A	-RPA- 16+18 to 16+89 LT	42" ALT W/ ELBOWS						< 0.01	< 0.01	75	25	
13A	-RPA- 16+18 to 16+89 LT	OUTLET CHANNEL PROTECTION/RIP RAP FILL						< 0.01		36		
13B***	-RPA- 16+65 LT	ROADWAY FILL	< 0.01									
14A	-RPA- 23+82 to 25+59 LT	8' x 6' RCBC						0.02	< 0.01	154	10	
14A	-RPA- 23+82 to 25+59 LT	BANK STABILIZATION ONLY						< 0.01		24		
TOTALS*:			0.27	0.00	0.07	0.07	0.00	0.36	0.04	3120	292	0

*Rounded totals are sum of actual impacts

NOTES:

**Wetland W43 is a total take

***Wetland W30 is a total take

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
6/4/2019
FORSYTH COUNTY
R-2247 EB
34409.3.17

SHEET
70
OF
71

WETLAND AND SURACE WATER IMPACTS SUMMARY												
			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
14B	-NB52- 84+51 to 93+96 LT	8' x 6' RCBC/LOSS OF WATER DUE TO CHANNEL CHANGE						0.12		926		
15A	-L- 189+05 to 189+45 LT	2 @ 9' x 9' RCBC						0.01	< 0.01	83	27	
15A	-L- 189+05 to 189+45 LT	BANK STABILIZATION ONLY						< 0.01		37		
15B	-L- 181+77 to 188+71 RT	ROADWAY FILL/LOSS OF WATER DUE TO CHANNEL CHANGE						0.30	< 0.01	1092	25	
15C	EBBYP- 52+13 to 52+60 R	BANK STABILIZATION ONLY						< 0.01	< 0.01	34	22	
15D	-RPDB- 42+56 to 43+02 LT	BANK STABILIZATION ONLY						< 0.01	0.01	13	44	
15E	-RPD- 32+41 to 32+64 RT	BANK STABILIZATION ONLY						< 0.01	< 0.01	13	19	
15F	-RPD- 33+82 to 34+06 RT	BANK STABILIZATION ONLY						< 0.01	< 0.01	19	26	
15G	-Y68- 106+60 to 108+27 RT	2 @ 9' x 9' RCBC EXTENSION						0.08	< 0.01	334	22	
15G	-Y68- 106+60 to 108+27 RT	RIP RAP FILL						< 0.01		27		
16	-RPD- 19+51 to 19+71 LT	7' x 6' RCBC						< 0.01	< 0.01	39	27	
16	-RPD- 19+51 to 19+71 LT	INLET CHANNEL PROTECTION/EMBEDDED RIP RAP						< 0.01		22		
17A**	-RPD- 32+06 RT	ROADWAY FILL	0.02									
17A**	-RPD- 32+06 RT	DITCH EXCAVATION			0.05							
17B	-RPD- 32+44RT	DITCH EXCAVATION						< 0.01		25		
18	-Y68- 118+61 to 118+74 LT	BANK STABILIZATION ONLY						< 0.01	< 0.01	33	12	
TOTALS*:			0.29	0.00	0.12	0.07	0.00	0.91	0.09	5817	516	0

*Rounded totals are sum of actual impacts

NOTES:

**Wetland W29 is a total take

*** Wetland W49 is a total take

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
6/4/2019
FORSYTH COUNTY
R-2247 EB
34409.3.17

INDEX OF SHEETS

1	TITLE SHEET
1A	INDEX OF SHEETS
1B	CONVENTIONAL SYMBOLS
1C-1 THRU 1C-	SURVEY CONTROL SHEETS (TO BE PROVIDED WITH FINAL PLAN SUBMITTAL)
1D-1 THRU 1D-	CENTERLINE COORDINATE LIST (TO BE PROVIDED WITH FINAL PLAN SUBMITTAL)
2A-1 THRU 2A-8	TYPICAL SECTIONS
2B-1 THRU 2B-3	BRIDGE SKETCHES
2B-4 THRU 2B-14	SHEER POINT DIAGRAMS
2D-1 THRU 2D-2	DRAINAGE DETAILS
3A-1 THRU 3A-2	ALIGNMENT CURVE DATA
3P-1.....	PARCEL INDEX SHEET
4 THRU 17.....	PLAN SHEETS
18 THRU 51	PROFILE SHEETS
X-0 THRU X-Y13-6	CROSS SECTIONS



STV100 Years

STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number E-0991

PROJECT REFERENCE NO.		SHEET NO.	
R-2247EB		1A	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			

STATE OF NORTH CAROLINA, DIVISION OF HIGHWAYS
CONVENTIONAL PLAN SHEET SYMBOLS

BOUNDARIES AND PROPERTY:

State Line	
County Line	
Township Line	
City Line	
Reservation Line	
Property Line	
Existing Iron Pin	
Computed Property Corner	
Property Monument	
Parcel/Sequence Number	
Existing Fence Line	
Proposed Woven Wire Fence	
Proposed Chain Link Fence	
Proposed Barbed Wire Fence	
Existing Wetland Boundary	
Proposed Wetland Boundary	
Existing Endangered Animal Boundary	
Existing Endangered Plant Boundary	
Existing Historic Property Boundary	
Known Contamination Area: Soil	
Potential Contamination Area: Soil	
Known Contamination Area: Water	
Potential Contamination Area: Water	
Contaminated Site: Known or Potential	

BUILDINGS AND OTHER CULTURE:

Gas Pump Vent or U/G Tank Cap	
Sign	
Well	
Small Mine	
Foundation	
Area Outline	
Cemetery	
Building	
School	
Church	
Dam	

HYDROLOGY:

Stream or Body of Water	
Hydro, Pool or Reservoir	
Jurisdictional Stream	
Buffer Zone 1	
Buffer Zone 2	
Flow Arrow	
Disappearing Stream	
Spring	
Wetland	
Proposed Lateral, Tail, Head Ditch	
False Sump	

RAILROADS:

Standard Gauge	
RR Signal Milepost	
Switch	
RR Abandoned	
RR Dismantled	

RIGHT OF WAY & PROJECT CONTROL:

Secondary Horiz and Vert Control Point	
Primary Horiz Control Point	
Primary Horiz and Vert Control Point	
Exist Permanent Easment Pin and Cap	
New Permanent Easement Pin and Cap	
Vertical Benchmark	
Existing Right of Way Marker	
Existing Right of Way Line	
New Right of Way Line	
New Right of Way Line with Pin and Cap	
New Right of Way Line with Concrete or Granite R/W Marker	
New Control of Access Line with Concrete C/A Marker	
Existing Control of Access	
New Control of Access	
Existing Easement Line	
New Temporary Construction Easement	
New Temporary Drainage Easement	
New Permanent Drainage Easement	
New Permanent Drainage /Utility Easement	
New Permanent Utility Easement	
New Temporary Utility Easement	
New Aerial Utility Easement	

ROADS AND RELATED FEATURES:

Existing Edge of Pavement	
Existing Curb	
Proposed Slope Stakes Cut	
Proposed Slope Stakes Fill	
Proposed Curb Ramp	
Existing Metal Guardrail	
Proposed Guardrail	
Existing Cable Guiderail	
Proposed Cable Guiderail	
Equality Symbol	
Pavement Removal	

VEGETATION:

Single Tree	
Single Shrub	

*S.U.E. = Subsurface Utility Engineering

Hedge	
Woods Line	
Orchard	
Vineyard	

EXISTING STRUCTURES:

MAJOR:	
Bridge, Tunnel or Box Culvert	
Bridge Wing Wall, Head Wall and End Wall	
MINOR:	
Head and End Wall	
Pipe Culvert	
Footbridge	
Drainage Box: Catch Basin, DI or JB	
Paved Ditch Gutter	
Storm Sewer Manhole	
Storm Sewer	

UTILITIES:

POWER:	
Existing Power Pole	
Proposed Power Pole	
Existing Joint Use Pole	
Proposed Joint Use Pole	
Power Manhole	
Power Line Tower	
Power Transformer	
U/G Power Cable Hand Hole	
H-Frame Pole	
U/G Power Line LOS B (S.U.E.*)	
U/G Power Line LOS C (S.U.E.*)	
U/G Power Line LOS D (S.U.E.*)	

TELEPHONE:

Existing Telephone Pole	
Proposed Telephone Pole	
Telephone Manhole	
Telephone Pedestal	
Telephone Cell Tower	
U/G Telephone Cable Hand Hole	
U/G Telephone Cable LOS B (S.U.E.*)	
U/G Telephone Cable LOS C (S.U.E.*)	
U/G Telephone Cable LOS D (S.U.E.*)	
U/G Telephone Conduit LOS B (S.U.E.*)	
U/G Telephone Conduit LOS C (S.U.E.*)	
U/G Telephone Conduit LOS D (S.U.E.*)	
U/G Fiber Optics Cable LOS B (S.U.E.*)	
U/G Fiber Optics Cable LOS C (S.U.E.*)	
U/G Fiber Optics Cable LOS D (S.U.E.*)	

WATER:	
Water Manhole	
Water Meter	
Water Valve	
Water Hydrant	
U/G Water Line LOS B (S.U.E.*)	
U/G Water Line LOS C (S.U.E.*)	
U/G Water Line LOS D (S.U.E.*)	
Above Ground Water Line	

TV:	
TV Pedestal	
TV Tower	
U/G TV Cable Hand Hole	
U/G TV Cable LOS B (S.U.E.*)	
U/G TV Cable LOS C (S.U.E.*)	
U/G TV Cable LOS D (S.U.E.*)	
U/G Fiber Optic Cable LOS B (S.U.E.*)	
U/G Fiber Optic Cable LOS C (S.U.E.*)	
U/G Fiber Optic Cable LOS D (S.U.E.*)	

GAS:	
Gas Valve	
Gas Meter	
U/G Gas Line LOS B (S.U.E.*)	
U/G Gas Line LOS C (S.U.E.*)	
U/G Gas Line LOS D (S.U.E.*)	
Above Ground Gas Line	

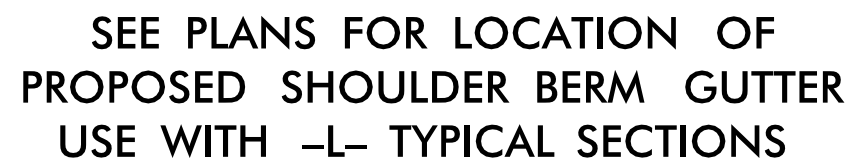
SANITARY SEWER:	
Sanitary Sewer Manhole	
Sanitary Sewer Cleanout	
U/G Sanitary Sewer Line	
Above Ground Sanitary Sewer	
SS Forced Main Line LOS B (S.U.E.*)	
SS Forced Main Line LOS C (S.U.E.*)	
SS Forced Main Line LOS D (S.U.E.*)	

MISCELLANEOUS:	
Utility Pole	
Utility Pole with Base	
Utility Located Object	
Utility Traffic Signal Box	
Utility Unknown U/G Line LOS B (S.U.E.*)	
U/G Tank; Water, Gas, Oil	
Underground Storage Tank, Approx. Loc.	
A/G Tank; Water, Gas, Oil	
Geoenvironmental Boring	
U/G Test Hole LOS A (S.U.E.*)	
Abandoned According to Utility Records	
End of Information	

SHOULDER DRAINS TO BE INSTALLED PER NCDOT STDS.



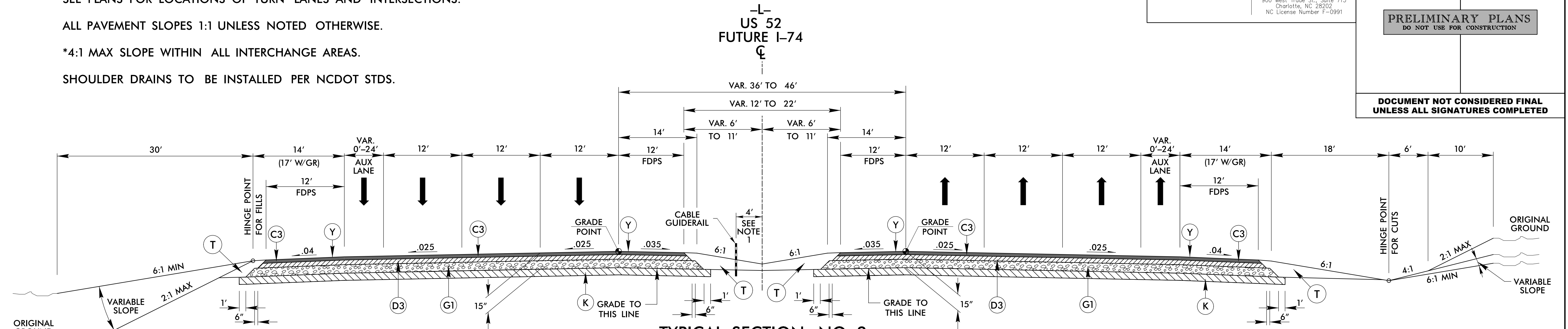
SEE PLANS FOR LOCATION OF PROPOSED WEDGING
USE WITH -L- TYPICAL SECTIONS



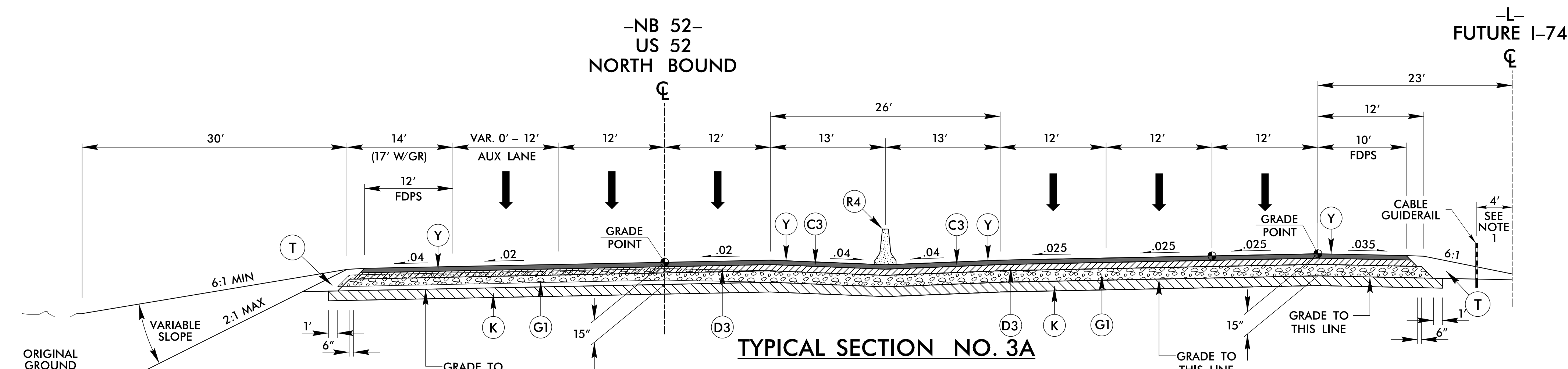
-L- STA. 54+55.29 TO -L- STA. 70+00.00

PAVEMENT SCHEDULE							
C1	PROP. APPROX. 3" ASPHALT CONCRETE SURFACE COURSE TYPE S9.5B, AT AN AVERAGE RATE OF 165 LBS. PER SQ.YD. IN EACH OF TWO LAYERS.	D3	PROP. APPROX. 4" ASPHALT CONCRETE INTERMEDIATE COURSE TYPE I19.0C, AT AN AVERAGE RATE OF 456 LBS. PER SQ.YD.	J2	PROP. 8" AGGREGATE BASE COURSE	R3	SHOULDER BERM GUTTER
C2	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 110 LBS. PER SQ.YD. PER 1" DEPTH TO BE PLACED IN LAYERS NOT LESS THAN 1" IN DEPTH OR GREATER THAN 2" IN DEPTH.	D4	PROP. VAR. DEPTH ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 114 LBS. PER SQ.YD. PER 1" DEPTH TO BE PLACED IN LAYERS NOT LESS THAN 2.5" IN DEPTH OR GREATER THAN 4" IN DEPTH.	J3	PROP. 11" AGGREGATE BASE COURSE	R4	CONCRETE BARRIER TYPE-T, T-1 OR T-2
C3	PROP. APPROX. 3" ASPHALT CONCRETE SURFACE COURSE TYPE S9.5C, AT AN AVERAGE RATE OF 168 LBS. PER SQ.YD. IN EACH OF TWO LAYERS.	E1	PROP. APPROX. 3" ASPHALT CONCRETE BASE COURSE TYPE B25.0C, AT AN AVERAGE RATE OF 342 LBS. PER SQ.YD.	G1	PROP. 8" CEMENT TREATED AGGREGATE BASE COURSE	T	EARTH MATERIAL
C4	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5C, AT AN AVERAGE RATE OF 112 LBS. PER SQ.YD. PER 1" DEPTH TO BE PLACED IN LAYERS NOT LESS THAN 1.5" IN DEPTH OR GREATER THAN 2" IN DEPTH.	E2	PROP. APPROX. 4" ASPHALT CONCRETE BASE COURSE TYPE B25.0B, AT AN AVERAGE RATE OF 456 LBS. PER SQ.YD.	G2	PROP. VAR. DEPTH CEMENT TREATED AGGREGATE BASE COURSE	U	EXISTING PAVEMENT
C5	ULTRA THIN BONDED WEARING COURSE	E3	PROP. APPROX. 5.5" ASPHALT CONCRETE BASE COURSE TYPE B25.0C, AT AN AVERAGE RATE OF 627 LBS. PER SQ.YD.	K	SUBGRADE STABILIZATION (LIME/CEMENT)	V	MILLING ASPHALT PAVEMENT
D1	PROP. APPROX. 2.5" ASPHALT CONCRETE INTERMEDIATE COURSE TYPE I19.0C, AT AN AVERAGE RATE OF 285 LBS. PER SQ.YD.	E4	PROP. APPROX. 11" ASPHALT CONCRETE BASE COURSE TYPE B25.0C, AT AN AVERAGE RATE OF 627 LBS. PER SQ.YD. IN EACH OF TWO LAYERS.	R1	2'-6" CONCRETE CURB AND GUTTER	W	VARIABLE DEPTH ASPHALT PAVEMEN (SEE WEDGING DETAIL THIS SHEET)
D2	PROP. APPROX. 3" ASPHALT CONCRETE INTERMEDIATE COURSE TYPE I19.0C, AT AN AVERAGE RATE OF 342 LBS. PER SQ.YD.	J1	PROP. 6" AGGREGATE BASE COURSE	R2	EXPRESSWAY GUTTER	Y	MILLED RUMBLE STRIPS

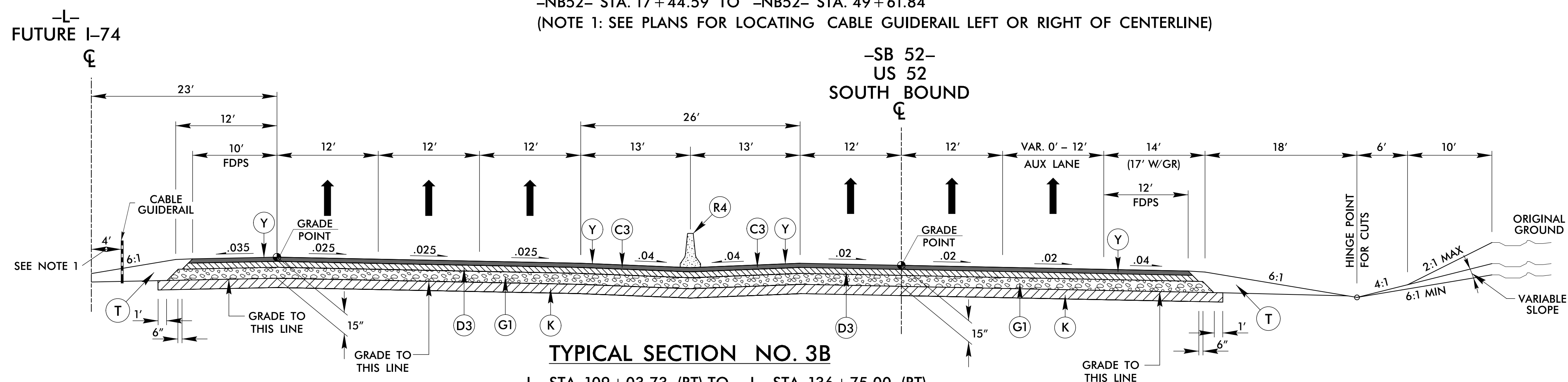
SHOULDER DRAINS TO BE INSTALLED PER NCDOT STDS.



-L- STA. 70+00.00 TO -L- STA. 107+30.43 (LT) / 109+03.73 (RT)
 -L- STA. 136+20.51 (LT) / 136+75.00 (RT) TO -L- STA. 183+89.97 (BEGIN BRIDGE)
 -L- STA. 187+13.47 (END BRIDGE) TO -L- STA. 209+56.22
 (NOTE 1: SEE PLANS FOR LOCATING CABLE GUIDERAIL LEFT OR RIGHT OF CENTERLINE)



THIS LINE
 -L- STA. 107+30.43 (LT) TO -L- STA. 136+20.51 (LT)
 -NB52- STA. 17+44.59 TO -NB52- STA. 49+61.84
 (NOTE 1: SEE PLANS FOR LOCATING CABLE GUIDERAIL LEFT OR RIGHT OF CENTERLINE)



-L- STA. 109+03.73 (RT) TO -L- STA. 136+75.00 (RT)
 -SB52- STA. 20+15.60 TO -SB52- STA. 51+14.09
 (NOTE 1: SEE PLANS FOR LOCATING CABLE GUIDERAIL LEFT OR RIGHT OF CENTERLINE)

PAVEMENT SCHEDULE	
C1	3.0" SURFACE COURSE TYPE S9.5B
C2	VAR. S9.5B
C3	3.0" SURFACE COURSE TYPE S9.5C
C4	VAR. S9.5C
C5	ULTRA THIN BONDED WEARING COURSE
D1	2.5" INTER. COURSE TYPE I19.0C
D2	3" INTER. COURSE TYPE I19.0C
D3	4.0" INTER. COURSE TYPE I19.0C
D4	VAR. DEPTH I19.0B
E1	3.0" BASE COURSE TYPE B25.0C
E2	4.0" BASE COURSE TYPE B25.0C
E3	5.5" BASE COURSE TYPE B25.0C
E4	11" BASE COURSE TYPE B25.0C
J1	6" ABC
J2	8" ABC
J3	11" ABC
G1	8" CEMENT TREATED ABC
G2	VAR. DEPTH CEMENT TREATED ABC
K	SUBGRADE STABILIZATION
R1	2'-6" CURB AND GUTTER
R2	EXPRESSWAY GUTTER
R3	SHOULDER BERM GUTTER
R4	CONCRETE BARRIER
T	EARTH MATERIAL
U	EXISTING PAVEMENT
V	MILLING
W	WEDGING
Y	RUMBLE STRIPS

3/22/2019
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NOTE: TYPICAL SECTIONS SHOWN FOR TANGENT SECTIONS ONLY,
SEE PLANS AND STANDARD DRAWINGS FOR SUPERELEVATION DETAILS.
SEE PLANS FOR LOCATIONS OF TURN LANES AND INTERSECTIONS.

ALL PAVEMENT SLOPES 1:1 UNLESS NOTED OTHERWISE.

*4:1 MAX SLOPE WITHIN ALL INTERCHANGE AREAS.

SHOULDER DRAINS TO BE INSTALLED PER NCDOT STDS.

BLYTHE

STV

100 years

STV Engineers, Inc.

900 West Trade St., Suite 715
Charlotte, NC 28202
No License Number F-0991

PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

2A-3

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

PRELIMINARY PLANS

DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL

UNLESS ALL SIGNATURES COMPLETED

TYPICAL SECTION NO. 4
-EBBYP- STA. 15 + 50.00 TO -EBBYP- STA. 41 + 93.98

TYPICAL SECTION NO. 5
-WBBYP- STA. 15 + 50.00 TO -WBBYP- STA. 16 + 49.61
-WBBYP- STA. 34 + 88.07 TO -WBBYP- STA. 42 + 78.49 (BEGIN BRIDGE)
-WBBYP- STA. 45 + 80.99 (END BRIDGE) TO -WBBYP- STA. 59 + 00.63 (BEGIN BRIDGE)
-WBBYP- STA. 62 + 50.54 (END BRIDGE) TO -WBBYP- STA. 63 + 59.65

TYPICAL SECTION NO. 6
-EBBYP- STA. 41 + 93.98 TO -EBBYP- STA. 44 + 37.95 (BEGIN BRIDGE)
-EBBYP- STA. 45 + 25.11 (END BRIDGE) TO -EBBYP- STA. 52 + 33.78

PAVEMENT SCHEDULE	
C1	3.0" SURFACE COURSE TYPE S9.5B
C2	VAR. S9.5B
C3	3.0" SURFACE COURSE TYPE S9.5C
C4	VAR. S9.5C
C5	ULTRA THIN BONDED WEARING COURSE
D1	2.5" INTER. COURSE TYPE I19.0C
D2	3" INTER. COURSE TYPE I19.0C
D3	4.0" INTER. COURSE TYPE I19.0C
D4	VAR. DEPTH I19.0B
E1	3.0" BASE COURSE TYPE B25.0C
E2	4.0" BASE COURSE TYPE B25.0C
E3	5.5" BASE COURSE TYPE B25.0C
E4	11" BASE COURSE TYPE B25.0C
J1	6" ABC
J2	8" ABC
J3	11" ABC
G1	8" CEMENT TREATED ABC
G2	VAR. DEPTH CEMENT TREATED ABC
K	SUBGRADE STABILIZATION
R1	2'-6" CURB AND GUTTER
R2	EXPRESSWAY GUTTER
R3	SHOULDER BERM GUTTER
R4	CONCRETE BARRIER
T	EARTH MATERIAL
U	EXISTING PAVEMENT
V	MILLING
W	WEDGING
Y	RUMBLE STRIPS

3/22/2018
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AlvinAC

NOTE: TYPICAL SECTIONS SHOWN FOR TANGENT SECTIONS ONLY,
SEE PLANS AND STANDARD DRAWINGS FOR SUPERELEVATION DETAILS.
SEE PLANS FOR LOCATIONS OF TURN LANES AND INTERSECTIONS.

ALL PAVEMENT SLOPES 1:1 UNLESS NOTED OTHERWISE.

*4:1 MAX SLOPE WITHIN ALL INTERCHANGE AREAS.

SHOULDER DRAINS TO BE INSTALLED PER NCDOT STDS.

BLYTHE

STV

100 years

STV Engineers, Inc.

900 West Trade St., Suite 715
Charlotte, NC 28202
No License Number F-0991

PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

2A-4

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

PRELIMINARY PLANS

DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL

UNLESS ALL SIGNATURES COMPLETED

TYPICAL SECTION NO. 7
-WBBYP- STA. 16+49.61 TO -WBBYP- STA. 34+88.07
-RPDB- STA. 20+03.64 TO -RPDB- STA. 28+34.14

The diagram shows a cross-section of a road with two main sections: WBBYP (Westbound Bridge Bypass) and RPDB (Right-of-Way Bridge Bypass). The WBBYP section has a total width of 30 feet, with a 14-foot (17' W/GR) section on the left and a 12-foot section on the right. The RPDB section has a total width of 30 feet, with a 12-foot section on the left and a 14-foot section on the right. The pavement structure includes a 3.0-inch surface course (C1), a variable surface course (C2), a 3.0-inch surface course (C3), and a variable surface course (C4). The subgrade is stabilized (K). The road has a 6:1 minimum slope on the left and a 4:1 maximum slope on the right. The original ground is shown on the right side.

TYPICAL SECTION NO. 8
-SB52- STA. 51+14.09 TO -SB52- STA. 57+75.00 (BEGIN BRIDGE)
-NB52- STA. 49+61.84 TO -NB52- STA. 73+83.85 (BEGIN BRIDGE)
-SB52- STA. 60+06.50 (END BRIDGE) TO -SB52- STA. 80+26.28 (BEGIN BRIDGE)
-SB52- STA. 81+80.29 (END BRIDGE) TO -SB52- STA. 85+14.47 (BEGIN BRIDGE)
-SB52- STA. 86+04.22 (END BRIDGE) TO -SB52- STA. 102+70.76
-NB52- STA. 76+85.34 (END BRIDGE) TO -NB52- STA. 81+90.90 (BEGIN BRIDGE)
-NB52- STA. 83+18.25 (END BRIDGE) TO -NB52- STA. 86+02.94 (BEGIN BRIDGE)
-NB52- STA. 86+76.66 (END BRIDGE) TO -NB52- STA. 101+80.27 (BEGIN BRIDGE)

The diagram shows a cross-section of a road with two main sections: SB52 (Southbound Bridge) and NB52 (Northbound Bridge). The SB52 section has a total width of 30 feet, with a 12-foot (15' W/GR) section on the left and a 12-foot section on the right. The NB52 section has a total width of 30 feet, with a 12-foot (17' W/GR) section on the left and a 14-foot section on the right. The pavement structure includes a 3.0-inch surface course (C1), a variable surface course (C2), a 3.0-inch surface course (C3), and a variable surface course (C4). The subgrade is stabilized (K). The road has a 6:1 minimum slope on the left and a 4:1 maximum slope on the right. The original ground is shown on the right side.

TYPICAL SECTION NO. 9
-RPB- STA. 13+65.26 TO STA. 31+50.00
-RPC- STA. 13+00.71 TO STA. 24+11.51

The diagram shows a cross-section of a road with two main sections: RPB (Right-of-Way Bridge) and RPC (Right-of-Way Bridge). The RPB section has a total width of 30 feet, with a 10-foot section on the left and a 12-foot section on the right. The RPC section has a total width of 30 feet, with a 12-foot section on the left and a 14-foot section on the right. The pavement structure includes a 3.0-inch surface course (C1), a variable surface course (C2), a 3.0-inch surface course (C3), and a variable surface course (C4). The subgrade is stabilized (K). The road has a 6:1 minimum slope on the left and a 4:1 maximum slope on the right. The original ground is shown on the right side.

PAVEMENT SCHEDULE	
C1	3.0" SURFACE COURSE TYPE S9.5B
C2	VAR. S9.5B
C3	3.0" SURFACE COURSE TYPE S9.5C
C4	VAR. S9.5C
C5	ULTRA THIN BONDED WEARING COURSE
D1	2.5" INTER. COURSE TYPE I19.0C
D2	3" INTER. COURSE TYPE I19.0C
D3	4.0" INTER. COURSE TYPE I19.0C
D4	VAR. DEPTH I19.0B
E1	3.0" BASE COURSE TYPE B25.0C
E2	4.0" BASE COURSE TYPE B25.0C
E3	5.5" BASE COURSE TYPE B25.0C
E4	11" BASE COURSE TYPE B25.0C
J1	6" ABC
J2	8" ABC
J3	11" ABC
G1	8" CEMENT TREATED ABC
G2	VAR. DEPTH CEMENT TREATED ABC
K	SUBGRADE STABILIZATION
R1	2'-6" CURB AND GUTTER
R2	EXPRESSWAY GUTTER
R3	SHOULDER BERM GUTTER
R4	CONCRETE BARRIER
T	EARTH MATERIAL
U	EXISTING PAVEMENT
V	MILLING
W	WEDGING
Y	RUMBLE STRIPS

3/22/2018
R:\Roadway\Pro\PSH\R2247EB_rdi_psh02A_tjpa.dgn
Alvord

NOTE: TYPICAL SECTIONS SHOWN FOR TANGENT SECTIONS ONLY,
SEE PLANS AND STANDARD DRAWINGS FOR SUPERELEVATION DETAILS.
SEE PLANS FOR LOCATIONS OF TURN LANES AND INTERSECTIONS.

ALL PAVEMENT SLOPES 1:1 UNLESS NOTED OTHERWISE.

*4:1 MAX SLOPE WITHIN ALL INTERCHANGE AREAS.

SHOULDER DRAINS TO BE INSTALLED PER NCDOT STDs.

BEGIN/END STATIONS FOR RAMPS & LOOPS REFLECT GORE
ADJACENT TO MAINLINE PAVEMENT

BLYTHE

STV

100 years

STV Engineers, Inc.

900 West Trade St., Suite 715
Charlotte, NC 28202
No License Number F-0991

PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

2A-5

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

PRELIMINARY PLANS

DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL

UNLESS ALL SIGNATURES COMPLETED

-RPA- STA. 14+89.31 TO STA. 34+80.81
-RPD- STA. 14+10.05 TO STA. 43+33.92
-RPDB- STA. 28+34.14 TO STA. 50+77.86

-LPB- STA. 12+37.07 TO STA. 21+52.23
-LPD- STA. 12+19.08 TO STA. 20+01.87

-Y13- STA. 14+00.00 TO STA. 16+63.12 (BEGIN BRIDGE)
-Y13- STA. 18+40.53 (END BRIDGE) TO STA. 19+90.00

-Y13- STA. 11+97.54 TO STA. 14+00.00
-Y13- STA. 19+90.00 TO STA. 20+77.84

PAVEMENT SCHEDULE	
C1	3.0" SURFACE COURSE TYPE S9.5B
C2	VAR. S9.5B
C3	3.0" SURFACE COURSE TYPE S9.5C
C4	VAR. S9.5C
C5	ULTRA THIN BONDED WEARING COURSE
D1	2.5" INTER. COURSE TYPE I19.0C
D2	3" INTER. COURSE TYPE I19.0C
D3	4.0" INTER. COURSE TYPE I19.0C
D4	VAR. DEPTH I19.0B
E1	3.0" BASE COURSE TYPE B25.0C
E2	4.0" BASE COURSE TYPE B25.0C
E3	5.5" BASE COURSE TYPE B25.0C
E4	11" BASE COURSE TYPE B25.0C
J1	6" ABC
J2	8" ABC
J3	11" ABC
G1	8" CEMENT TREATED ABC
G2	VAR. DEPTH CEMENT TREATED ABC
K	SUBGRADE STABILIZATION
R1	2'-6" CURB AND GUTTER
R2	EXPRESSWAY GUTTER
R3	SHOULDER BERM GUTTER
R4	CONCRETE BARRIER
T	EARTH MATERIAL
U	EXISTING PAVEMENT
V	MILLING
W	WEDGING
Y	RUMBLE STRIPS

3/22/2018
R:\Roadway\Projects\PSH\R2247EB_rdl\psht02A_tjpa.dgn
Alvord

NOTE: TYPICAL SECTIONS SHOWN FOR TANGENT SECTIONS ONLY,
SEE PLANS AND STANDARD DRAWINGS FOR SUPERELEVATION DETAILS.
SEE PLANS FOR LOCATIONS OF TURN LANES AND INTERSECTIONS.

ALL PAVEMENT SLOPES 1:1 UNLESS NOTED OTHERWISE.

*4:1 MAX SLOPE WITHIN ALL INTERCHANGE AREAS.

SHOULDER DRAINS TO BE INSTALLED PER NCDOT STDs.

BEGIN STATIONS FOR RAMPS REFLECT GORE ADJACENT
TO MAINLINE PAVEMENT

BLYTHE

STV

100 years

STV Engineers, Inc.

900 West Trade St., Suite 715
Charlotte, NC 28202
No License Number F-0991

PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

2A-6

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

PRELIMINARY PLANS

DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL

UNLESS ALL SIGNATURES COMPLETED

Diagram of Typical Section No. 14 showing cross-section details for -Y62RPA- STA. 13+12.12 TO STA. 13+43.03. The diagram illustrates the pavement structure, including the original ground, variable slope, and various layers (D2, C3, J2, E1, T). Key dimensions include 10', 6', 18', 14', 12', 4', 12', and 30'. Slopes are indicated as 2:1 MAX, 6:1 MIN, and 4:1. The centerline is marked with a dashed line and the label -Y62RPA-.

Diagram of Typical Section No. 15 showing cross-section details for -Y62RPA- STA. 13+43.03 TO STA. 18+60.00. The diagram illustrates the pavement structure, including the original ground, variable slope, and various layers (D2, C3, J2, E1, T, U). Key dimensions include 10', 6', 18', 14', 12', 4', 12', and 30'. Slopes are indicated as 2:1 MAX, 6:1 MIN, and 4:1. The centerline is marked with a dashed line and the label -Y62RPA-.

Diagram of Typical Section No. 16 showing cross-section details for -Y62RPB- STA. 14+52.05 TO STA. 21+41.02. The diagram illustrates the pavement structure, including the original ground, variable slope, and various layers (D2, C3, J2, E1, T, U). Key dimensions include 30', 12', 4', 12', 14', 18', 6', and 10'. Slopes are indicated as 6:1 MIN, 2:1 MAX, and 4:1. The centerline is marked with a dashed line and the label -Y62RPB-.

PAVEMENT SCHEDULE	
C1	3.0" SURFACE COURSE TYPE S9.5B
C2	VAR. S9.5B
C3	3.0" SURFACE COURSE TYPE S9.5C
C4	VAR. S9.5C
C5	ULTRA THIN BONDED WEARING COURSE
D1	2.5" INTER. COURSE TYPE I19.0C
D2	3" INTER. COURSE TYPE I19.0C
D3	4.0" INTER. COURSE TYPE I19.0C
D4	VAR. DEPTH I19.0B
E1	3.0" BASE COURSE TYPE B25.0C
E2	4.0" BASE COURSE TYPE B25.0C
E3	5.5" BASE COURSE TYPE B25.0C
E4	11" BASE COURSE TYPE B25.0C
J1	6" ABC
J2	8" ABC
J3	11" ABC
G1	8" CEMENT TREATED ABC
G2	VAR. DEPTH CEMENT TREATED ABC
K	SUBGRADE STABILIZATION
R1	2'-6" CURB AND GUTTER
R2	EXPRESSWAY GUTTER
R3	SHOULDER BERM GUTTER
R4	CONCRETE BARRIER
T	EARTH MATERIAL
U	EXISTING PAVEMENT
V	MILLING
W	WEDGING
Y	RUMBLE STRIPS

3/22/2018
R:\Roadway\ProJ\PSH\R2247EB_rdl_psh02A_tjpa.dgn
Alvord

NOTE: TYPICAL SECTIONS SHOWN FOR TANGENT SECTIONS ONLY,
SEE PLANS AND STANDARD DRAWINGS FOR SUPERELEVATION DETAILS.
SEE PLANS FOR LOCATIONS OF TURN LANES AND INTERSECTIONS.

ALL PAVEMENT SLOPES 1:1 UNLESS NOTED OTHERWISE.

*4:1 MAX SLOPE WITHIN ALL INTERCHANGE AREAS.

SHOULDER DRAINS TO BE INSTALLED PER NCDOT STDs.

BEGIN STATIONS FOR RAMPS REFLECT GORE ADJACENT TO MAINLINE
PAVEMENT

BLYTHE

STV

100

Years

STV Engineers, Inc.

900 West Trade St., Suite 715

Charlotte, NC 28202

No. License Number E-10991

PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

2A-7

ROADWAY DESIGN
ENGINEER

HYDRAULICS
ENGINEER

PRELIMINARY PLANS

DO NOT USE FOR CONSTRUCTION

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UNLESS ALL SIGNATURES COMPLETED

This diagram shows a cross-section of a highway with a centerline (CL) and a 30-foot total width. The left side features a 10-foot shoulder with a 2:1 maximum slope and a 6:1 minimum slope. The main travel lane is 18 feet wide, with a 4:1 maximum slope on the left and a 6:1 minimum slope on the right. The right side has a 14-foot shoulder with a 2:1 maximum slope. The pavement structure includes a 4-inch surface course (D3), a 3-inch surface course (C3), and a 4-inch base course (E1). The subgrade is labeled 'VAR. 0'-12"' and 'VAR. 8'-12"'. The diagram also shows 'HINGE POINT FOR CUTS' and 'HINGE POINT FOR FILLS'.

TYPICAL SECTION NO. 17
-Y62RPC- STA. 17+99.53 TO STA. 32+36.00

This diagram shows a cross-section of a highway with a centerline (CL) and a 30-foot total width. The left side features a 10-foot shoulder with a 4:1 maximum slope and a 6:1 minimum slope. The main travel lane is 18 feet wide, with a 4:1 maximum slope on the left and a 6:1 minimum slope on the right. The right side has a 14-foot shoulder with a 4:1 maximum slope. The pavement structure includes a 4-inch surface course (D3), a 3-inch surface course (C3), and a 4-inch base course (E1). The subgrade is labeled 'VAR. 10' TO 22"'. The diagram also shows 'HINGE POINT FOR CUTS' and 'HINGE POINT FOR FILLS'.

TYPICAL SECTION NO. 18
-Y62LPA- STA. 12+45.26 TO STA. 15+44.69

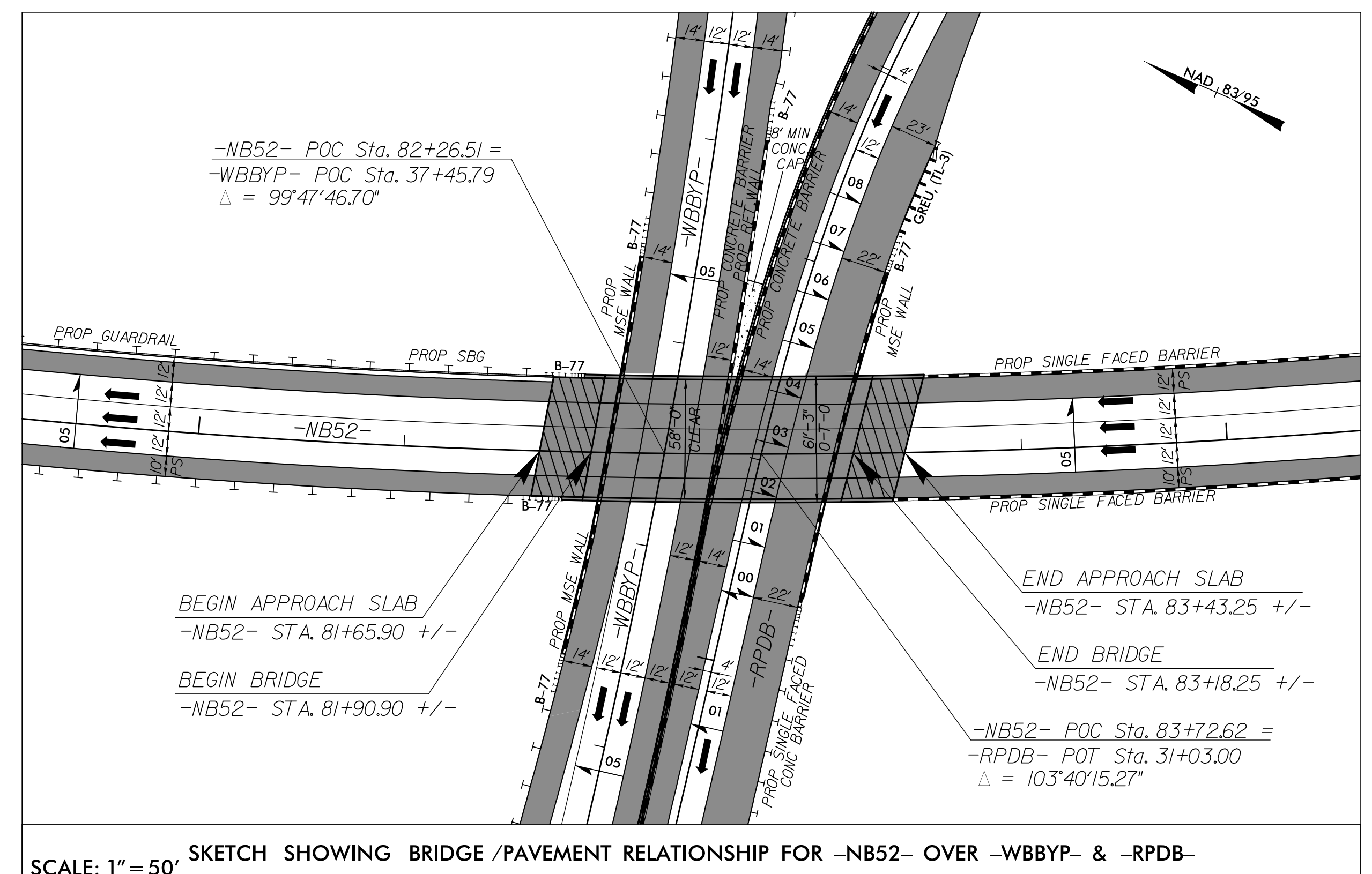
This diagram shows a cross-section of a highway with a centerline (CL) and a 30-foot total width. The left side features a 14-foot shoulder with a 4:1 maximum slope and a 6:1 minimum slope. The main travel lane is 18 feet wide, with a 4:1 maximum slope on the left and a 6:1 minimum slope on the right. The right side has a 10-foot shoulder with a 4:1 maximum slope. The pavement structure includes a 4-inch surface course (D3), a 3-inch surface course (C3), and a 4-inch base course (E1). The subgrade is labeled 'VAR. 12'-14"'. The diagram also shows 'HINGE POINT FOR CUTS' and 'HINGE POINT FOR FILLS'.

TYPICAL SECTION NO. 19
-Y62LPB- STA. 12+06.88 TO STA. 12+49.30

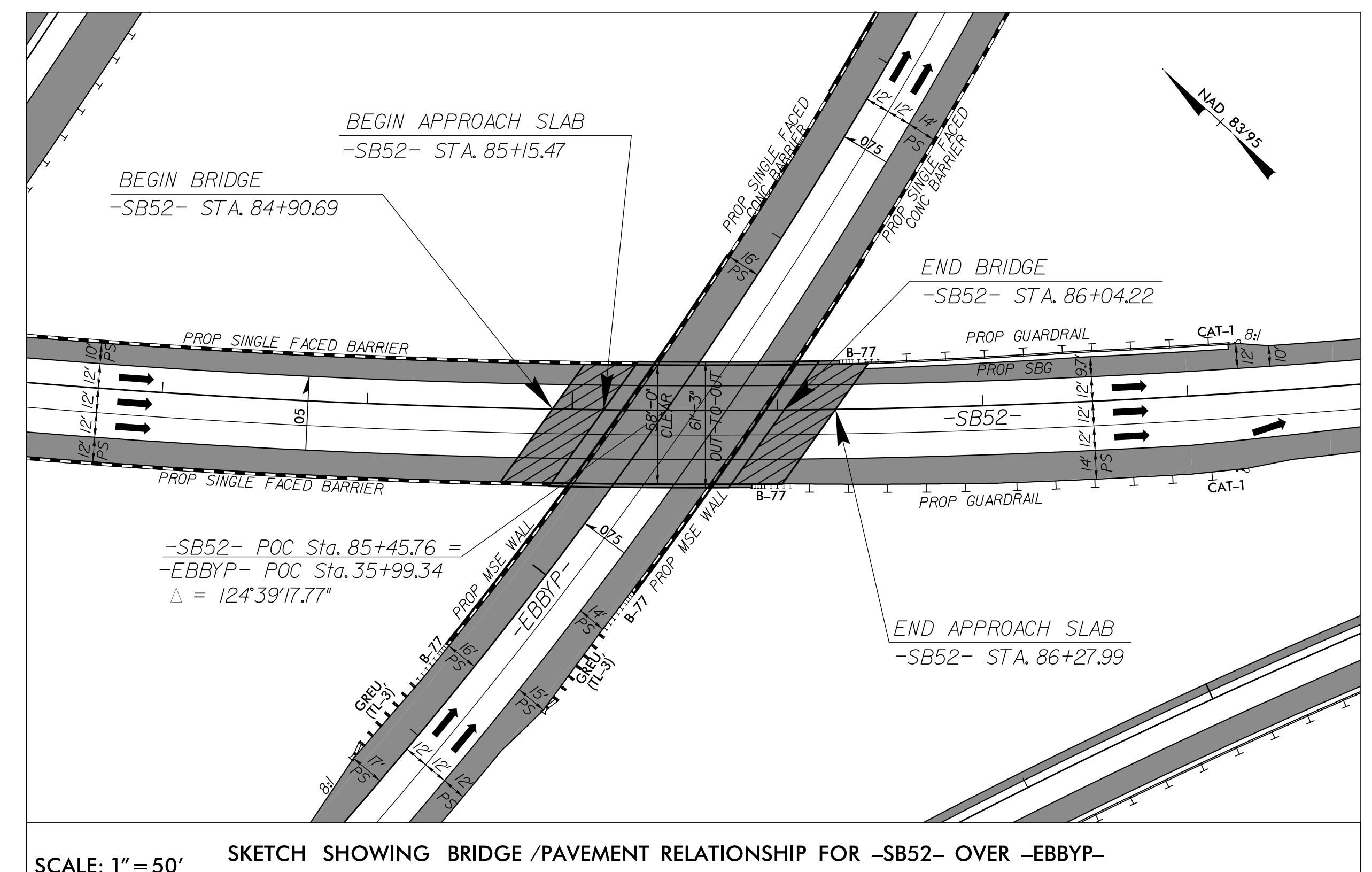
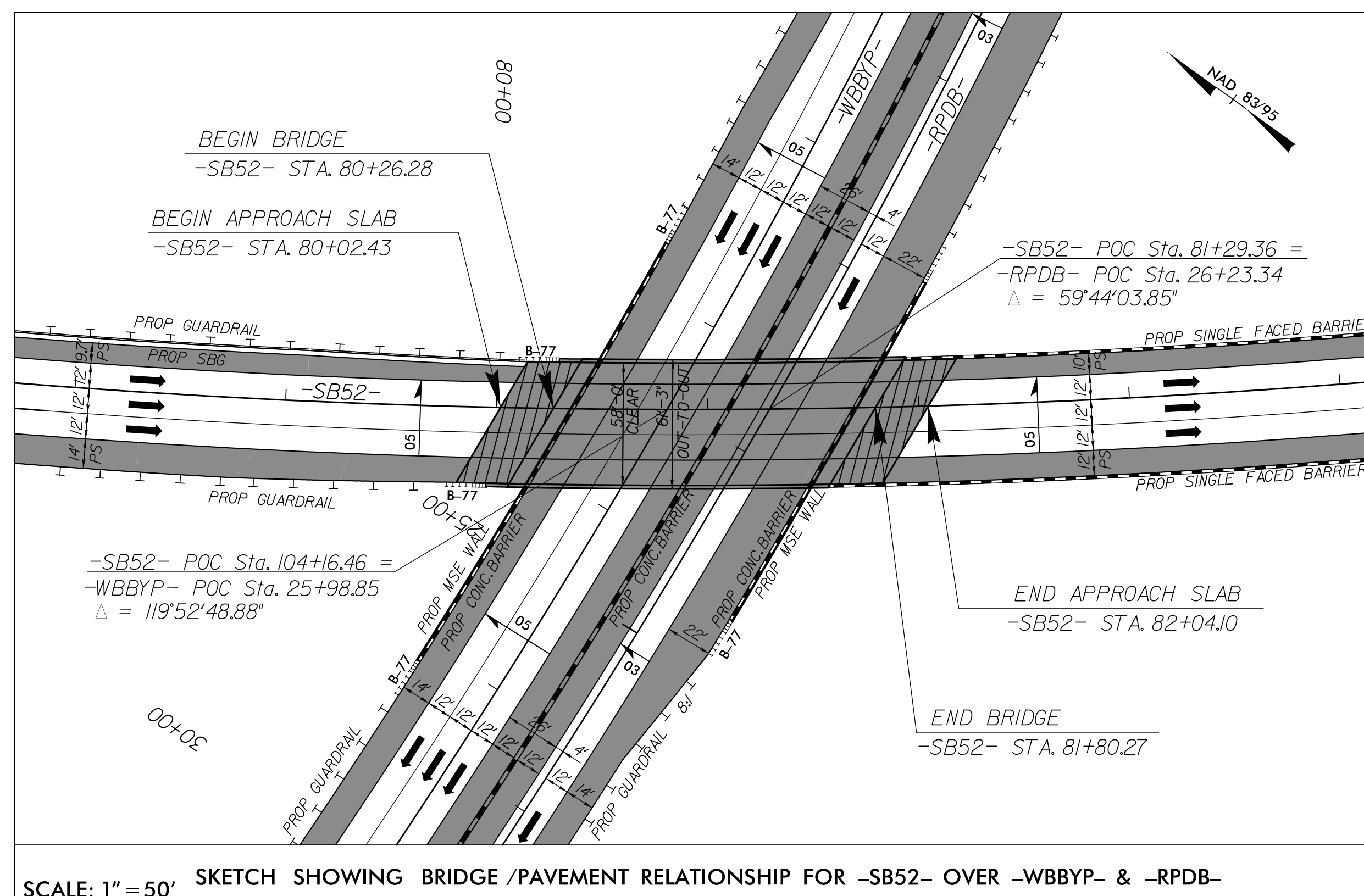
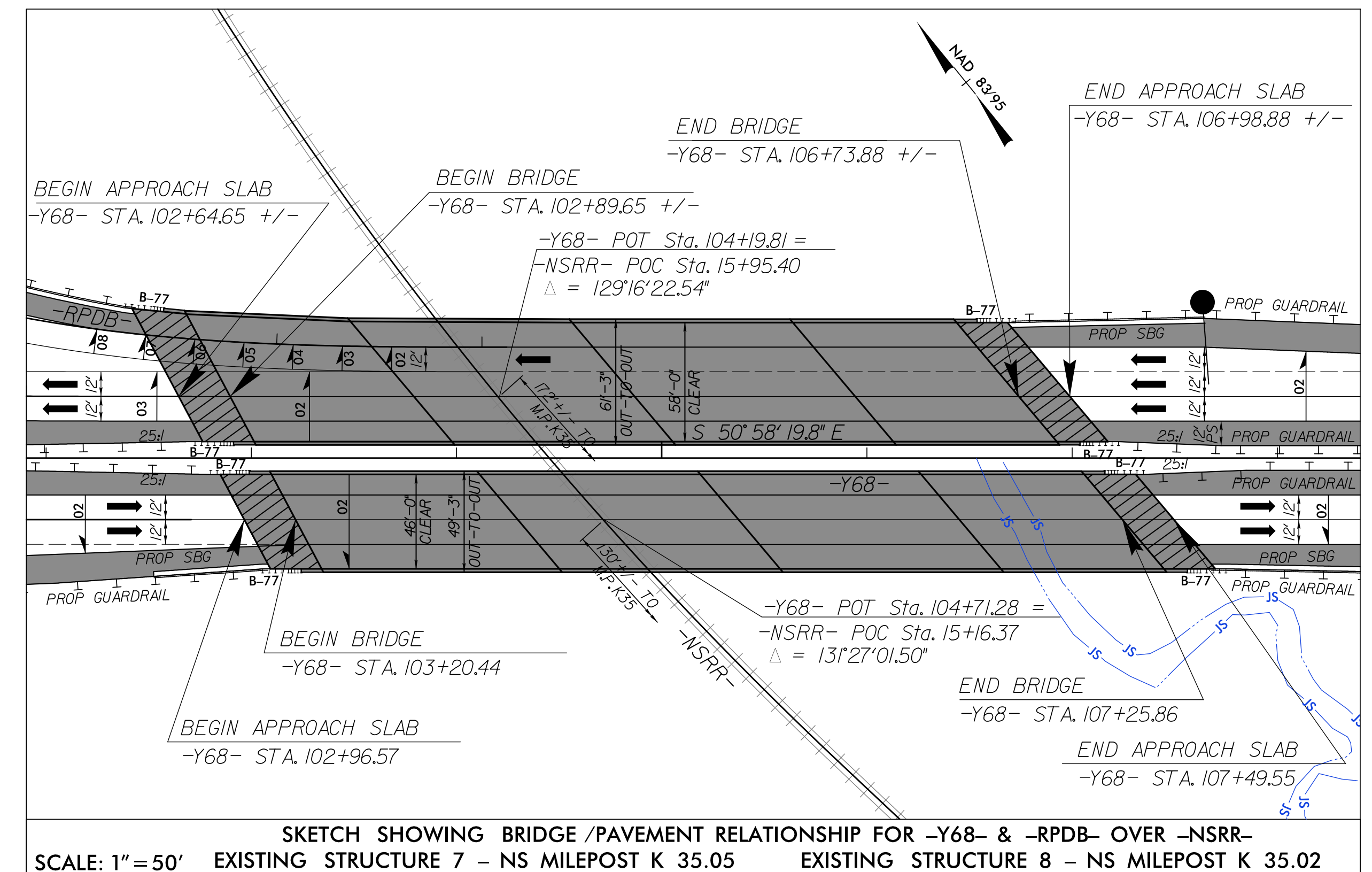
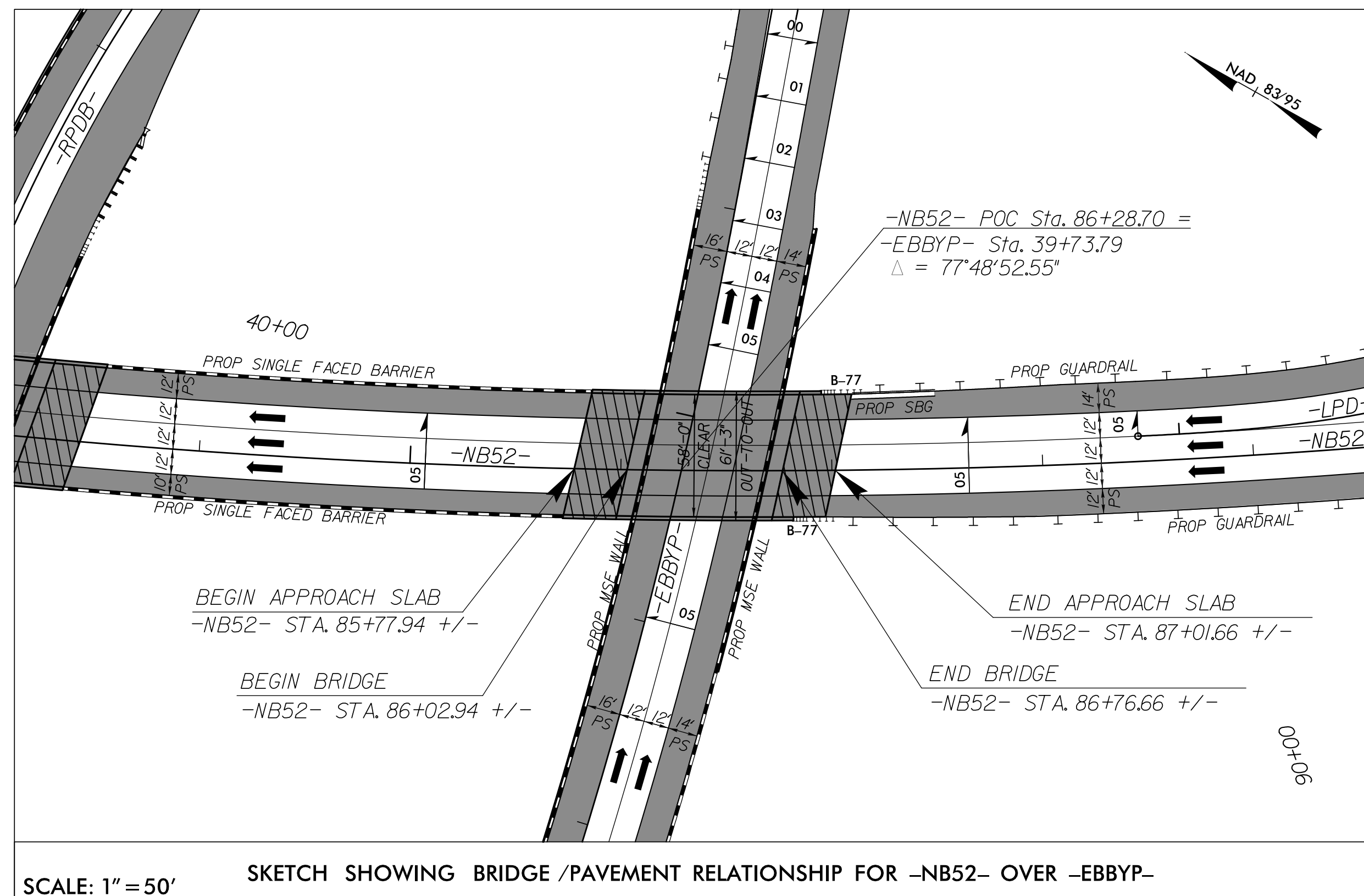
This diagram shows a cross-section of an expressway gutter. The gutter is 30 feet wide, with a 12-foot section on the left and a 14-foot section on the right. The gutter is 4 feet deep, with a 4:1 maximum slope. The gutter is labeled 'EXPRESSWAY GUTTER DETAIL NO. 5'. The diagram also shows 'HINGE POINT FOR CUTS' and 'HINGE POINT FOR FILLS'.

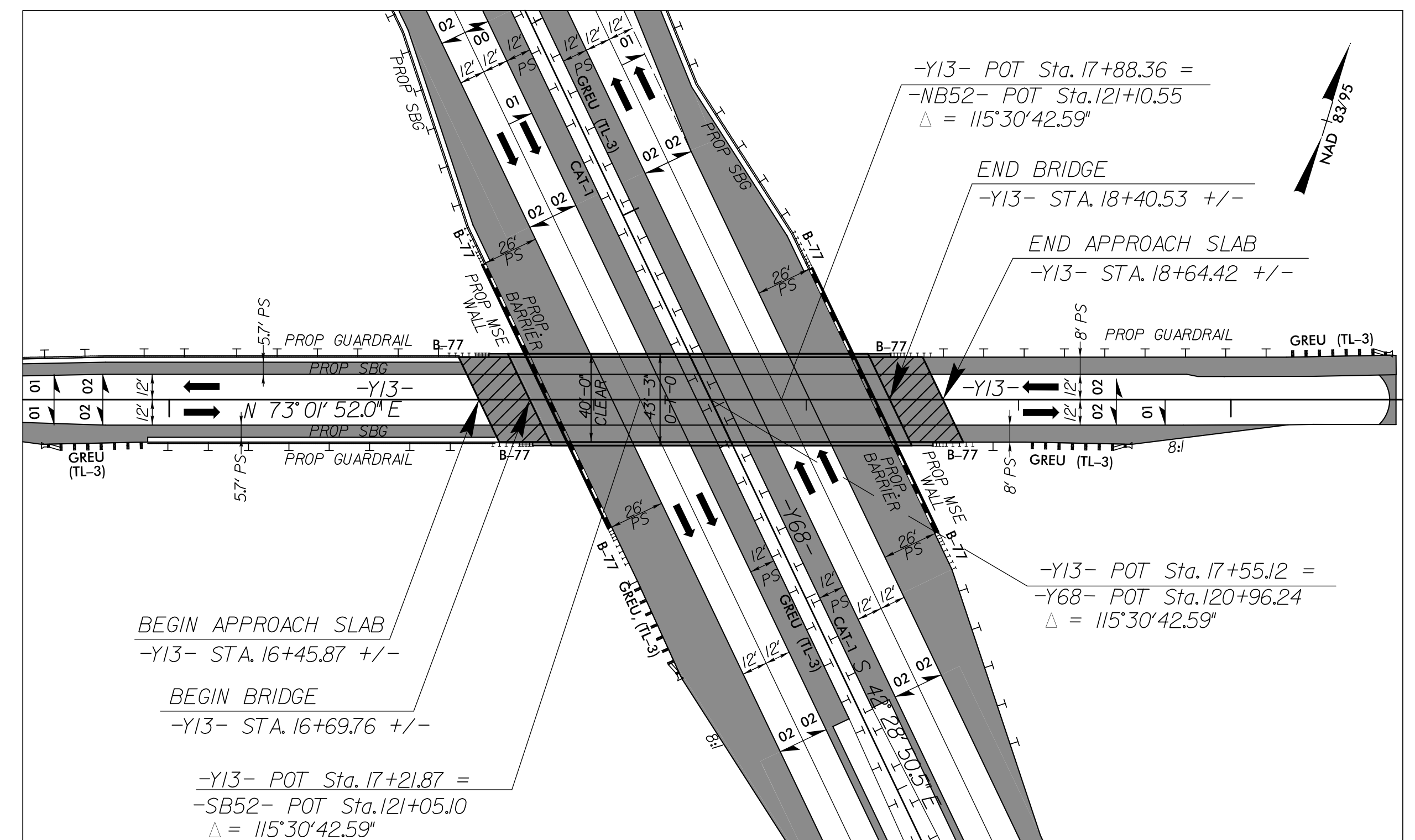
PAVEMENT SCHEDULE	
C1	3.0" SURFACE COURSE TYPE S9.5B
C2	VAR. S9.5B
C3	3.0" SURFACE COURSE TYPE S9.5C
C4	VAR. S9.5C
C5	ULTRA THIN BONDED WEARING COURSE
D1	2.5" INTER. COURSE TYPE I19.0C
D2	3" INTER. COURSE TYPE I19.0C
D3	4.0" INTER. COURSE TYPE I19.0C
D4	VAR. DEPTH I19.0B
E1	3.0" BASE COURSE TYPE B25.0C
E2	4.0" BASE COURSE TYPE B25.0C
E3	5.5" BASE COURSE TYPE B25.0C
E4	11" BASE COURSE TYPE B25.0C
J1	6" ABC
J2	8" ABC
J3	11" ABC
G1	8" CEMENT TREATED ABC
G2	VAR. DEPTH CEMENT TREATED ABC
K	SUBGRADE STABILIZATION
R1	2'-6" CURB AND GUTTER
R2	EXPRESSWAY GUTTER
R3	SHOULDER BERM GUTTER
R4	CONCRETE BARRIER
T	EARTH MATERIAL
U	EXISTING PAVEMENT
V	MILLING
W	WEDGING
Y	RUMBLE STRIPS

3/22/2018
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Alvord



BRIDGE SKETCHES





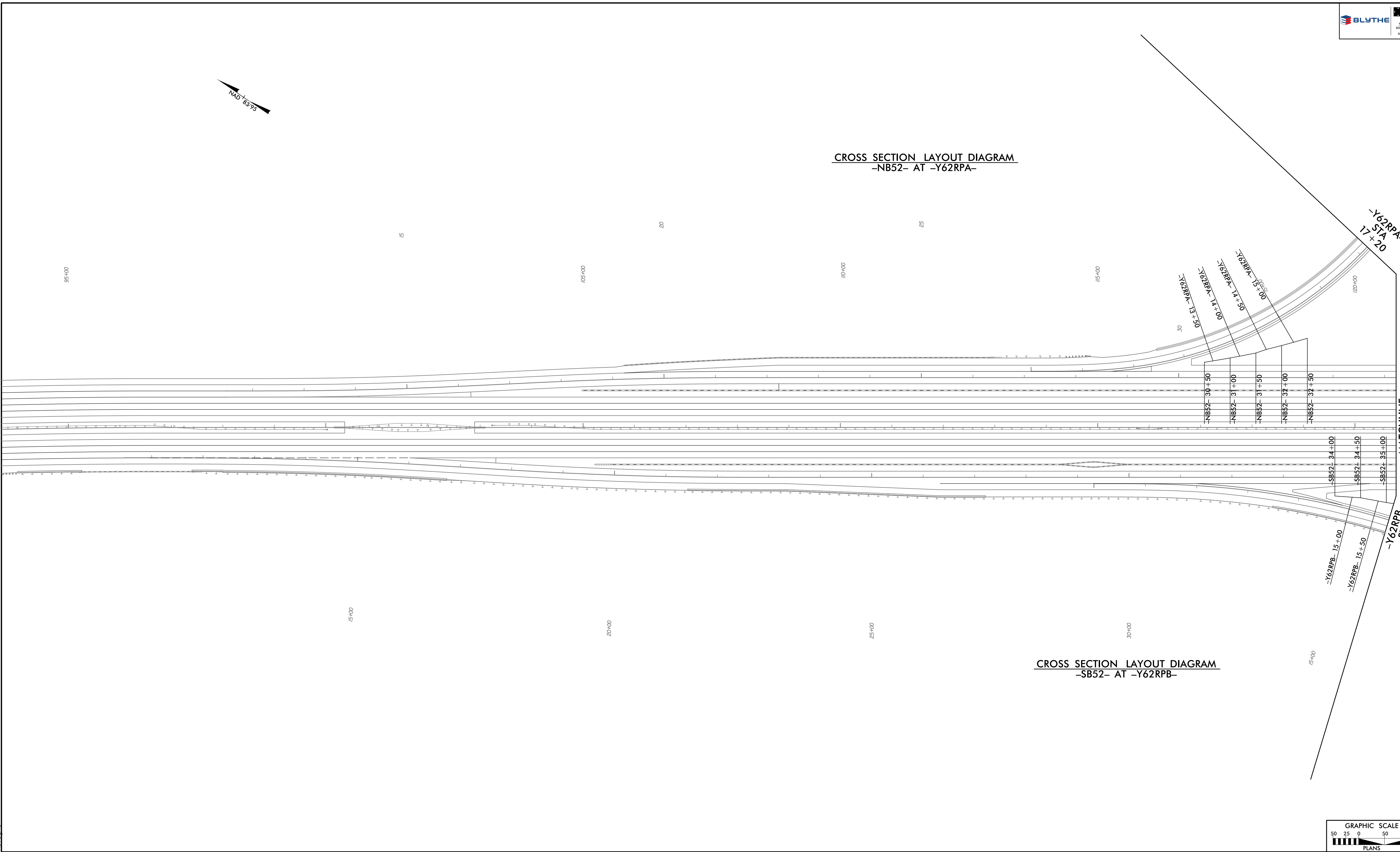


MATCHLINE
-L- STA 117+30
SEE SHEET 2B-5

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	2B-4
ADWAY DESIGN ENGINEER	PAYMENT DESIGN ENGINEER
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
DOCUMENT NOT CONSIDERED FINAL UNTIL ALL SIGNATURES COMPLETED	



3/22/2019 6/2/99
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blvauk



STV Engineers, Inc.
800 West 10th St., Suite 215
Tomball, TX 77375
MC License Number T-2981

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	2B-6
ROADWAY DESIGN ENGINEER	PAYMENT DESIGN ENGINEER
PRELIMINARY PLANS NO. NOT FOR CONSTRUCTION	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

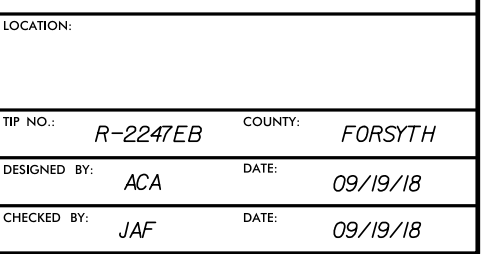
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PLANS

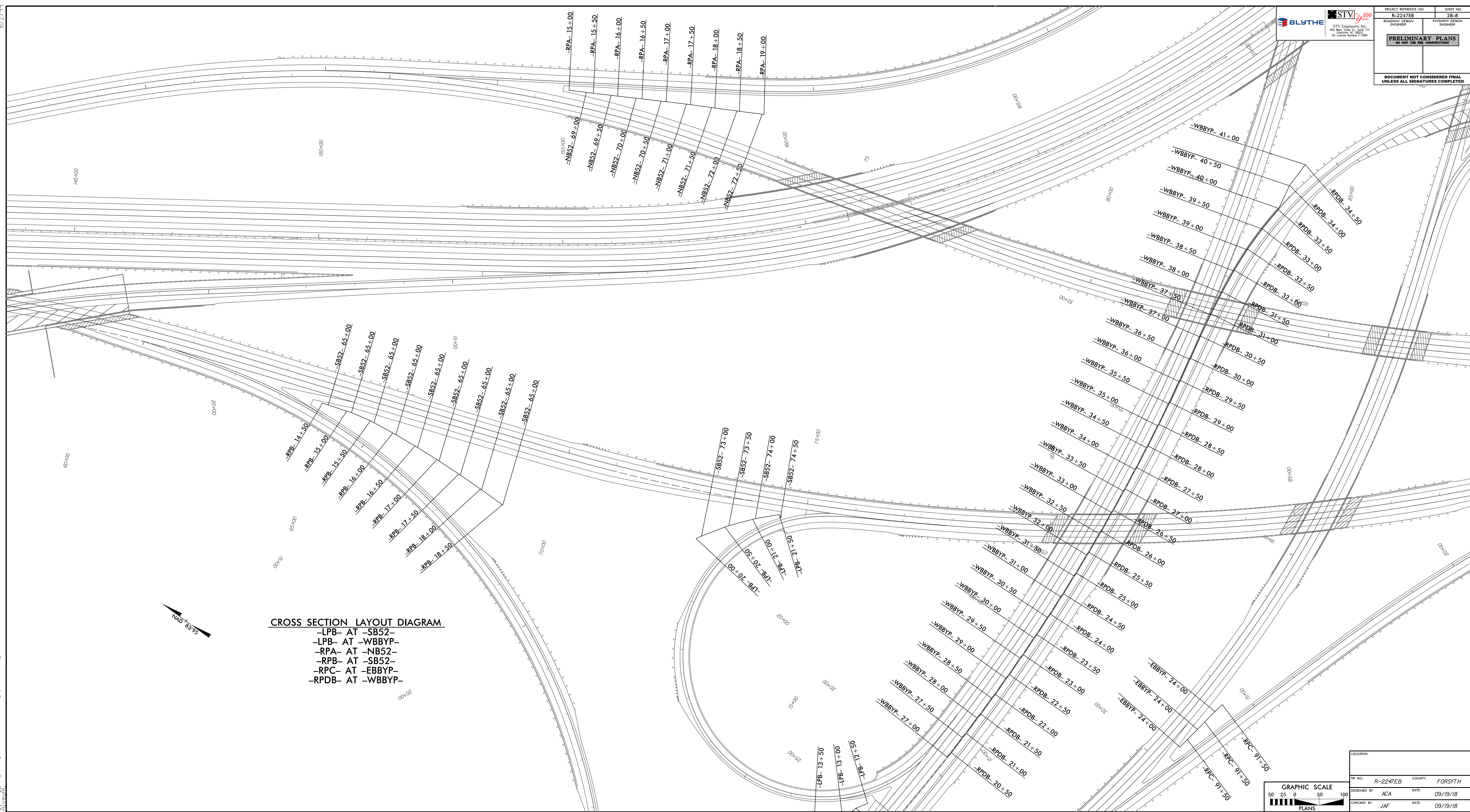
LOCATION:

TRP NO.: R-2247EB COUNTY: FORSYTH

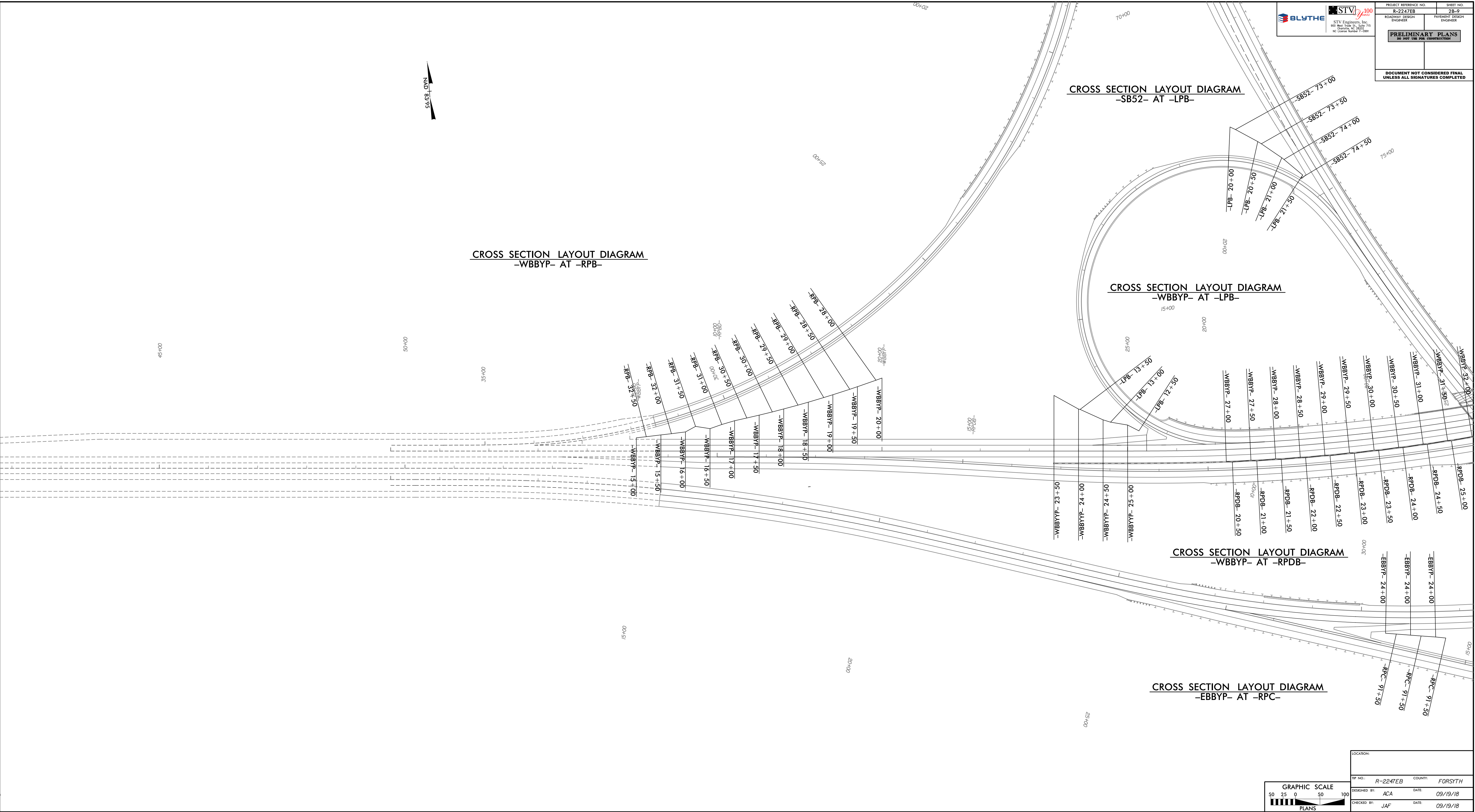
DESIGNED BY: ACA DATE: 09/19/18

CHECKED BY: JAF DATE: 09/19/18



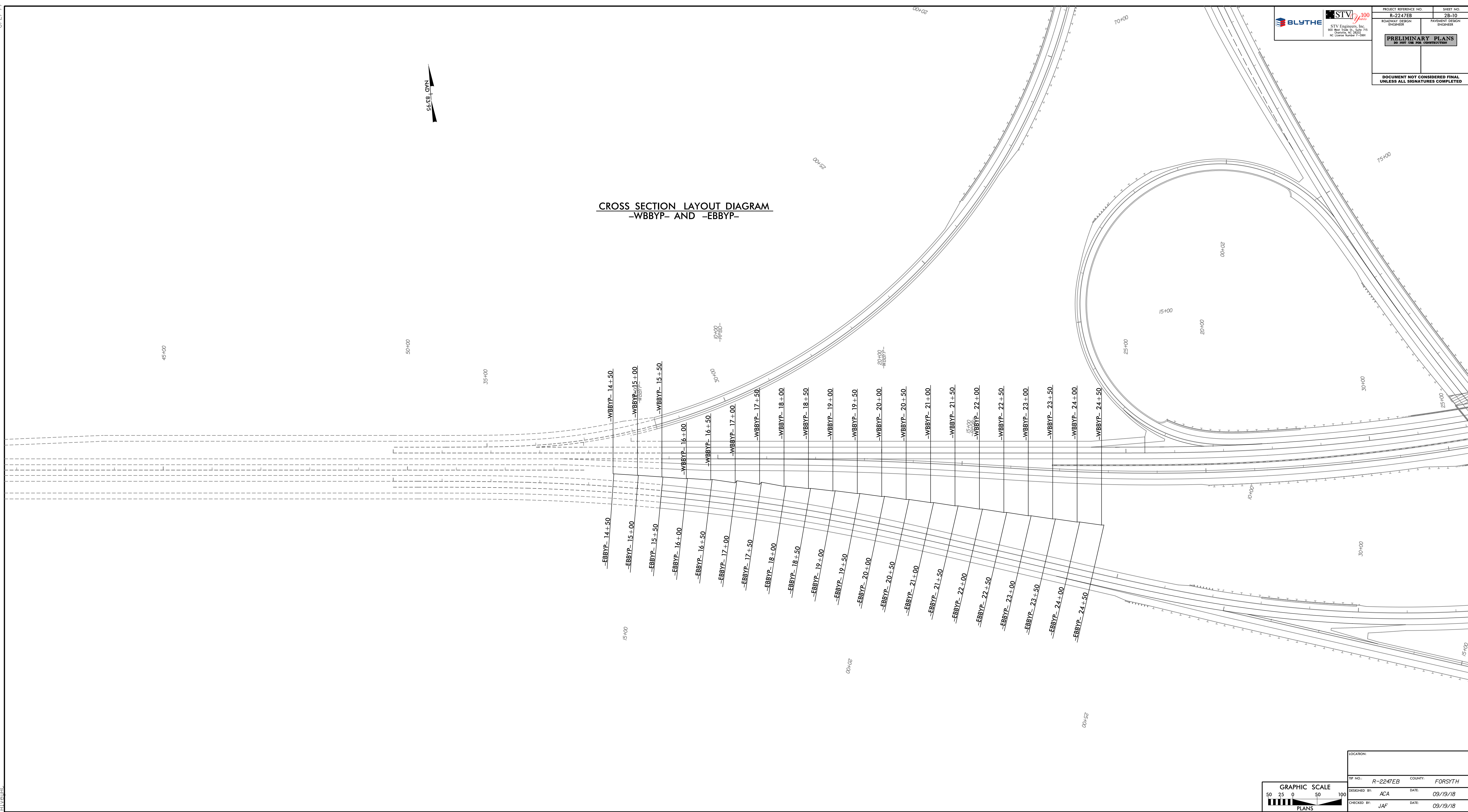


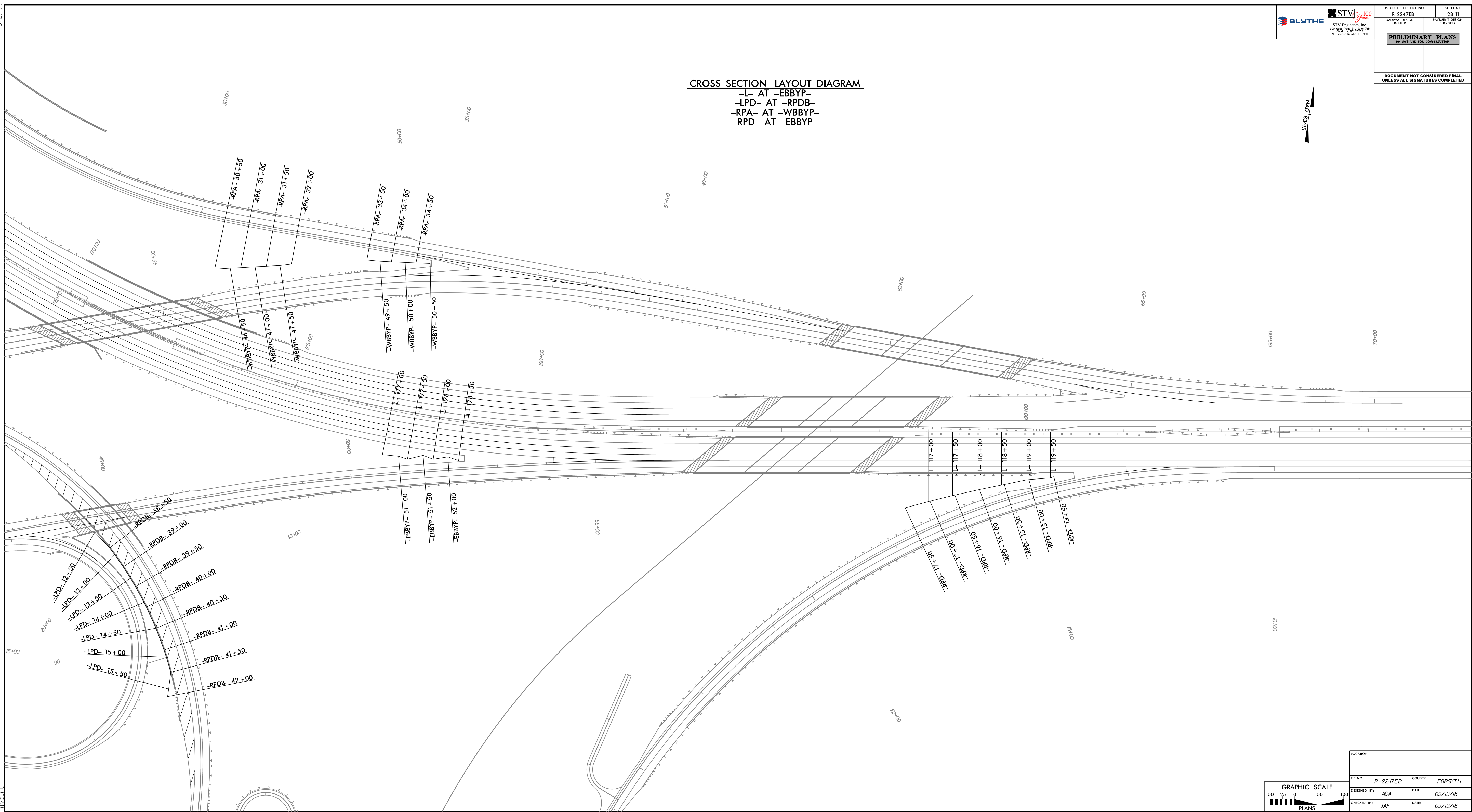
3/22/2019 R:\Roadway\Proj\95\H\2247EB-rd\pstr2B-9.dgn 6/2/99



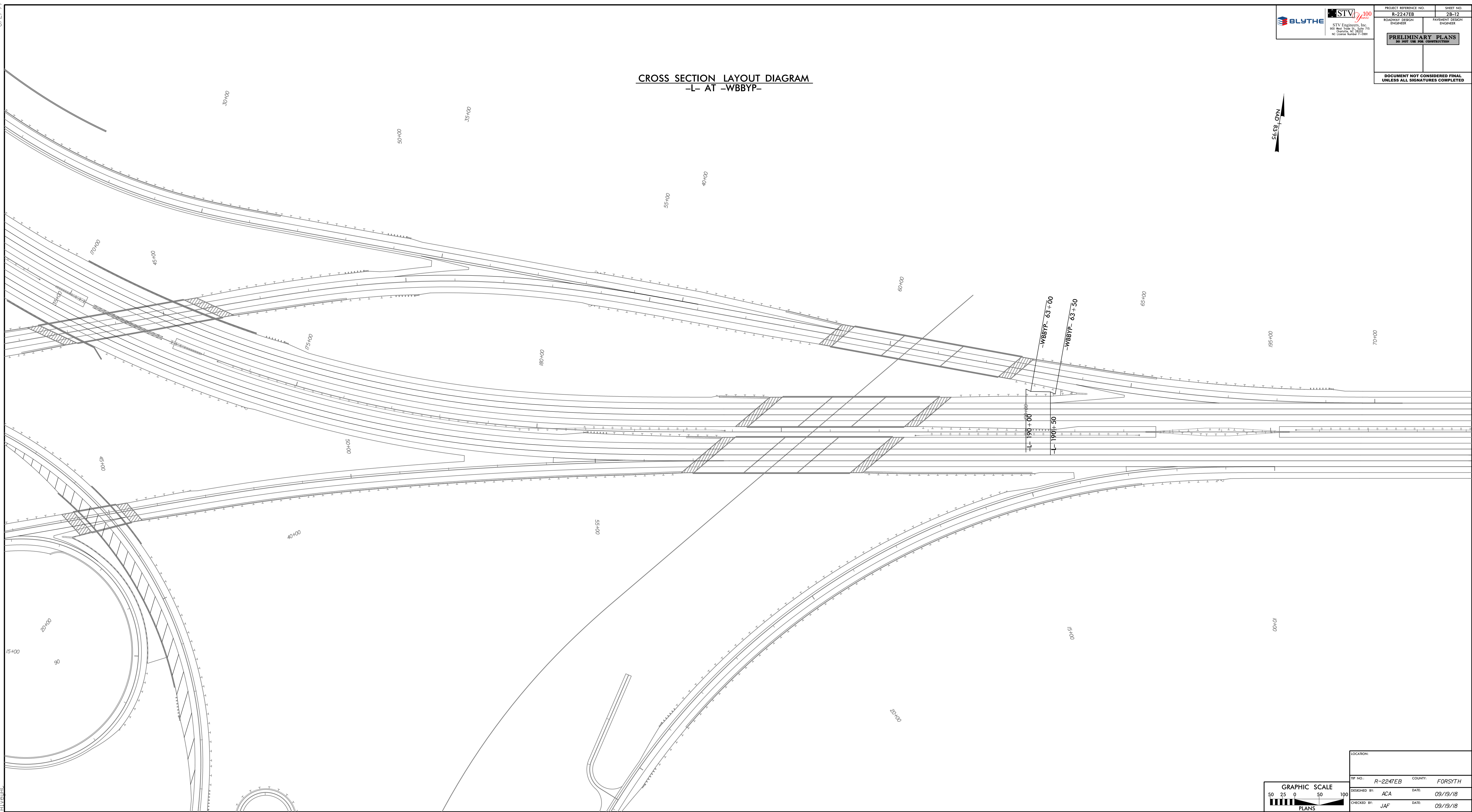
PROJECT REFERENCE NO. R-2247EB		SHEET NO. 2B-9
ROADWAY DESIGN ENGINEER		PAVEMENT DESIGN ENGINEER
PRELIMINARY PLANS NO. NOT FOR CONSTRUCTION		
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED		

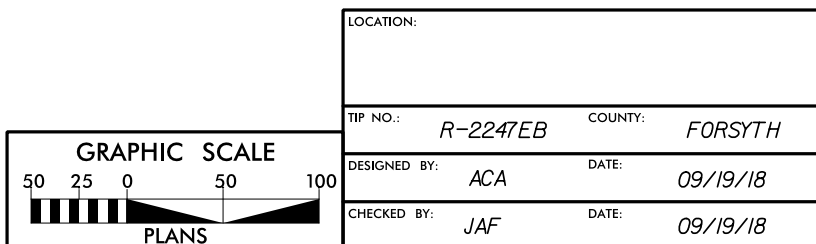
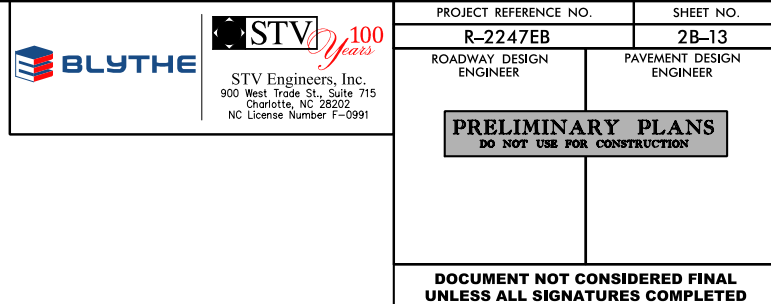
GRAPHIC SCALE 50 25 0 50 100 PLANS		LOCATION:
DESIGNED BY: ACA	CHECKED BY: JAF	DATE: 09/19/18
RTP NO.: R-2247EB		COUNTY: FORSYTH

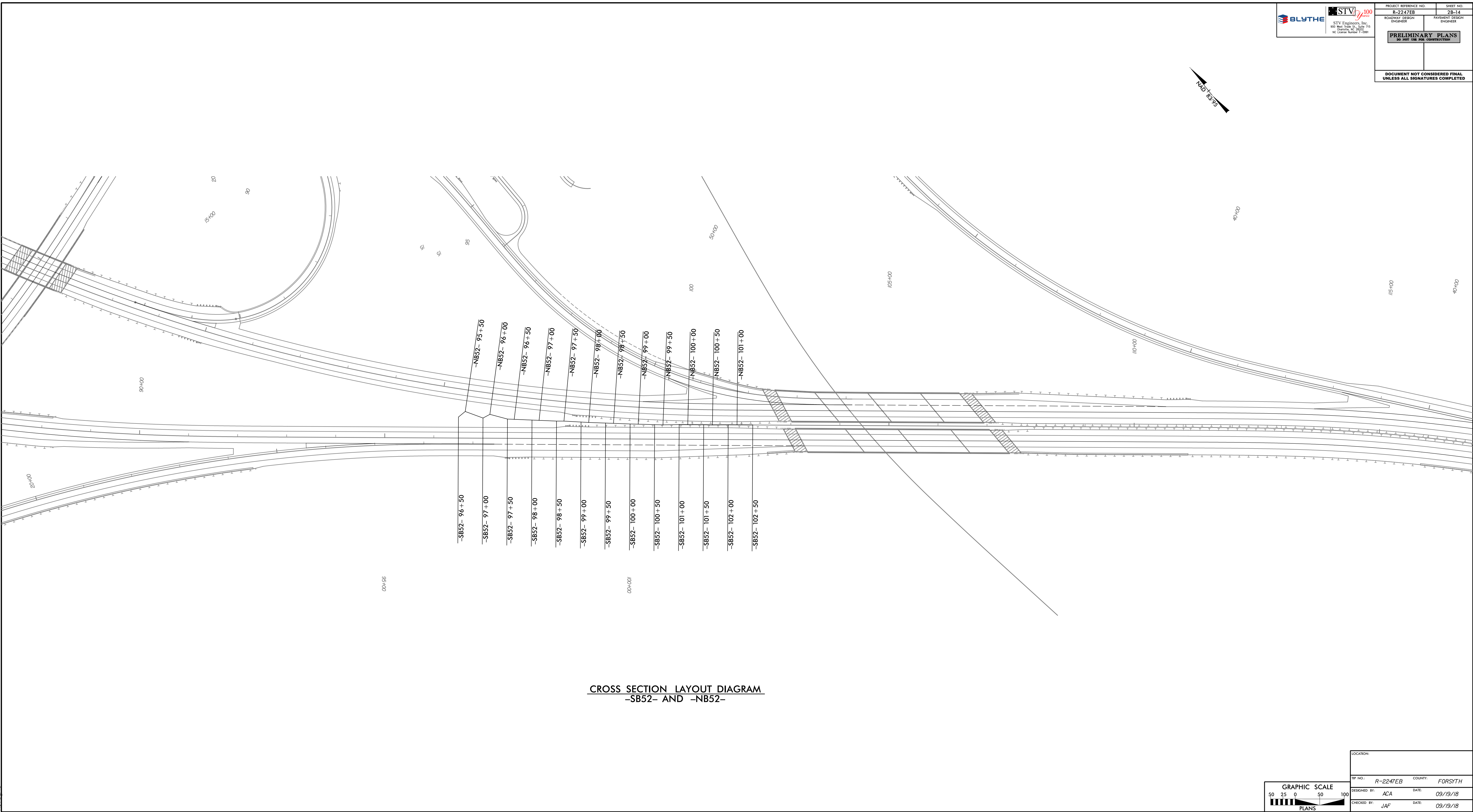




3/22/2019
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AlveinAC









STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number E-0991

PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

3A-1

ROADWAY DESIGN
ENGINEER

HYDRAULICS
ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

ALIGNMENT CURVE DATA

CURVE & SPIRAL DATA -L-

<i>Pls Sta 74+17.90</i> $\Delta = 22^{\circ} 17' 59.9"$ (RT) $D = 0^{\circ} 29' 29.0"$ $L = 4538.17'$ $T = 2,298.17'$ $R = 11,660.00'$ $RUNOFF = 150'$ $DS = 70$ MPH $e = 2.5\%$	<i>Pls Sta 155+77.81</i> $\Theta_s = 5^{\circ} 32' 56.7"$ $Ls = 455.00'$ $LT = 303.48'$ $ST = 151.80'$	<i>Pls Sta 169+16.27</i> $\Delta = 53^{\circ} 36' 52.7"$ (LT) $D = 2^{\circ} 26' 21.0"$ $L = 2,198.08'$ $T = 1,186.94'$ $R = 2,349.00'$ $DS = 70$ MPH $e = 7.5\%$	<i>Pls Sta 180+79.22</i> $\Theta_s = 5^{\circ} 32' 56.7"$ $Ls = 455.00'$ $LT = 303.48'$ $ST = 151.80'$
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CURVE & SPIRAL DATA -RPA-

<i>Pls Sta 10+66.68</i> $\Theta_s = 2^{\circ} 22' 31.6"$ $Ls = 200.00'$ $LT = 133.35'$ $ST = 66.68'$	<i>Pls Sta 19+25.14</i> $\Theta_s = 4^{\circ} 46' 28.7"$ $Ls = 200.00'$ $LT = 133.38'$ $ST = 66.71'$	<i>Pls Sta 25+04.05</i> $\Delta = 46^{\circ} 14' 11.4"$ (LT) $D = 4^{\circ} 46' 28.7"$ $L = 968.37'$ $T = 512.30'$ $R = 1,200.00'$ $DS = 60$ MPH $e = 8.0\%$	<i>Pls Sta 30+26.84</i> $\Theta_s = 4^{\circ} 46' 28.7"$ $Ls = 200.00'$ $LT = 133.38'$ $ST = 66.71'$
--	--	---	--

CURVE & SPIRAL DATA -RPB-

<i>Pls Sta 11+59.90</i> $\Theta_s = 4^{\circ} 17' 49.9"$ $Ls = 180.00'$ $LT = 120.04'$ $ST = 60.03'$	<i>Pls Sta 27+11.82</i> $\Delta = 102^{\circ} 22' 47.3"$ (RT) $D = 4^{\circ} 46' 28.7"$ $L = 2,144.24'$ $T = 1,491.96'$ $R = 1,200.00'$ $DS = 60$ MPH $e = 8.0\%$	<i>Pls Sta 34+37.49</i> $\Theta_s = 5^{\circ} 15' 07.6"$ $Ls = 220.00'$ $LT = 146.73'$ $ST = 73.39'$
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CURVE & SPIRAL DATA -RPC-

<i>Pls Sta 17+51.79</i> $\Theta_s = 1^{\circ} 55' 40.3"$ $Ls = 200.00'$ $LT = 133.34'$ $ST = 66.67'$	<i>Pls Sta 22+84.44</i> $\Delta = 17^{\circ} 49' 20.2"$ (RT) $D = 1^{\circ} 55' 40.3"$ $L = 924.46'$ $T = 465.99'$ $R = 2,972.00'$ $DS = 60$ MPH $e = 5.0\%$	<i>Pls Sta 28+09.58</i> $\Theta_s = 1^{\circ} 55' 40.3"$ $Ls = 200.00'$ $LT = 133.34'$ $ST = 66.67'$
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CURVE & SPIRAL DATA -RPD-

<i>Pls Sta 11+50.05</i> $\Theta_s = 4^{\circ} 26' 21.3"$ $Ls = 225.00'$ $LT = 150.05'$ $ST = 75.04'$	<i>Pls Sta 33+40.98</i> $\Delta = 111^{\circ} 05' 01.0"$ (LT) $D = 3^{\circ} 56' 45.6"$ $L = 2,815.10'$ $T = 2,115.98'$ $R = 1,452.00'$ $DS = 60$ MPH $e = 8.0\%$	<i>Pls Sta 41+15.14</i> $\Theta_s = 4^{\circ} 26' 21.3"$ $Ls = 225.00'$ $LT = 150.05'$ $ST = 75.04'$
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CURVE & SPIRAL DATA -LPB-

<i>Pls Sta 10+97.01</i> $\Theta_s = 1^{\circ} 05' 35.3"$ $\Theta_s = 14^{\circ} 58' 55.3"$ $Ls = 150.00'$ $LT = 97.01'$ $ST = 53.83'$	<i>Pls Sta 23+31.39</i> $\Delta = 207^{\circ} 18' 32.6"$ (RT) $D = 19^{\circ} 57' 49.3"$ $L = 1,038.43'$ $T = 1,181.39'$ $R = 287.00'$ $DS = 30$ MPH $e = 8.0\%$	<i>Pls Sta 22+38.76</i> $\Theta_s = 14^{\circ} 58' 22.0"$ $Ls = 150.00'$ $LT = 100.36'$ $ST = 50.33'$	<i>Pls Sta 24+38.43</i> $\Theta_s = 1^{\circ} 04' 04.4"$ $Ls = 150.00'$ $LT = 100.00'$ $ST = 50.00'$
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CURVE & SPIRAL DATA -LPD-

<i>Pls Sta 11+20.98</i> $\Theta_s = 22^{\circ} 25' 12.3"$ $Ls = 180.00'$ $LT = 120.98'$ $ST = 60.89'$	<i>Pls Sta 21+50.54</i> $\Delta = 206^{\circ} 39' 50.6"$ (RT) $D = 24^{\circ} 54' 40.4"$ $L = 829.60'$ $T = 970.54'$ $R = 230.00'$ $DS = 30$ MPH $e = 8.0\%$	<i>Pls Sta 20+85.35</i> $\Theta_s = 1^{\circ} 33' 27.2"$ $\Theta_s = 26^{\circ} 12' 30.2"$ $Ls = 210.00'$ $LT = 137.80'$ $ST = 75.75'$
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CURVE & SPIRAL DATA -NB52-

<i>Pls Sta 12+83.33</i> $\Theta_s = 0^{\circ} 49' 31.3"$ $Ls = 200.00'$ $LT = 133.33'$ $ST = 66.67'$	<i>Pls Sta 14+18.25</i> $\Delta = 1^{\circ} 07' 35.9"$ (LT) $D = 0^{\circ} 49' 31.3"$ $L = 136.51'$ $T = 68.25'$ $R = 6,942.00'$ $DS = 70$ MPH $e = 3.0\%$	<i>Pls Sta 15+53.17</i> $\Theta_s = 0^{\circ} 49' 31.3"$ $Ls = 200.00'$ $LT = 133.33'$ $ST = 66.67'$
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<i>Pls Sta 18+19.84</i> $\Theta_s = 0^{\circ} 49' 31.3"$ $Ls = 200.00'$ $LT = 133.33'$ $ST = 66.67'$	<i>Pls Sta 19+54.76</i> $\Delta = 1^{\circ} 07' 35.9"$ (RT) $D = 0^{\circ} 49' 31.3"$ $L = 136.51'$ $T = 68.25'$ $R = 6,942.00'$ $DS = 70$ MPH $e = 3.0\%$	<i>Pls Sta 20+89.68</i> $\Theta_s = 0^{\circ} 49' 31.3"$ $Ls = 200.00'$ $LT = 133.33'$ $ST = 66.67'$
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<i>Pls Sta 48+91.74</i> $\Theta_s = 5^{\circ} 25' 52.2"$ $Ls = 455.00'$ $LT = 303.48'$ $ST = 151.80'$	<i>Pls Sta 50+86.14</i> $\Delta = 2^{\circ} 02' 48.7"$ (LT) $D = 2^{\circ} 23' 14.4"$ $L = 85.74'$ $T = 42.87'$ $R = 2,400.00'$ $DS = 70$ MPH $e = 7.5\%$	<i>Pls Sta 52+80.80</i> $\Theta_s = 5^{\circ} 25' 52.2"$ $Ls = 455.00'$ $LT = 303.48'$ $ST = 151.80'$
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<i>Pls Sta 59+22.52</i> $\Theta_s = 3^{\circ} 45' 36.1"$ $Ls = 315.00'$ $LT = 210.05'$ $ST = 105.04'$	<i>Pls Sta 65+65.85</i> $\Delta = 25^{\circ} 17' 12.7"$ (RT) $D = 2^{\circ} 23' 14.4"$ $L = 1,059.21'$ $T = 538.37'$ $R = 2,400.00'$ $DS = 70$ MPH $e = 7.5\%$	<i>Pls Sta 71+66.71</i> $\Theta_s = 2^{\circ} 51' 53.2"$ $Ls = 240.00'$ $LT = 160.02'$ $ST = 80.02'$
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<i>Pls Sta 77+70.75</i> $\Theta_s = 1^{\circ} 08' 45.3"$ $Ls = 150.00'$ $LT = 100.00'$ $ST = 50.00'$	<i>Pls Sta 89+31.37</i> $\Delta = 32^{\circ} 59' 42.2"$ (LT) $D = 1^{\circ} 31' 40.4"$ $L = 2,159.52'$ $T = 1,110.62'$ $R = 3,750.00'$ $DS = 70$ MPH $e = 5.0\%$	<i>Pls Sta 100+46.94</i> $\Theta_s = 1^{\circ} 31' 40.4"$ $Ls = 200.00'$ $LT = 133.34'$ $ST = 66.67'$
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CURVE & SPIRAL DATA -SB52-

<i>Pls Sta 12+29.48</i> $\Theta_s = 0^{\circ} 49' 31.3"$ $Ls = 200.00'$ $LT = 133.33'$ $ST = 66.67'$	<i>Pls Sta 14+07.83</i> $\Delta = 1^{\circ} 50' 36.4"$ (RT) $D = 0^{\circ} 49' 31.3"$ $L = 223.35'$ $T = 111.69'$ $R = 6,942.00'$ $DS = 70$ MPH $e = 3.0\%$	<i>Pls Sta 15+86.16</i> $\Theta_s = 0^{\circ} 49' 31.3"$ $Ls = 200.00'$ $LT = 133.33'$ $ST = 66.67'$
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<i>Pls Sta 18+52.83</i> $\Theta_s = 0^{\circ} 49' 31.3"$ $Ls = 200.00'$ $LT = 133.33'$ $ST = 66.67'$	<i>Pls Sta 20+31.18</i> $\Delta = 1^{\circ} 50' 36.4"$ (LT) $D = 0^{\circ} 49' 31.3"$ $L = 223.35'$ $T = 111.69'$ $R = 6,942.00'$ $DS = 70$ MPH $e = 3.0\%$	<i>Pls Sta 22+09.52</i> $\Theta_s = 0^{\circ} 49' 31.3"$ $Ls = 200.00'$ $LT = 133.33'$ $ST = 66.67'$
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<i>Pls Sta 52+38.55</i> $\Theta_s = 1^{\circ} 36' 41.2"$ $Ls = 225.00'$ $LT = 150.01'$ $ST = 75.01'$	<i>Pls Sta 57+24.41</i> $\Delta = 11^{\circ} 43' 45.9"$ (RT) $D = 1^{\circ} 25' 56.6"$ $L = 818.87'$ $T = 410.87'$ $R = 4,000.00'$ $DS = 70$ MPH $e = 5.0\%$	<i>Pls Sta 62+07.41</i> $\Theta_s = 1^{\circ} 36' 41.2"$ $Ls = 225.00'$ $LT = 150.01'$ $ST = 75.01'$
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<i>Pls Sta 69+87.94</i> $\Theta_s = 2^{\circ} 08' 31.8"$ $Ls = 300.00'$ $LT = 200.01'$ $ST = 100.01'$	<i>Pls Sta 80+63.51</i> $\Delta = 27^{\circ} 20' 03.6"$ (LT) $D = 1^{\circ} 25' 41.2"$ $L = 1,914.02'$ $T = 975.58'$ $R = 4,012.00'$ $DS = 70$ MPH $e = 5.0\%$	<i>Pls Sta 91+01.96</i> $\Theta_s = 2^{\circ} 08' 31.8"$ $Ls = 300.00'$ $LT = 200.01'$ $ST = 100.01'$
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CURVE & SPIRAL DATA -RPDB-

<i>Pls Sta 11+00.00</i> $\Theta_s = 0^{\circ} 37' 12.3"$ $Ls = 150.00'$ $LT = 100.00'$ $ST = 50.00'$	<i>Pls Sta 12+87.71</i> $\Delta = 2^{\circ} 16' 36.8"$ (RT) $D = 0^{\circ} 49' 36.4"$ $L = 275.39'$ $T = 137.71'$ $R = 6,930.00'$ $DS = 70$ MPH $e = 3.0\%$	<i>Pls Sta 14+75.39</i> $\Theta_s = 0^{\circ} 37' 12.3"$ $Ls = 150.00'$ $LT = 100.00'$ $ST = 50.00'$
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<i>Pls Sta 16+75.39</i> $\Theta_s = 1^{\circ} 05' 14.4"$ $Ls = 150.00'$ $LT = 100.00'$ $ST = 50.00'$	<i>Pls Sta 22+83.43</i> $\Delta = 16^{\circ} 04' 28.3"$ (LT) $D = 1^{\circ} 26' 59.3"$ $L = 1,108.75'$ $T = 558.04'$ $R = 3,952.00'$ $DS = 50$ MPH $e = 3.0\%$	<i>Pls Sta 29+00.81</i> $\Theta_s = 1^{\circ} 26' 59.3"$ $Ls = 200.00'$ $LT = 133.34'$ $ST = 66.67'$
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<i>Pls Sta 31+67.59</i> $\Theta_s = 7^{\circ} 33' 31.7"$ $Ls = 200.00'$ $LT = 133.46'$ $ST = 66.78'$	<i>Pls Sta 39+22.02</i> $\Delta = 84^{\circ} 26' 50.4"$ (RT) $D = 7^{\circ} 33' 31.7"$ $L = 1,117.20'$ $T = 687.88'$ $R = 758.00'$ $DS = 50$ MPH $e = 8.0\%$	<i>Pls Sta 44+18.12</i> $\Theta_s = 7^{\circ} 33' 31.7"$ $Ls = 200.00'$ $LT = 133.46'$ $ST = 66.78'$
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<i>Pls Sta 46+84.80</i> $\Theta_s = 7^{\circ} 33' 31.7"$ $Ls = 200.00'$ $LT = 133.46'$ $ST = 66.78'$	<i>Pls Sta 49+89.07</i> $\Delta = 34^{\circ} 49' 29.4"$ (LT) $D = 7^{\circ} 33' 31.7"$ $L = 460.72'$ $T = 237.72'$ $R = 758.00'$ $DS = 50$ MPH $e = 8.0\%$	<i>Pls Sta 52+78.84</i> $\Theta_s = 7^{\circ} 33' 31.7"$ $Ls = 200.00'$ $LT = 133.46'$ $ST = 66.78'$
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CURVE & SPIRAL DATA -EBBYP-

<i>Pls Sta 12+00.01</i> $\Theta_s = 1^{\circ} 35' 12.7"$ $Ls = 225.00'$ $LT = 150.01'$ $ST = 75.01'$	<i>Pls Sta 16+27.68</i> $\Delta = 9^{\circ} 55' 27.8"$ (RT) $D = 1^{\circ} 24' 37.9"$ $L = 703.59'$ $T = 352.68'$ $R = 4,062.00'$ $DS = 70$ MPH $e = 5.0\%$	<i>Pls Sta 20+53.60</i> $\Theta_s = 1^{\circ} 35' 12.7"$ $Ls = 225.00'$ $LT = 150.01'$ $ST = 75.01'$	<i>Pls Sta 26+05.32</i> $\Theta_s = 4^{\circ} 04' 43.8"$ $Ls = 340.00'$ $LT = 226.73'$ $ST = 113.39'$	<i>Pls Sta 33+53.56</i> $\Delta = 29^{\circ} 46' 50.5"$ (LT) $D = 2^{\circ} 23' 57.6"$ $L = 1,241.21'$ $T = 634.97'$ $R = 2,388.00'$ $DS = 70$ MPH $e = 7.5\%$
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<i>Pls Sta 40+34.82</i> $\Theta_s = 2^{\circ} 41' 57.2"$ $Ls = 225.00'$ $LT = 150.02'$ $ST = 75.02'$	<i>Pls Sta 47+18.14</i> $\Theta_s = 1^{\circ} 27' 55.3"$ $Ls = 200.00'$ $LT = 133.34'$ $ST = 66.67'$	<i>Pls Sta 48+47.37</i> $\Delta = 1^{\circ} 50' 00.0"$ (RT) $D = 1^{\circ} 27' 55.3"$ $L = 125.11'$ $T = 62.56'$ $R = 3,910.00'$ $DS = 70$ MPH $e = 5.0\%$	<i>Pls Sta 49+97.68</i> $\Theta_s = 0^{\circ} 40' 40.9"$ $\Theta_s = 1^{\circ} 27' 55.5"$ $Ls = 200.00'$ $LT = 112.26'$ $ST = 87.77'$	<i>Pls Sta 54+41.92</i> $\Delta = 4^{\circ} 30' 00.0"$ (RT) $D = 0^{\circ} 40' 41.0"$ $L = 663.66'$ $T = 332.00'$ $R = 8,450.00'$ $DS = 70$ MPH $e = 2.5\%$
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CURVE & SPIRAL DATA -WBBYP-

<i>Pls Sta 25+94.42</i> $\Theta_s = 1^{\circ} 38' 54.7"$ $Ls = 225.00'$ $LT = 150.01'$ $ST = 75.01'$	<i>Pls Sta 33+67.92</i> $\Delta = 20^{\circ} 15' 27.0"$ (LT) $D = 1^{\circ} 27' 55.3"$ $L = 1,382.42'$ $T = 698.50'$ $R = 3,910.00'$ $DS = 70$ MPH $e = 5.0\%$	<i>Pls Sta 41+26.84</i> $\Theta_s = 1^{\circ} 38' 54.7"$ $Ls = 225.00'$ $LT = 150.01'$ $ST = 75.01'$	<i>Pls Sta 48+18.50</i> $\Theta_s = 5^{\circ} 32' 19.7"$ $Ls = 360.00'$ $LT = 240.12'$ $ST = 120.11'$	<i>Pls Sta 50+89.07</i> $\Delta = 9^{\circ} 15' 13.1"$ (RT) $D = 3^{\circ} 04' 37.6"$ $L = 300.73'$ $T = 150.69'$ $R = 1,862.00'$ $DS = 70$ MPH $e = 8.0\%$
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<i>Pls Sta 53+59.21</i> $\Theta_s = 5^{\circ} 32' 19.7"$ $Ls = 360.00'$ $LT = 240.12'$ $ST = 120.11'$	<i>Pls Sta 64+02.01</i> $\Theta_s = 1^{\circ} 45' 07.8"$ $Ls = 200.00'$ $LT = 133.34'$ $ST = 66.67'$	<i>Pls Sta 66+62.68</i> $\Delta = 6^{\circ} 47' 27.3"$ (LT) $D = 1^{\circ} 45' 07.8"$ $L = 387.57'$ $T = 194.01'$ $R = 3,270.00'$ $DS = 70$ MPH $e = 6.0\%$	<i>Pls Sta 69+22.92</i> $\Theta_s = 1^{\circ} 45' 07.8"$ $Ls = 200.00'$ $LT = 133.34'$ $ST = 66.67'$
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PROJECT REFERENCE NO.		SHEET NO.	
R-2247EB		3A-2	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			

ALIGNMENT CURVE DATA

CURVE & SPIRAL DATA -Y62RPA-		
<i>Pls Sta 11+33.45</i> <i>Θs = 7° 33' 30.4"</i> <i>Ls = 200.00'</i> <i>LT = 133.45'</i> <i>ST = 66.77'</i>	<i>Pl Sta 14+97.25</i> <i>Δ = 42° 49' 36.8" (LT)</i> <i>D = 7° 33' 51.5"</i> <i>L = 566.17'</i> <i>T = 297.26'</i> <i>R = 758.00'</i> <i>DS = 50 MPH</i> <i>e = 8.0%</i>	<i>Pls Sta 18+32.93</i> <i>Θs = 7° 33' 30.4"</i> <i>Ls = 200.00'</i> <i>LT = 133.45'</i> <i>ST = 66.77'</i>

CURVE & SPIRAL DATA -Y62RPC-			
<i>Pls Sta 10+73.35</i> <i>Θs = 2° 37' 02.4"</i> <i>Ls = 220.00'</i> <i>LT = 146.68'</i> <i>ST = 73.35'</i>	<i>Pls Sta 22+26.33</i> <i>Θs = 6° 01' 52.1"</i> <i>Ls = 400.00'</i> <i>LT = 266.82'</i> <i>ST = 133.47'</i>	<i>Pl Sta 26+04.06</i> <i>Δ = 14° 40' 05.9" (LT)</i> <i>D = 3° 00' 56.0"</i> <i>L = 486.42'</i> <i>T = 244.55'</i> <i>R = 1,900.00'</i> <i>DS = 50 MPH</i> <i>e = 5.0%</i>	<i>Pls Sta 29+12.62</i> <i>Θs = 3° 00' 56.0"</i> <i>Ls = 200.00'</i> <i>LT = 133.35'</i> <i>ST = 66.68'</i>

CURVE & SPIRAL DATA -Y62RPB-		
<i>Pls Sta 11+33.35</i> <i>Θs = 3° 29' 36.5"</i> <i>Ls = 200.00'</i> <i>LT = 133.35'</i> <i>ST = 66.69'</i>	<i>Pl Sta 15+76.94</i> <i>Δ = 25° 53' 19.6" (RT)</i> <i>D = 3° 29' 39.1"</i> <i>L = 740.91'</i> <i>T = 376.95'</i> <i>R = 1,640.00'</i> <i>DS = 60 MPH</i> <i>e = 7.5%</i>	<i>Pls Sta 20+07.59</i> <i>Θs = 3° 29' 36.5"</i> <i>Ls = 200.00'</i> <i>LT = 133.35'</i> <i>ST = 66.69'</i>
<i>Pls Sta 24+75.46</i> <i>Θs = 11° 27' 33.0"</i> <i>Ls = 200.00'</i> <i>LT = 133.61'</i> <i>ST = 66.92'</i>	<i>Pl Sta 26+95.50</i> <i>Δ = 34° 09' 52.1" (LT)</i> <i>D = 11° 28' 42.0"</i> <i>L = 297.64'</i> <i>T = 153.65'</i> <i>R = 500.00'</i> <i>DS = 40 MPH *</i> <i>e = 8.0% (EXISTING)</i>	<i>Pls Sta 29+06.41</i> <i>Θs = 11° 27' 28.8"</i> <i>Ls = 199.98'</i> <i>LT = 133.60'</i> <i>ST = 66.91'</i>

CURVE & SPIRAL DATA -Y68-		
<i>Pls Sta 113+10.00</i> <i>Θs = 2° 39' 09.3"</i> <i>Ls = 300.00'</i> <i>LT = 200.02'</i> <i>ST = 100.02'</i>	<i>Pl Sta 115+00.09</i> <i>Δ = 3° 11' 10.7" (RT)</i> <i>D = 1° 46' 06.2"</i> <i>L = 180.18'</i> <i>T = 90.11'</i> <i>R = 3,240.00'</i> <i>DS = 70 MPH</i> <i>e = 6.0%</i>	<i>Pls Sta 116+90.18</i> <i>Θs = 2° 39' 09.3"</i> <i>Ls = 300.00'</i> <i>LT = 200.02'</i> <i>ST = 100.02'</i>

* 40 MPH APPROACHING STOP CONDITION

CURVE & SPIRAL DATA -Y62LPA-		
<i>Pls Sta 11+00.23</i> <i>Θs = 12° 16' 36.7"</i> <i>Ls = 150.00'</i> <i>LT = 100.23'</i> <i>ST = 50.22'</i>	<i>Pl Sta 15+49.10</i> <i>Δ = 97° 30' 04.9" (RT)</i> <i>D = 16° 25' 35.1"</i> <i>L = 593.56'</i> <i>T = 399.11'</i> <i>R = 350.00'</i> <i>DS = 30 MPH</i> <i>e = 8.0%</i>	<i>Pls Sta 17+93.77</i> <i>Θs = 12° 16' 36.7"</i> <i>Ls = 150.00'</i> <i>LT = 100.23'</i> <i>ST = 50.22'</i>

CURVE & SPIRAL DATA -Y62LPB-		
<i>Pls Sta 11+48.31</i> <i>Θs = 26° 15' 38.0"</i> <i>Ls = 220.00'</i> <i>LT = 148.31'</i> <i>ST = 74.83'</i>	<i>Pl Sta 21+71.47</i> <i>Δ = 15° 41' 09.7" (LT)</i> <i>D = 23° 52' 23.7"</i> <i>L = 635.38'</i> <i>T = 951.47'</i> <i>R = 240.00'</i> <i>DS = 30 MPH</i> <i>e = 8.0%</i>	<i>Pls Sta 19+30.21</i> <i>Θs = 26° 15' 38.0"</i> <i>Ls = 220.00'</i> <i>LT = 148.31'</i> <i>ST = 74.83'</i>

CURVE DATA -RPDBDRI-		
<i>Pl Sta 10+83.34</i> <i>Δ = 89° 38' 01.6" (LT)</i> <i>D = 114° 35' 29.6"</i> <i>L = 78.22'</i> <i>T = 49.68'</i> <i>R = 50.00'</i> <i>DS = NA</i>	<i>Pl Sta 15+59.70</i> <i>Δ = 58° 50' 11.0" (LT)</i> <i>D = 95° 29' 34.7"</i> <i>L = 61.61'</i> <i>T = 33.83'</i> <i>R = 60.00'</i> <i>DS = NA</i>	<i>Pl Sta 30+97.05</i> <i>Δ = 183° 21' 39.9" (RT)</i> <i>D = 104° 10' 26.9"</i> <i>L = 176.01'</i> <i>T = 1,874.61'</i> <i>R = 55.00'</i> <i>DS = NA</i>

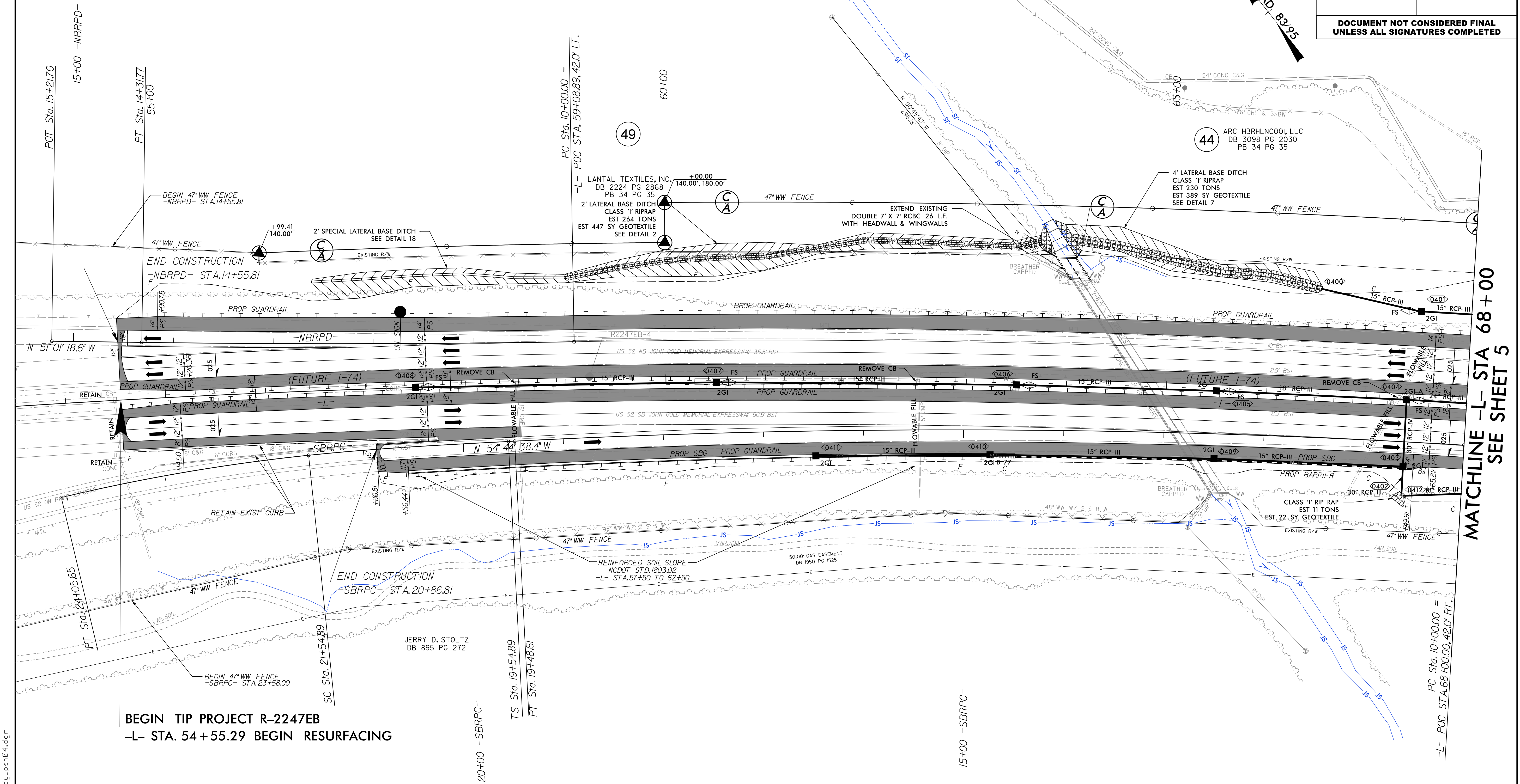
CURVE DATA -RPDDRI-
<i>Pl Sta 10+82.74</i> <i>= 81° 13' 58.3" (RT)</i> <i>D = 124° 33' 21.8"</i> <i>L = 65.22'</i> <i>T = 39.45'</i> <i>R = 46.00'</i> <i>DS = NA</i>

CURVE & SPIRAL DATA -NBRPD-		
<i>Pl Sta 14+74.80</i> <i>Δ = 6° 23' 39.3" (LT)</i> <i>D = 0° 40' 26.6"</i> <i>L = 948.61'</i> <i>T = 474.80'</i> <i>R = 8,500.00'</i> <i>DS = 70 MPH</i> <i>e = 2.5%</i>	<i>Pls Sta 20+88.24</i> <i>Θs = 2° 59' 36.6"</i> <i>Ls = 200.00'</i> <i>LT = 133.35'</i> <i>ST = 66.68'</i>	<i>Pl Sta 22+80.45</i> <i>Δ = 7° 30' 23.9" (LT)</i> <i>D = 2° 59' 36.6"</i> <i>L = 250.76'</i> <i>T = 125.56'</i> <i>R = 1,914.00'</i> <i>DS = NA</i> <i>e = NA</i>

CURVE DATA -SBRPC-
<i>Pl Sta 12+15.90</i> <i>Δ = 1° 42' 22.0" (RT)</i> <i>D = 0° 23' 42.5"</i> <i>L = 431.77'</i> <i>T = 215.90'</i> <i>R = 14,500.00'</i> <i>DS = 70 MPH</i> <i>e = 2.0%</i>

PROJ. REFERENCE NO.	SHEET NO.
U-2247EB	3P-1

[illegible]





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Charlotte, NC 28202
No License Number F-0991

PROJECT REFERENCE NO.

R-2247EB

ROADWAY DESIGN
ENGINEER

SHEET NO.

5

HYDRAULICS
ENGINEER

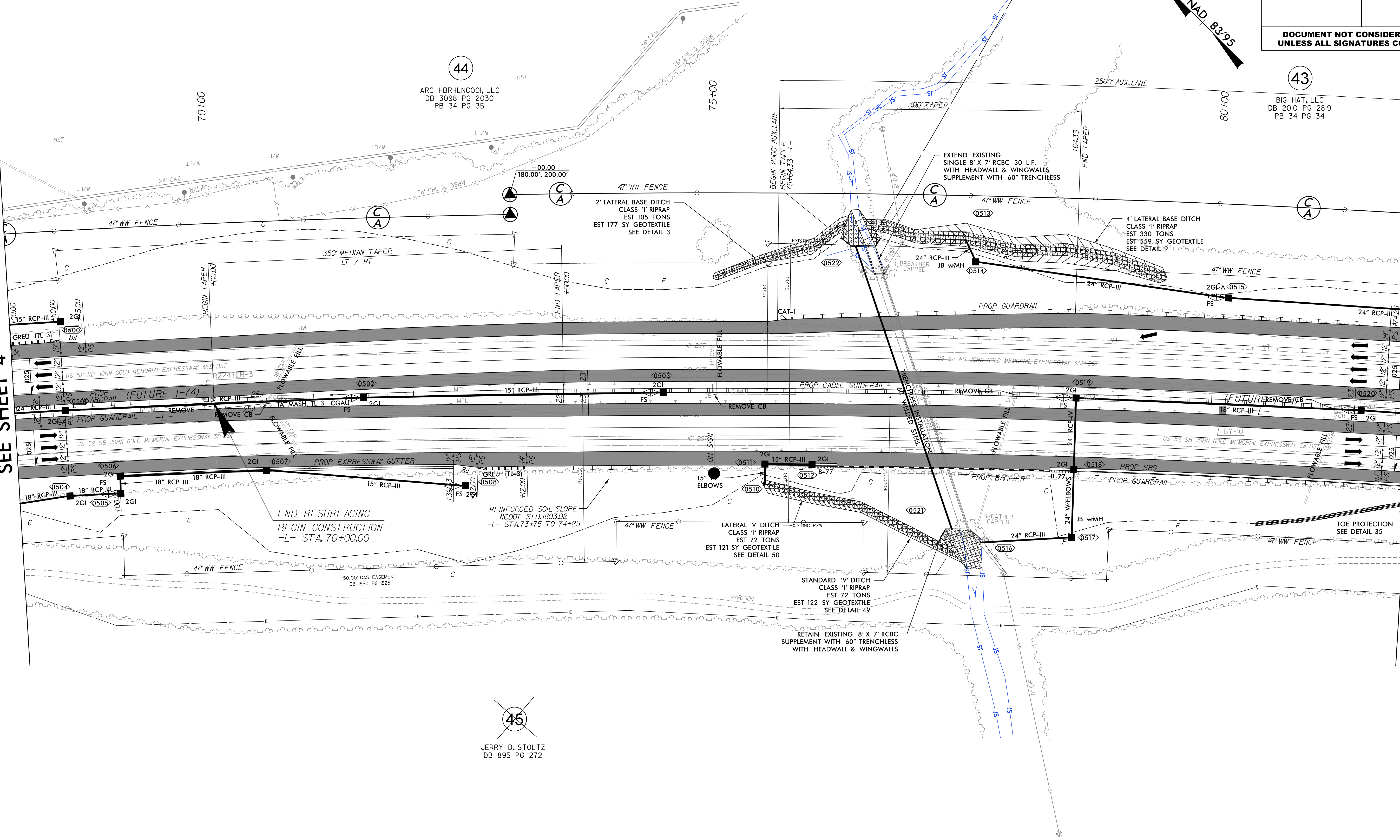
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NAD 83-95

MATCHLINE -L- STA 68+00
SEE SHEET 4

MATCHLINE -L- STA 82+00
SEE SHEET 6



45
JERRY D. STOLTZ
DB 895 PG 272

FOR -L- PROFILE SEE SHEETS 18 & 19

3/22/2018
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Alvord



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R-2247EB

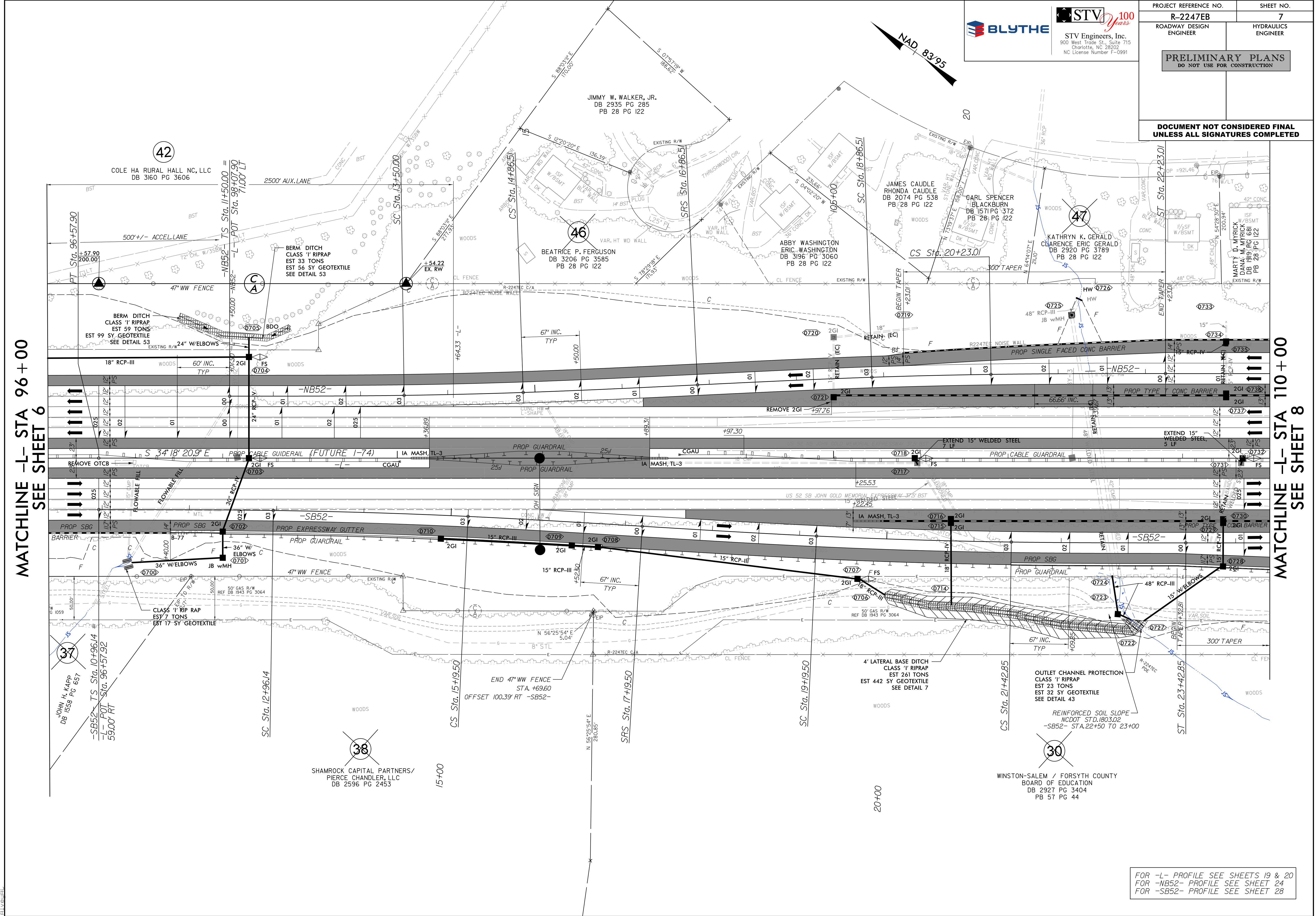
SHEET NO.
7

ROADWAY DESIGN ENGINEER

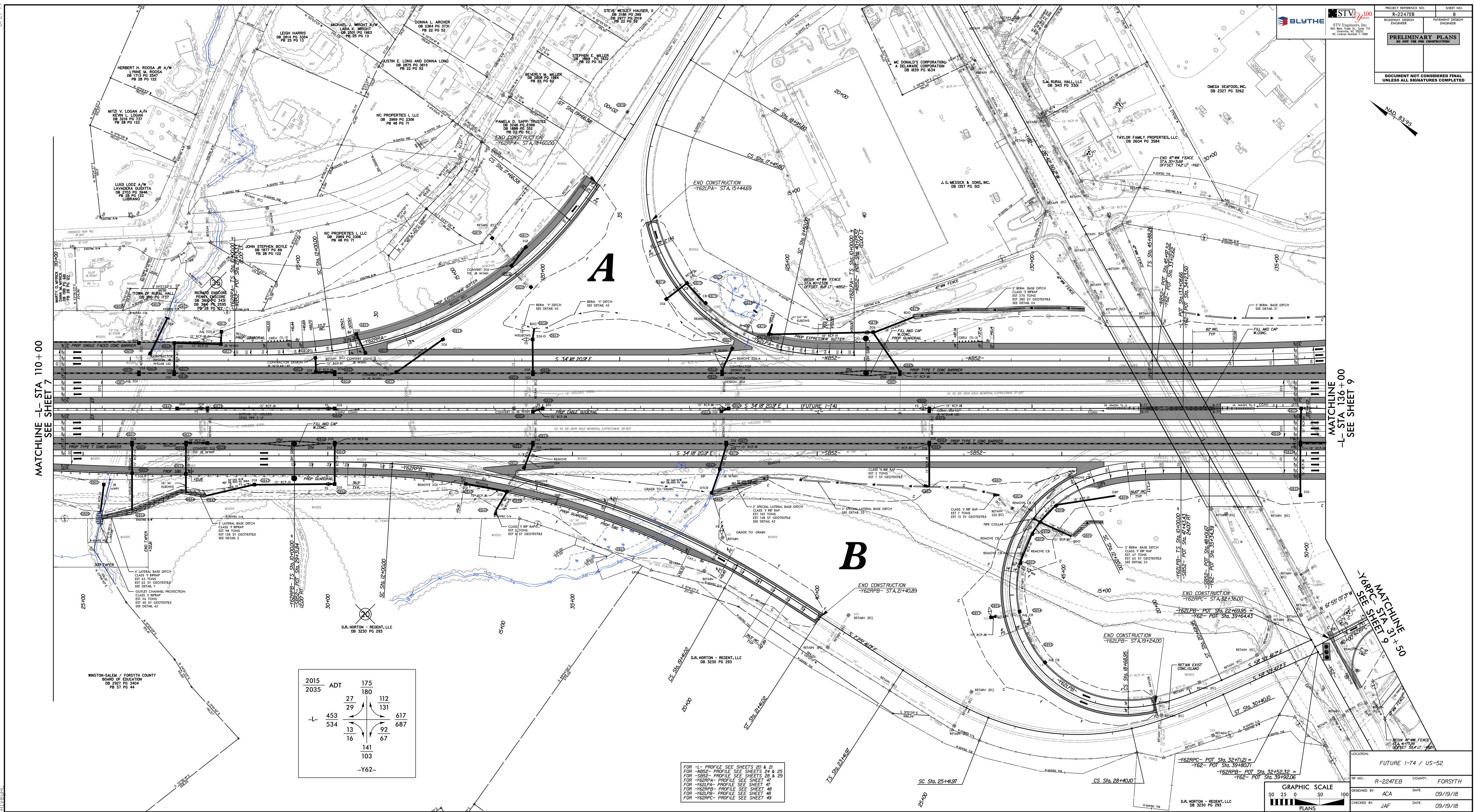
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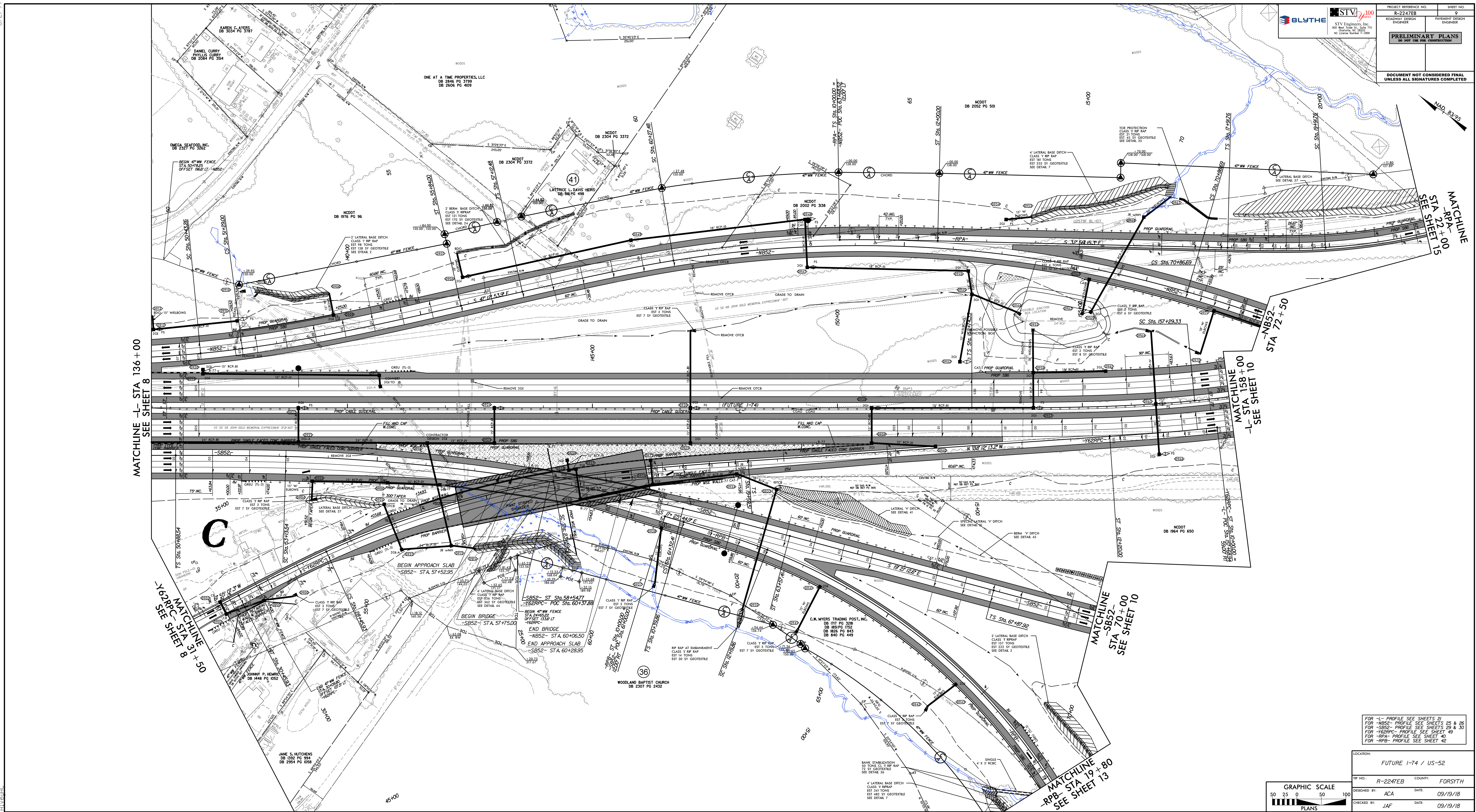
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

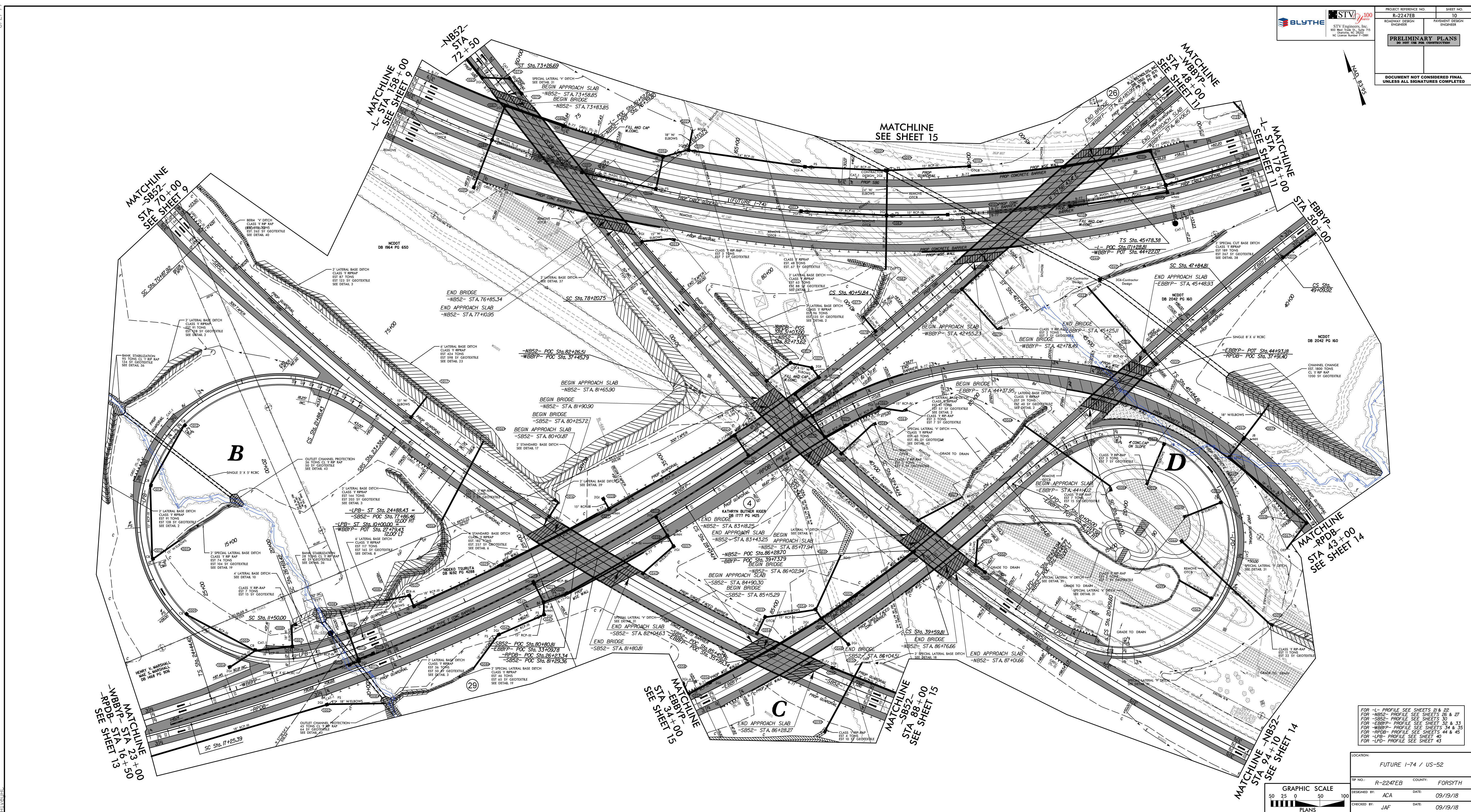
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

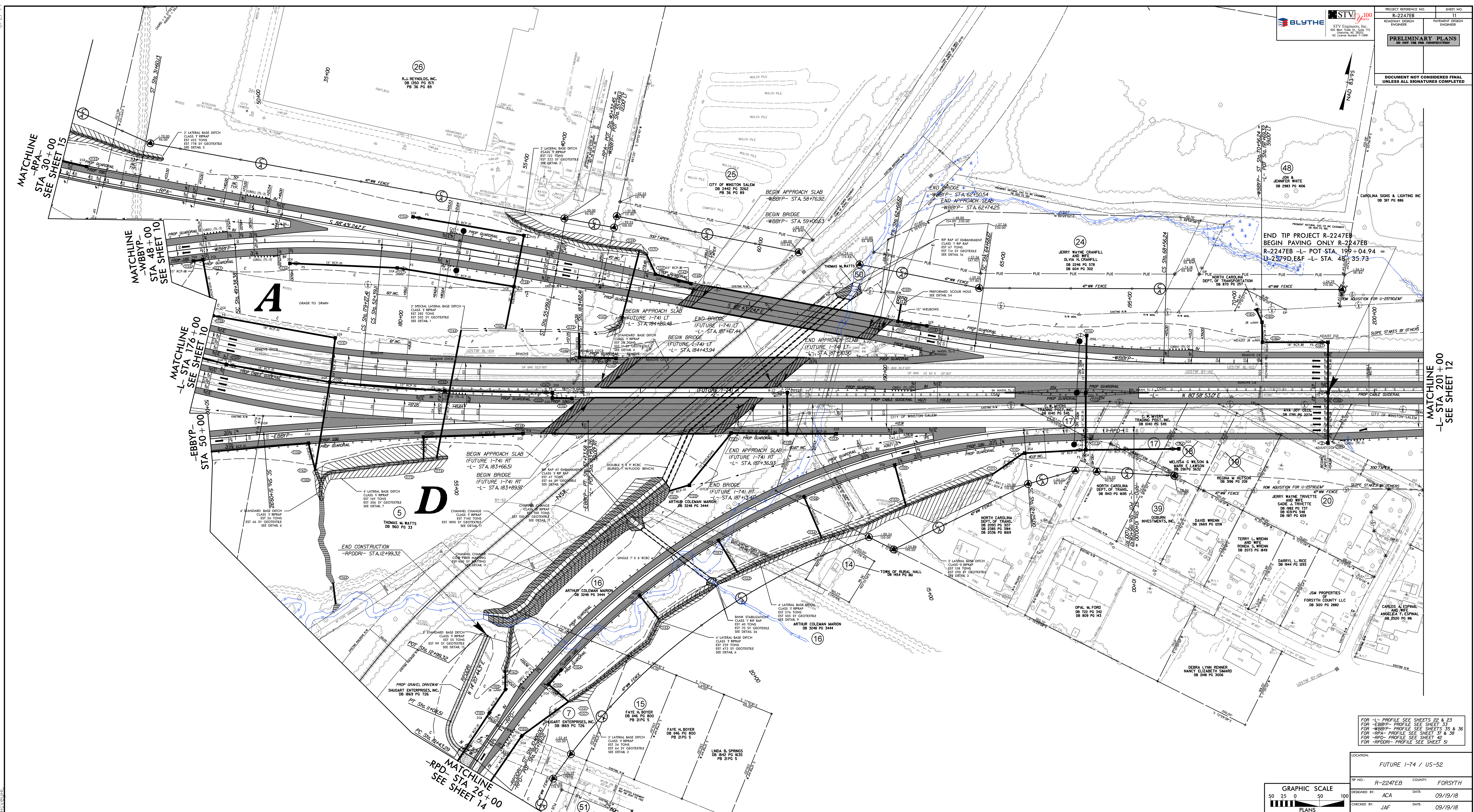


FOR -L- PROFILE SEE SHEETS 19 & 20
FOR -NB52- PROFILE SEE SHEET 24
FOR -SB52- PROFILE SEE SHEET 28







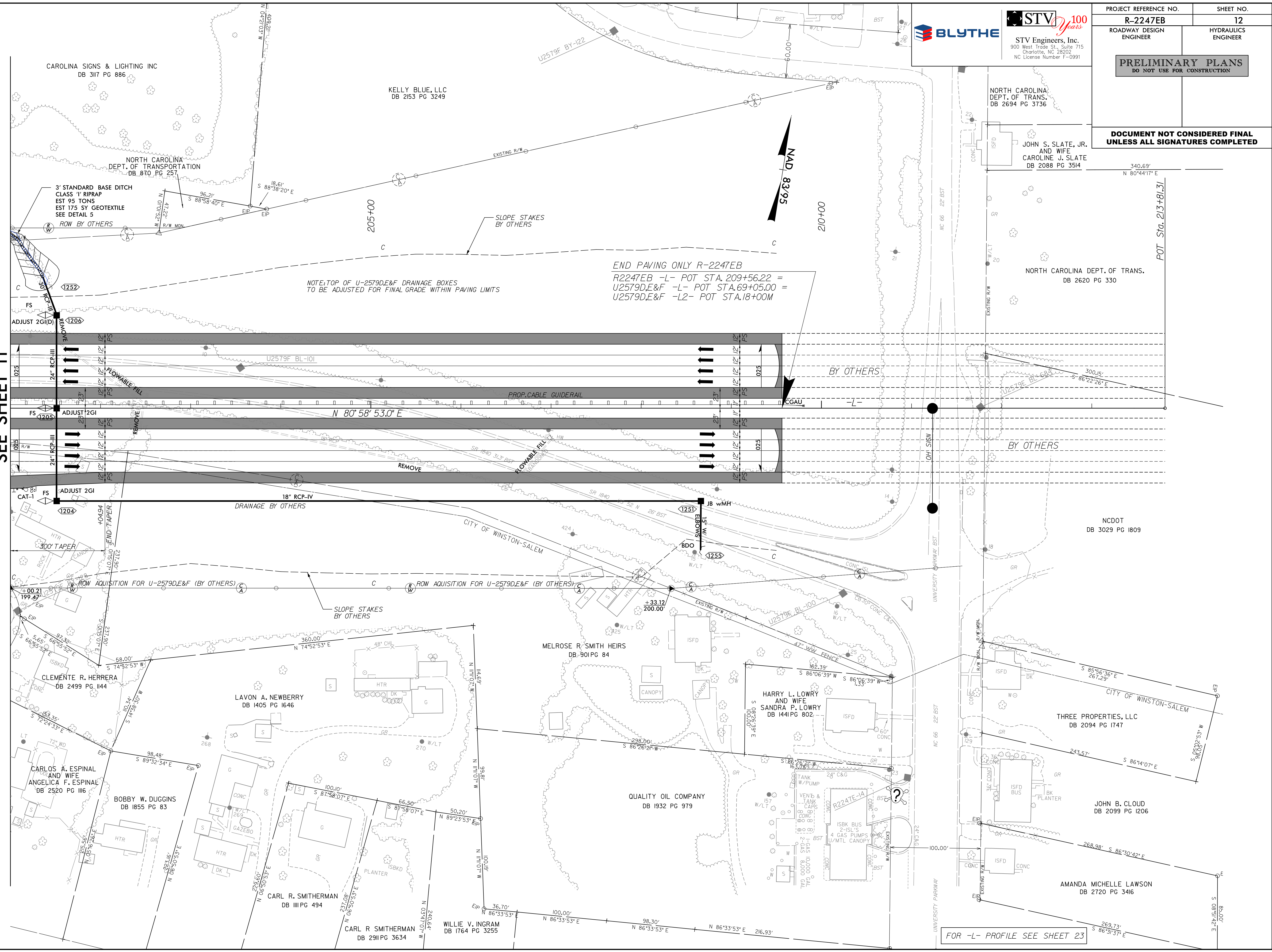




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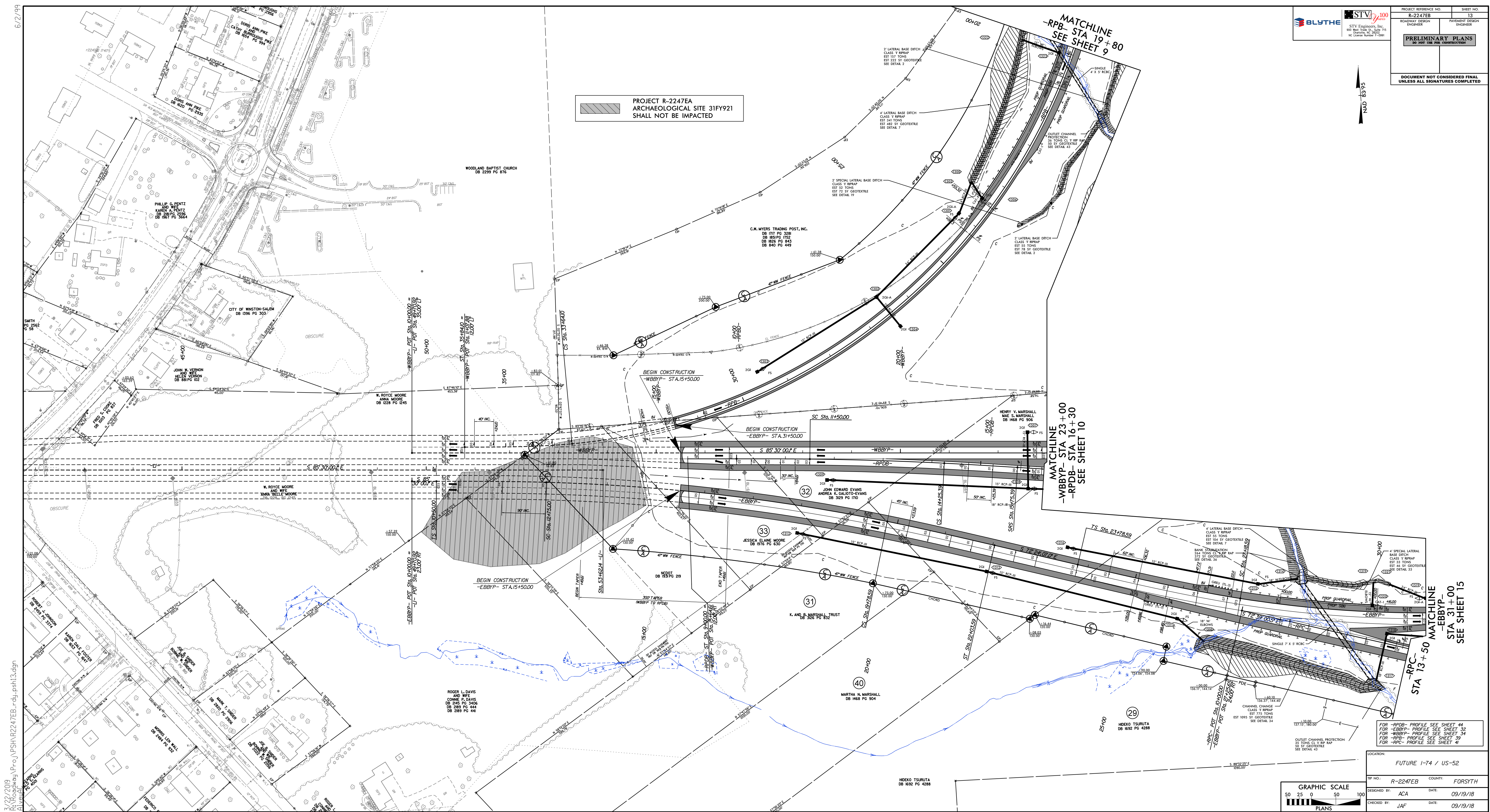
PROJECT REFERENCE NO.		SHEET NO.	
R-2247EB		12	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			

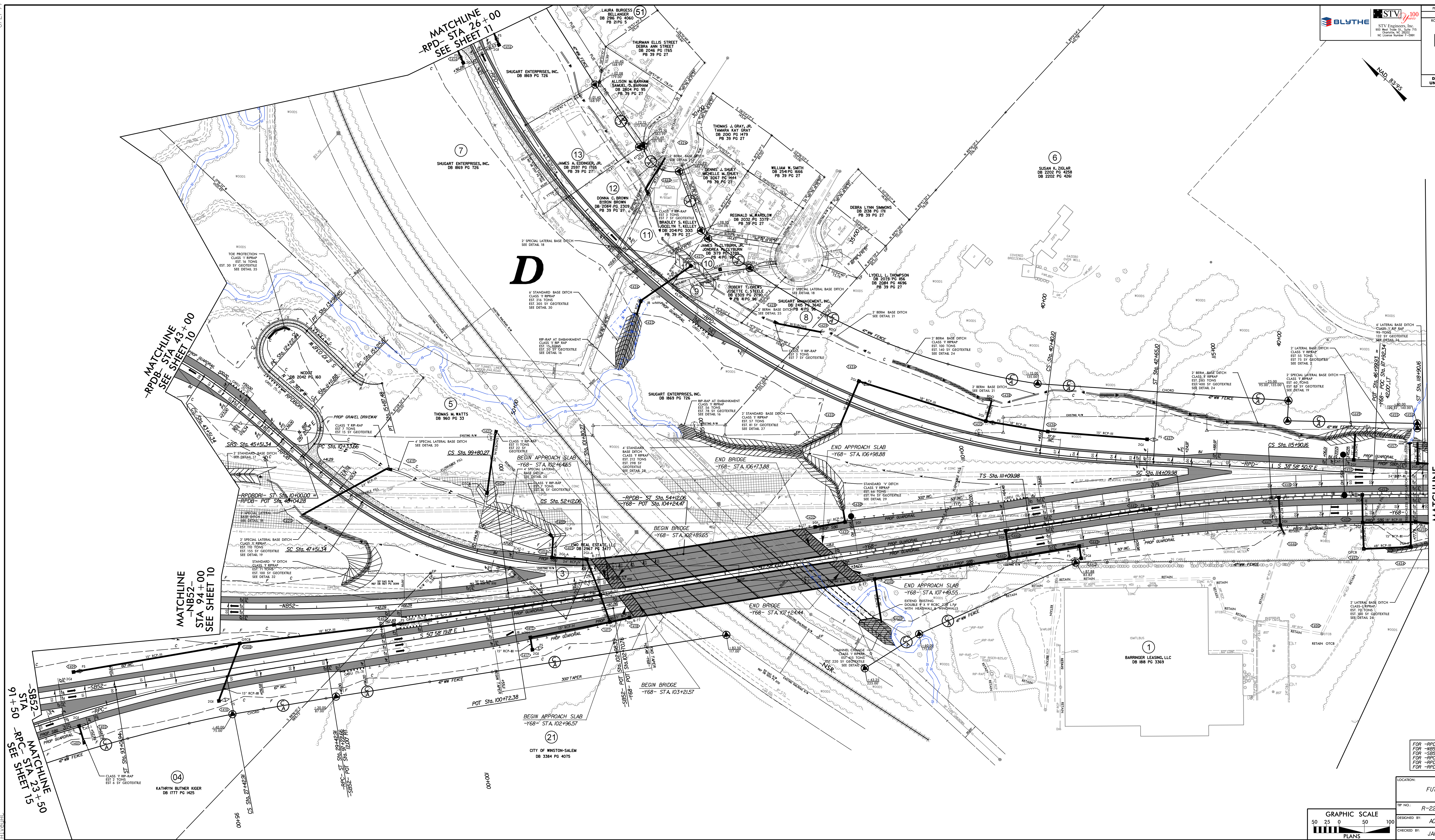
MATCHLINE -L- STA 201+00
SEE SHEET 11



FOR -L- PROFILE SEE SHEET 23

3/22/2018
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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	14
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
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UNLESS ALL SIGNATURES COMPLETED**

FOR -RPDB-- PROFILE SEE SHEET 45 FOR -WB52- PROFILE SEE SHEETS 27 FOR -SB52- PROFILE SEE SHEETS 30 & 31 FOR -APC- PROFILE SEE SHEET 41 FOR -RPD- PROFILE SEE SHEETS 42 & 43 FOR -RPDBDN- PROFILE SEE SHEET 51	
LOCATION: FUTURE I-74 / US-52	
TIP NO.: R-224TEB	COUNTY: FORTSITH
DESIGNED BY: ACA	DATE: 09/19/18
CHECKED BY: JAF	DATE: 09/19/18

BLYTHE

STV

100 Years

STV Engineers, Inc.

900 West Trade St., Suite 715
Charlotte, NC 28202
No License Number F-10991

PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

15

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

PRELIMINARY PLANS

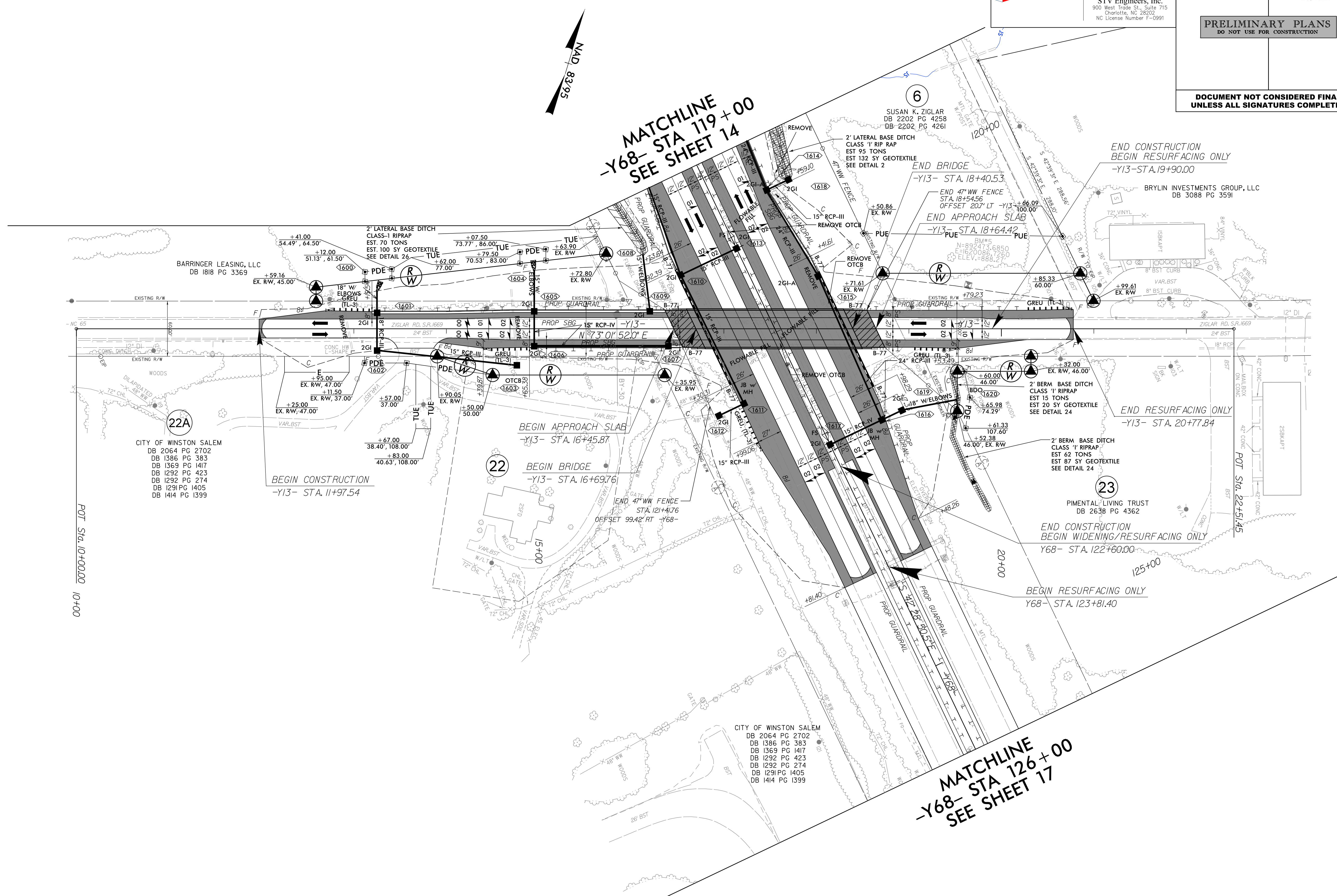
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL

UNLESS ALL SIGNATURES COMPLETED

FOR -RPA- PROFILE SEE SHEETS 37
FOR -EBBYP- PROFILE SEE SHEET 32
FOR -SB52- PROFILE SEE SHEET 30
FOR -RPC- PROFILE SEE SHEET 41

3/22/2018
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Alvord



FOR -Y13- PROFILE SEE SHEET 46



SHEET NO.

17

HYDRAULICS
ENGINEER

PRELIMINARY PLANS
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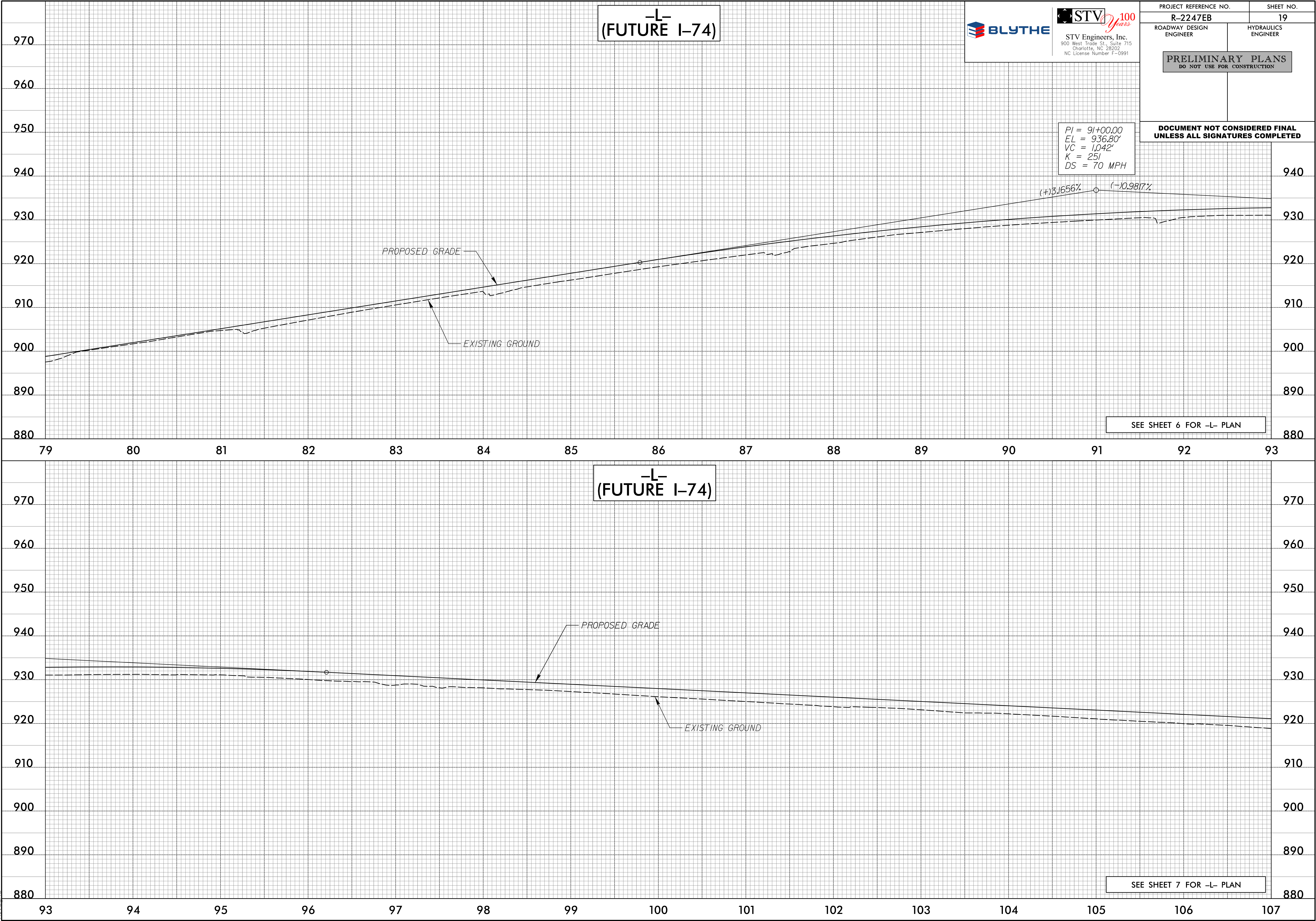
**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

MATCHLINE
-Y68- STA 126+00
SEE SHEET 16

22A

CITY OF WINSTON SALEM
DB 2064 PG 2702
DB 1386 PG 383
DB 1369 PG 1417
DB 1292 PG 423
DB 1292 PG 274
DB 1291 PG 1405
DB 1414 PG 1399

3/22/2019
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-L-
(FUTURE I-74)



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NC License Number E-0991

PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

19

ROADWAY DESIGN
ENGINEER

HYDRAULICS
ENGINEER

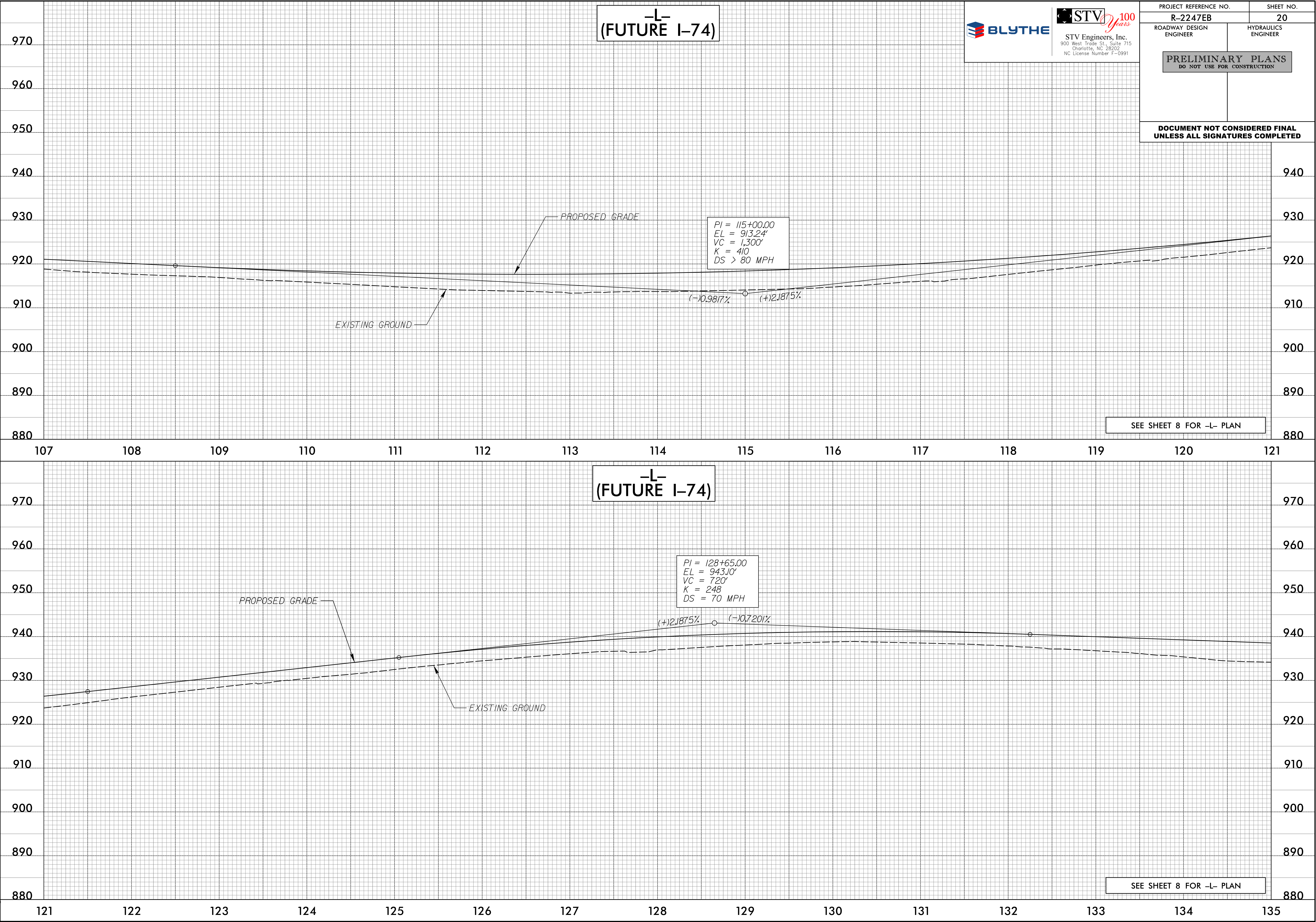
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

**DOCUMENT NOT CONSIDERED FINAL
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SEE SHEET 6 FOR -L- PLAN

-L-
(FUTURE I-74)

SEE SHEET 7 FOR -L- PLAN





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PROJECT REFERENCE NO. R-2247EB		SHEET NO. 20
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED		

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-L-
(FUTURE I-74)



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PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

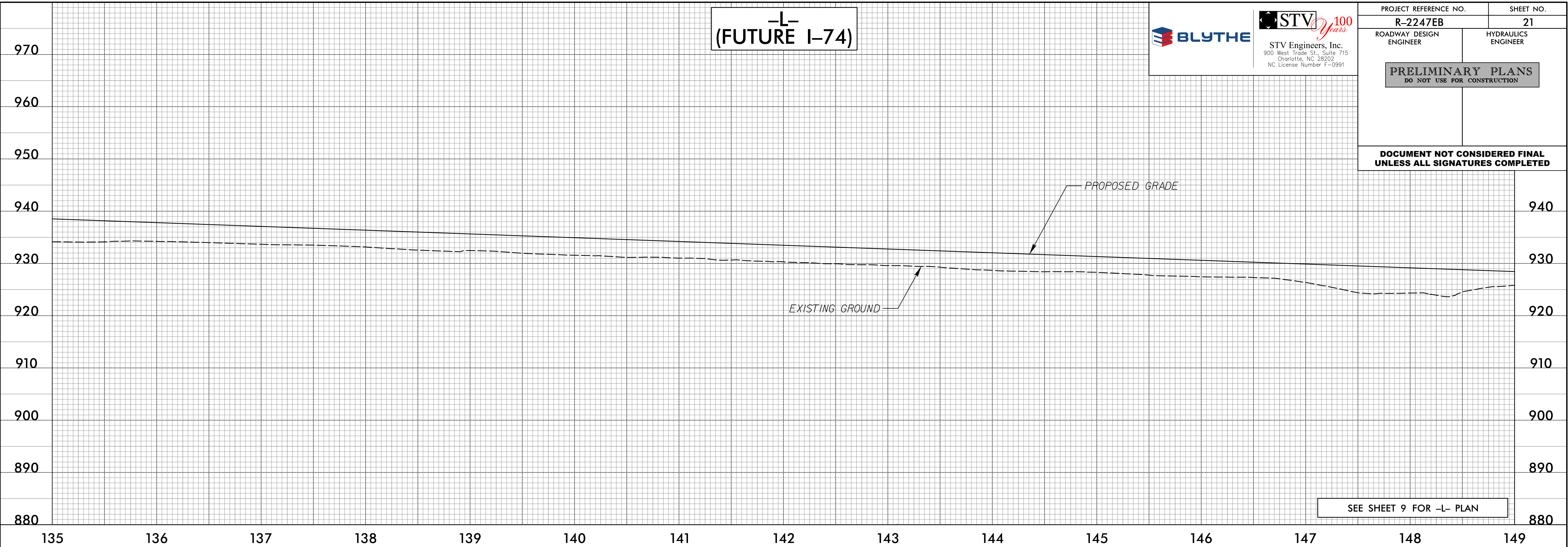
21

ROADWAY DESIGN
ENGINEER

HYDRAULICS
ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

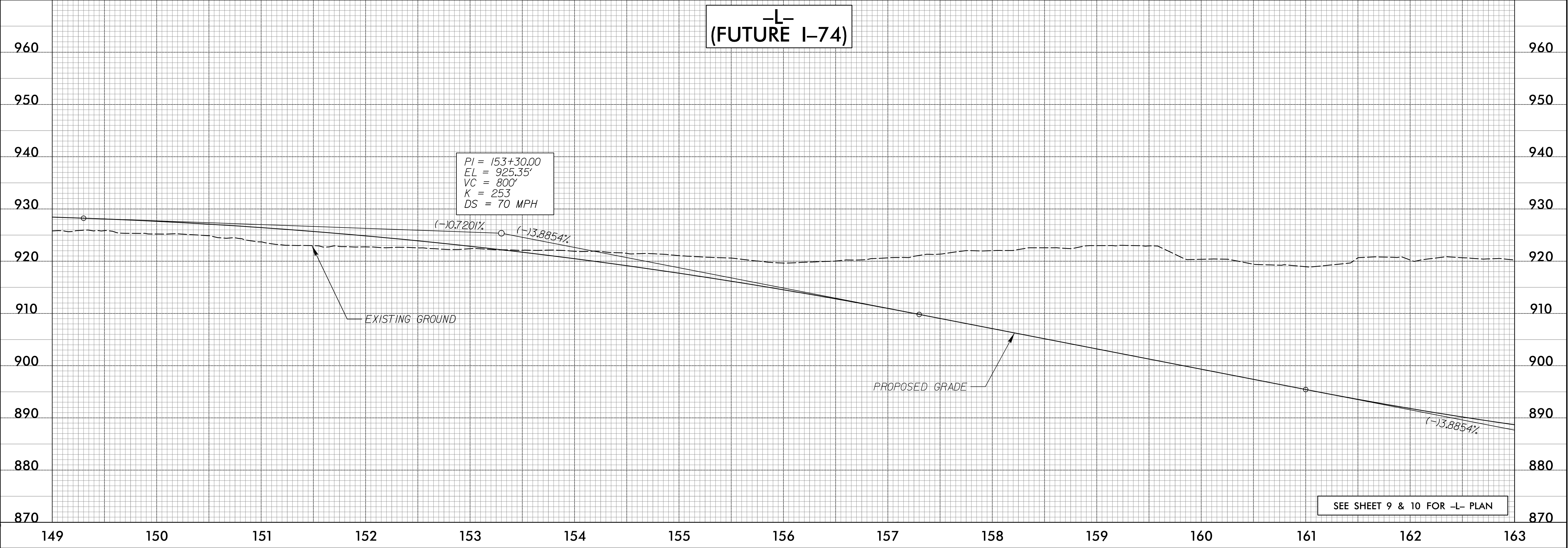
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UNLESS ALL SIGNATURES COMPLETED



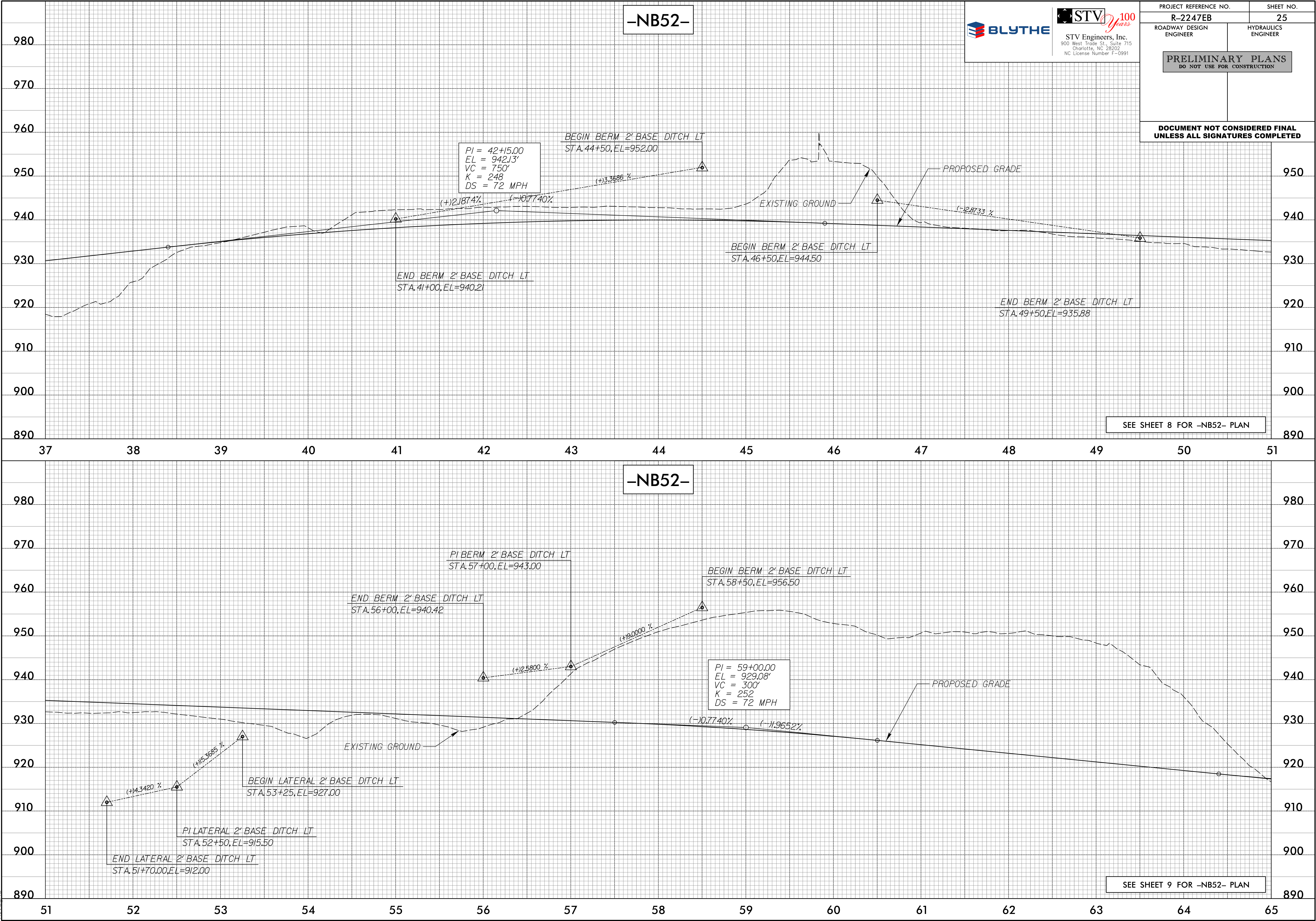
-L-
(FUTURE I-74)

PI = 153+30.00
EL = 925.35'
VC = 800'
K = 253
DS = 70 MPH

(-)-0.7201% (-)-3.8854%



3/22/2018
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dlv





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PROJECT REFERENCE NO.
R-2247EB

ROADWAY DESIGN ENGINEER

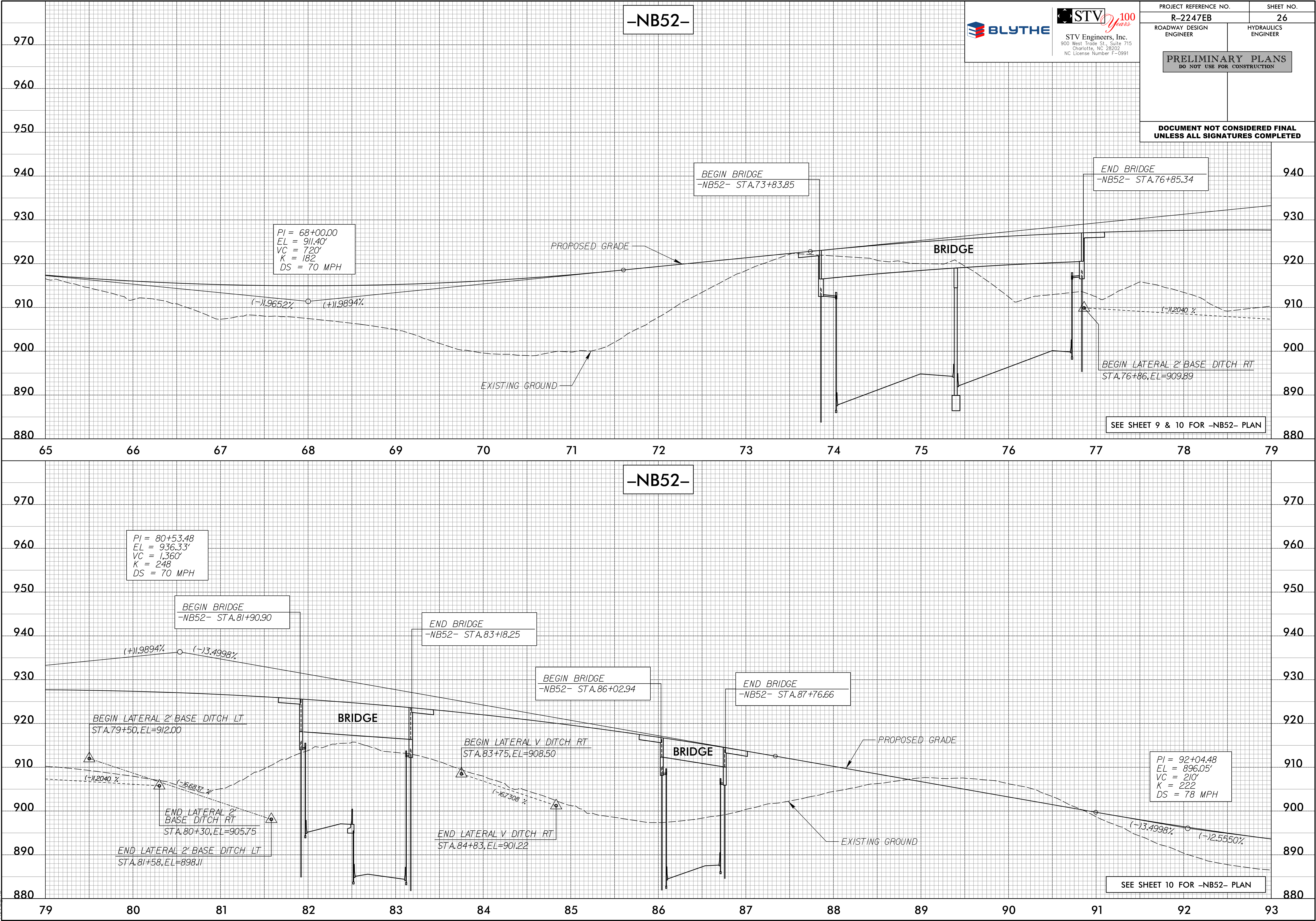
SHEET NO.
25

HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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3/22/2018
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dlv0606

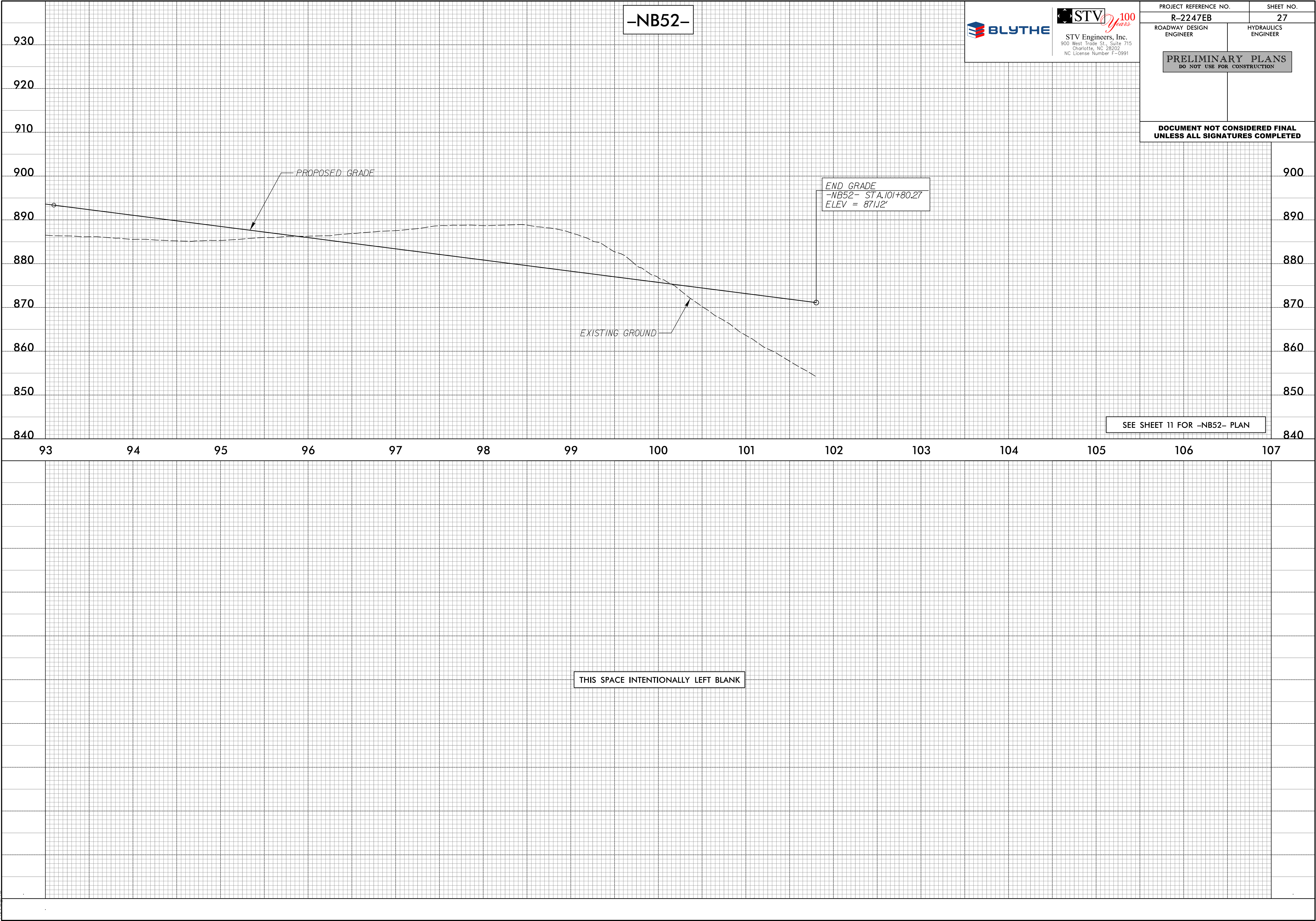




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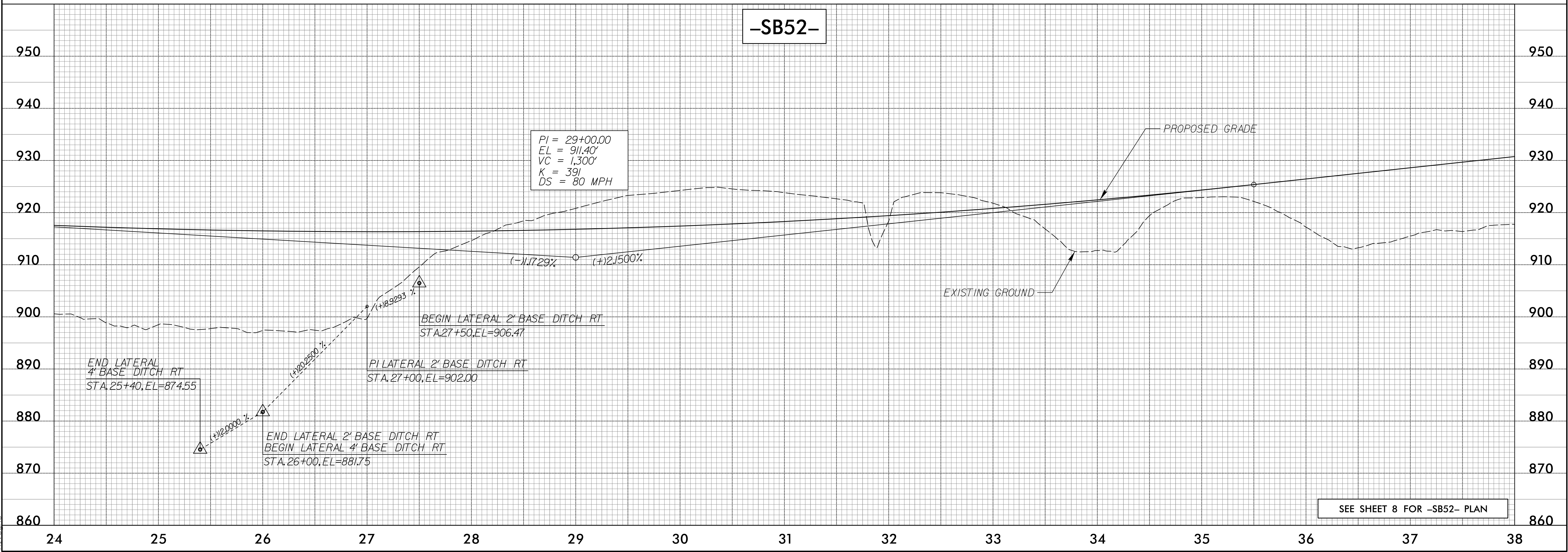
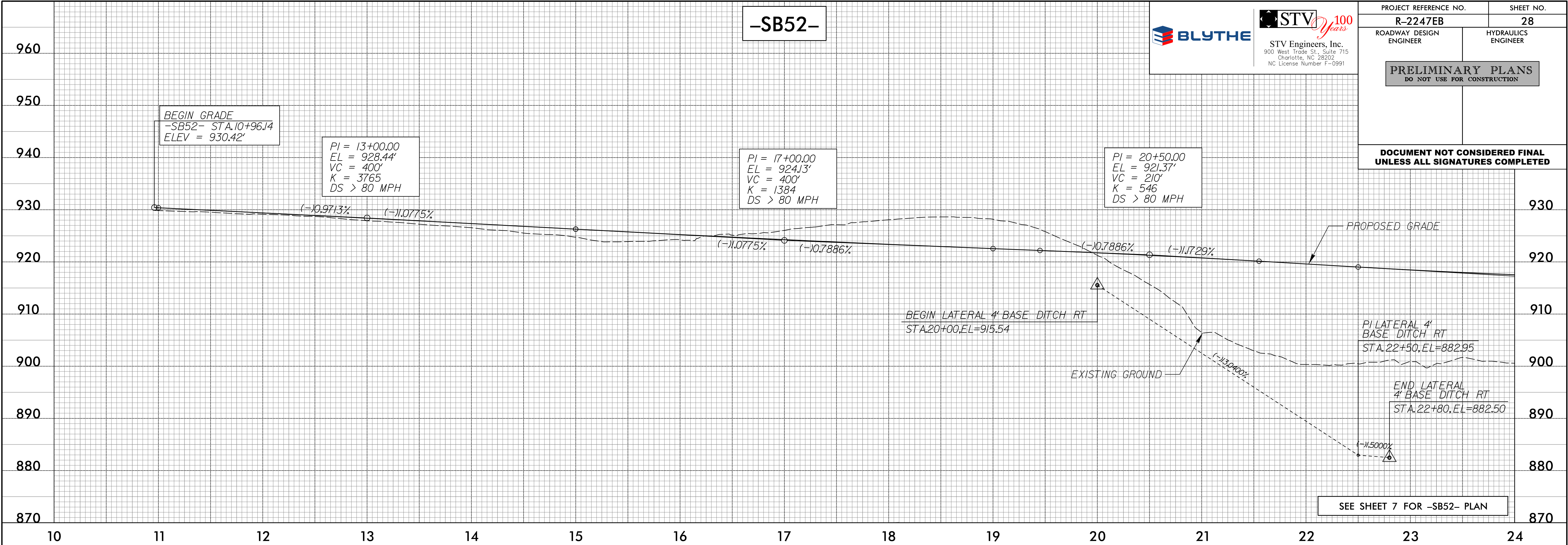
PROJECT REFERENCE NO. R-2247EB		SHEET NO. 26
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED		

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dlv063

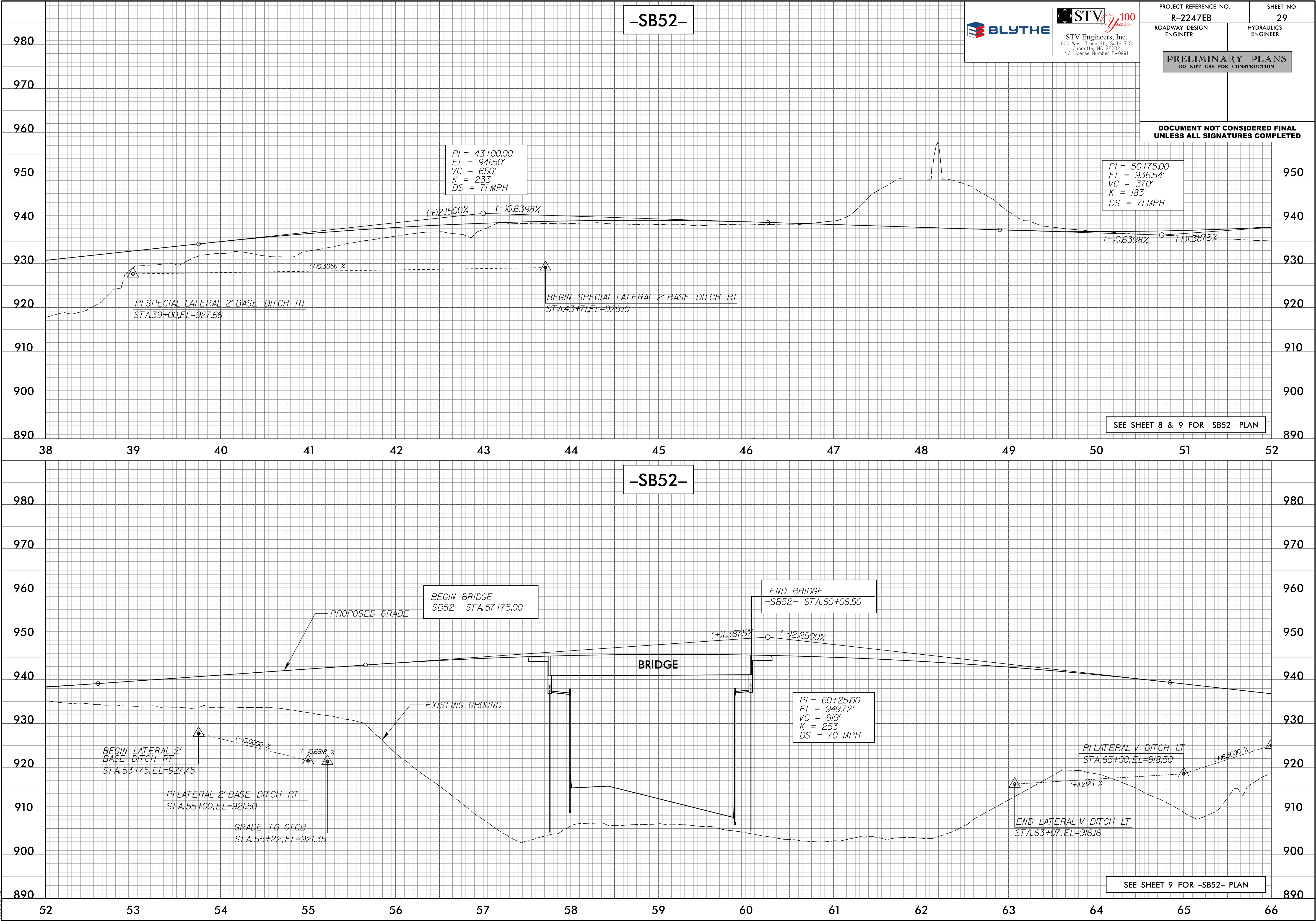


PROJECT REFERENCE NO.		SHEET NO.	
R-2247EB		27	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

DOCUMENT NOT CONSIDERED FINAL
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dlv060



3/22/2018
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dlv060

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PROJECT REFERENCE NO.
R-2247EB

SHEET NO.
30

ROADWAY DESIGN
ENGINEER

HYDRAULICS
ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

-SB52-

950

940

930

920

910

900

890

880

870

860

66

67

68

69

70

71

72

73

74

75

76

77

78

79

80

END SPECIAL LATERAL V DITCH
BEGIN LATERAL V DITCH LT
STA.66+00,EL=925.00

PI = 69+50.00
EL = 928.9'
VC = 210'
K = 420
DS > 80 MPH

BEGIN BERM V DITCH LT
STA.69+00,EL=934.00

PI BERM V DITCH LT
STA.68+00,EL=932.50

END BERM V DITCH LT
BEGIN SPECIAL LATERAL V DITCH LT
STA.67+00,EL=929.00

BEGIN LATERAL 2' BASE DITCH LT
STA.72+00,EL=912.35

END LATERAL 2' BASE DITCH LT
BEGIN LATERAL 6' BASE DITCH LT
STA.73+50,EL=894.90

BEGIN LATERAL 2' BASE DITCH RT
STA.76+75,EL=899.50

END LATERAL 6' BASE DITCH LT
STA.78+00,EL=891.06

END LATERAL 2' BASE DITCH LT
BEGIN LATERAL 6' BASE DITCH LT
STA.78+25,EL=891.77

END LATERAL 2' BASE DITCH RT
BEGIN LATERAL 4' BASE DITCH RT
STA.78+25,EL=882.10

END LATERAL 4' BASE DITCH RT
STA.78+39,EL=881.68

EXISTING GROUND

PROPOSED GRADE

CULVERT HYDRAULIC DATA

DESIGN DISCHARGE = 32.3 CFS
DESIGN FREQUENCY = 50 YRS
DESIGN HW ELEVATION = 892.1 FT
BASE DISCHARGE = 34.4 CFS
BASE FREQUENCY = 100 YRS
BASE HW ELEVATION = 892.3 FT
OVERTOPPING DISCHARGE = 132.4 CFS
OVERTOPPING FREQUENCY = 500+ YRS
OVERTOPPING ELEVATION = 913.9 FT

SEE SHEET 9 & 10 FOR -SB52- PLAN

-SB52-

950

940

930

920

910

900

890

880

870

860

80

81

82

83

84

85

86

87

88

89

90

91

92

93

94

BEGIN BRIDGE
-SB52- STA.80+26.28

END BRIDGE
-SB52- STA.81+80.27

BEGIN BRIDGE
-SB52- STA.85+14.47

END BRIDGE
-SB52- STA.86+04.22

BEGIN SPECIAL LATERAL V DITCH LT
STA.83+00,EL=897.50

END SPECIAL LATERAL V DITCH LT
STA.84+89,EL=895.61

BEGIN LATERAL 2' BASE DITCH LT
STA.80+00,EL=896.81

BEGIN SPECIAL LATERAL 2' BASE DITCH LT
STA.88+50,EL=888.69

END SPECIAL LATERAL 2' BASE DITCH LT
STA.87+12,EL=885.00

EXISTING GROUND

PROPOSED GRADE

CULVERT HYDRAULIC DATA

DESIGN DISCHARGE = 41 CFS
DESIGN FREQUENCY = 50 YRS
DESIGN HW ELEVATION = 886.0 FT
BASE DISCHARGE = 4.4 CFS
BASE FREQUENCY = 100 YRS
BASE HW ELEVATION = 886.1 FT
OVERTOPPING DISCHARGE = 37.1 CFS
OVERTOPPING FREQUENCY = 500+ YRS
OVERTOPPING ELEVATION = 898.17 FT

PI = 90+50.00
EL = 892.16'
VC = 210'
K = 291
DS > 80 MPH

SEE SHEET 10, 11 & 15 FOR -SB52- PLAN

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01 vba

-SB52-



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PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

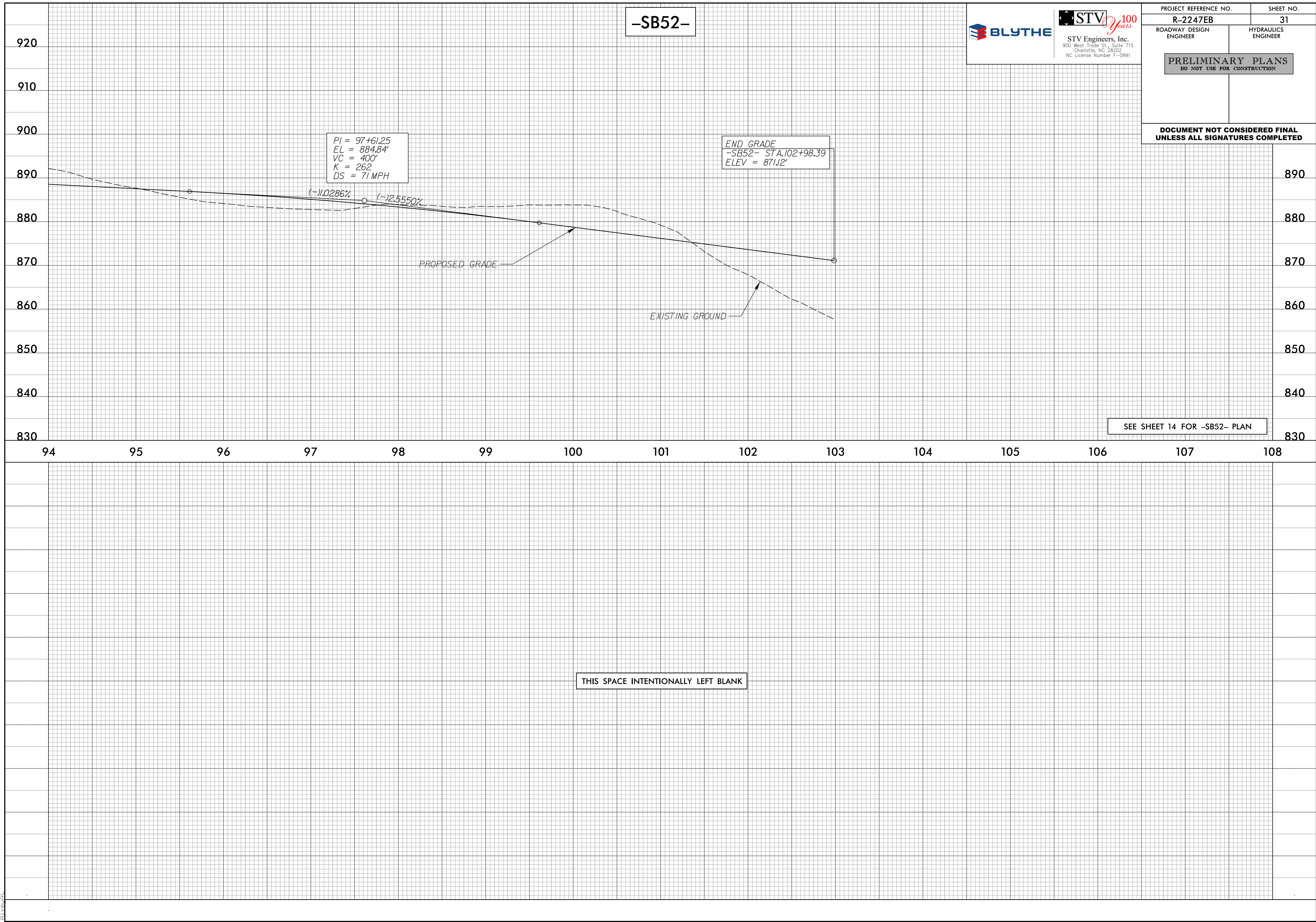
31

ROADWAY DESIGN
ENGINEER

HYDRAULICS
ENGINEER

PRELIMINARY PLANS
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DOCUMENT NOT CONSIDERED FINAL
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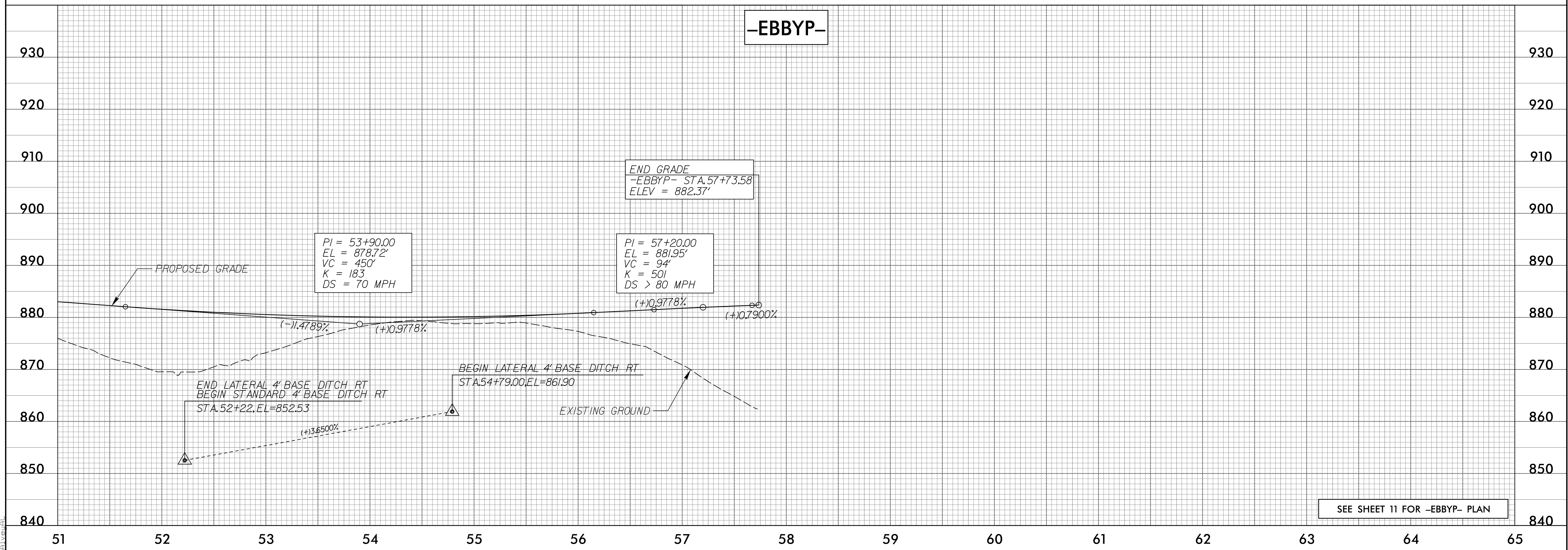
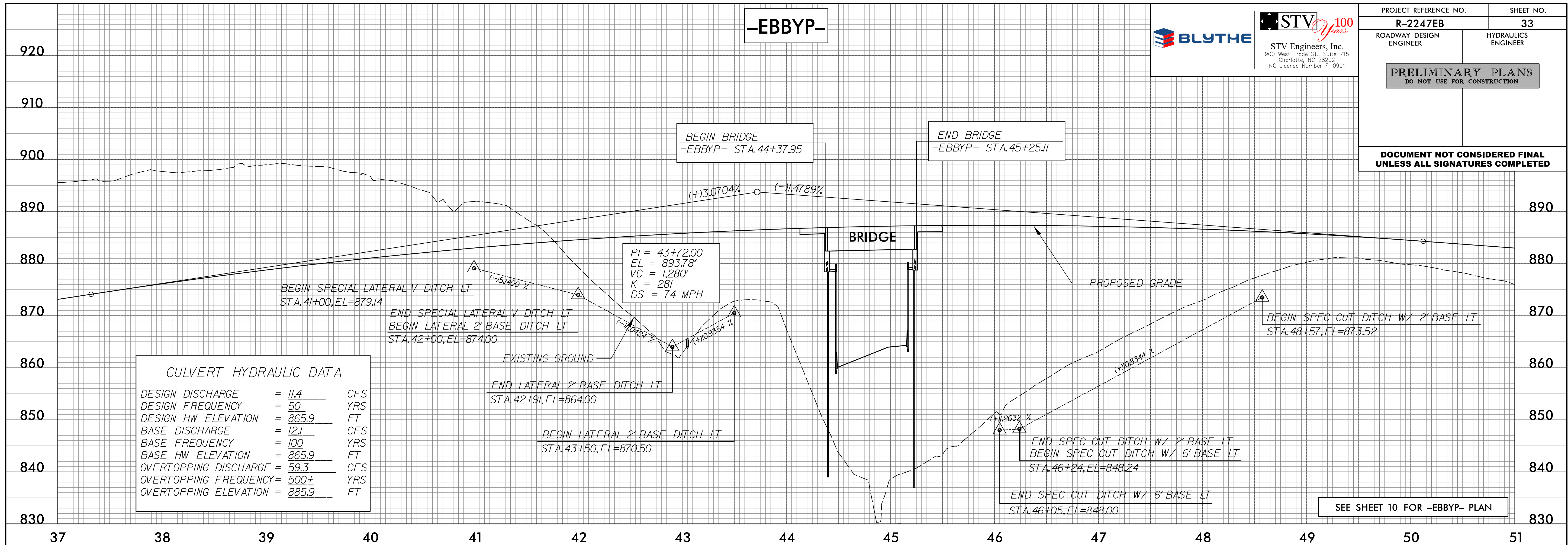
SEE SHEET 14 FOR -SB52- PLAN

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PROJECT REFERENCE NO.		SHEET NO.	
R-2247EB		33	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			

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dlv060

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PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

34

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

PRELIMINARY PLANS

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DOCUMENT NOT CONSIDERED FINAL

UNLESS ALL SIGNATURES COMPLETED

-WBBYP-

EXISTING GROUND

PROPOSED GRADE

END GRADE R-2247EA
BEGIN GRADE
-WBBYP- STA.15+50.00
ELEV = 905.06'

-WBBYP- STA.10+00.00
ELEV = 924.54'

PI = 12+00.00
EL = 919.06'
VC = 320'
K = 254
DS = 71 MPH

FUTURE
R2247-EA
GRADE
(BY OTHERS)

(-12.7415%)

(-14.0000%)

SEE SHEET 13 FOR -WBBYP- PLAN

-WBBYP-

EXISTING GROUND

PROPOSED GRADE

END LATERAL 2' BASE DITCH LT
STA.32+36,EL=894.62

BEGIN LATERAL 2' BASE DITCH LT
STA.36+28,EL=905.75

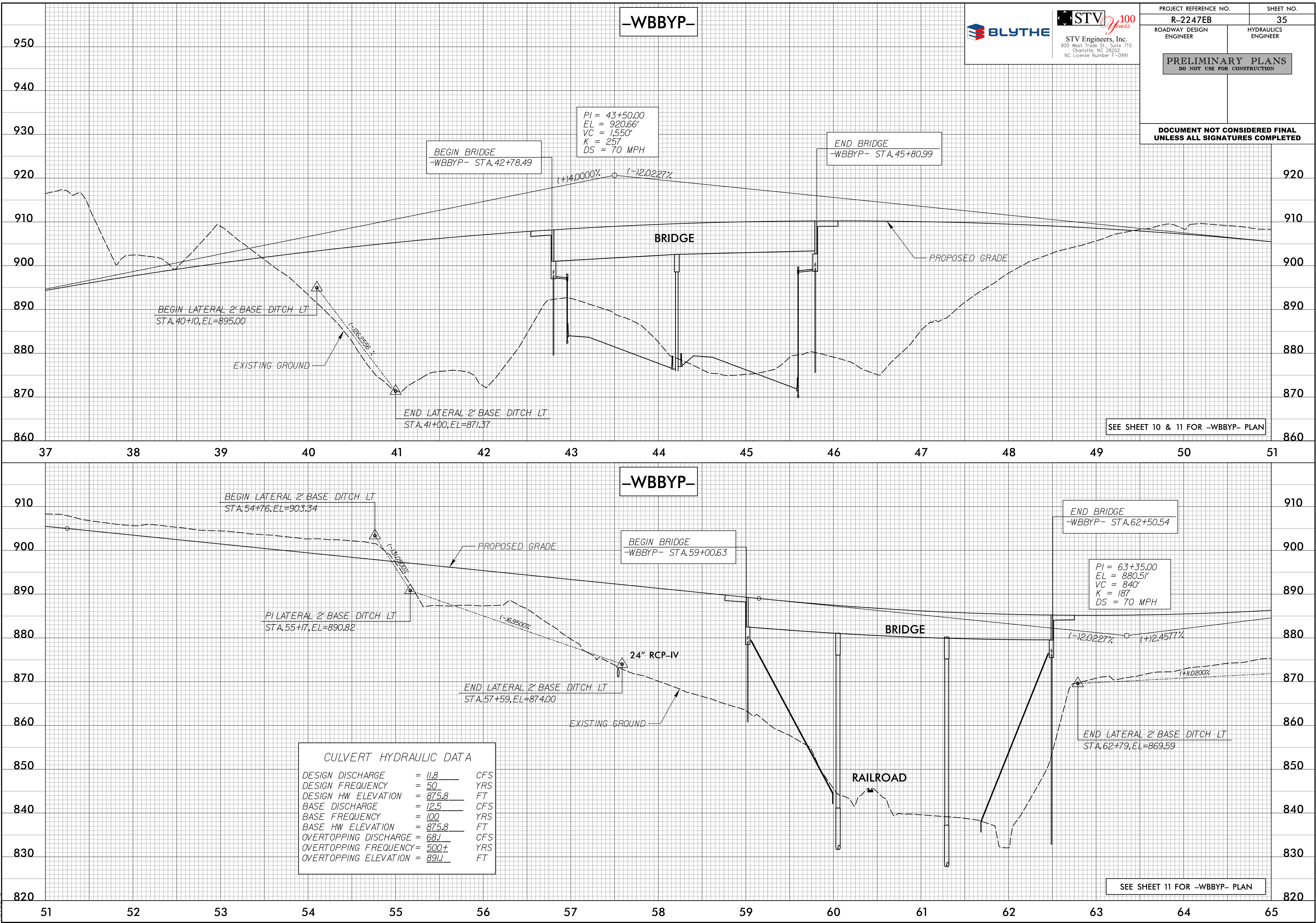
PI = 27+55.00
EL = 856.86'
VC = 1450'
K = 181
DS = 70 MPH

(-14.0000%)

(+14.0000%)

SEE SHEET 10 FOR -WBBYP- PLAN

3/22/2018
R:\Roadway\Projects\PSHY\R2247EB_rdy_psh34_PFL.dgn
dlv0000



—WBBYP—



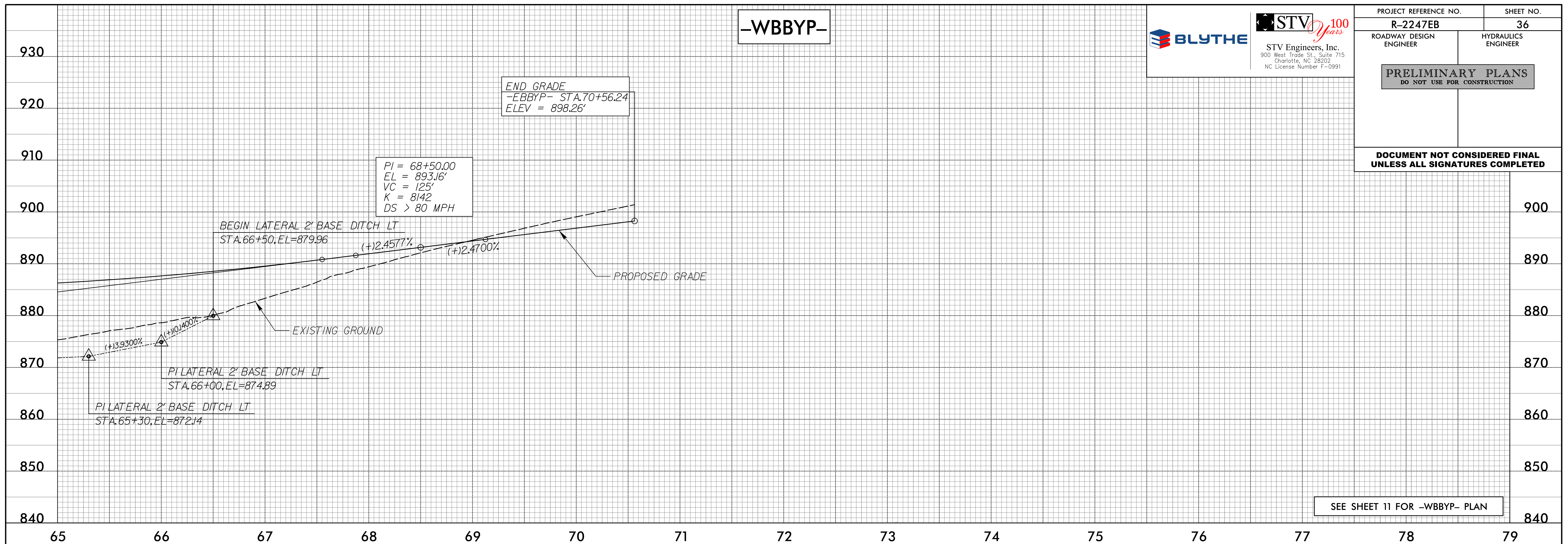
SHEET NO.

3.6

**HYDRAULICS
ENGINEER**

PRELIMINARY PLANS
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AlveuAC

-RPA-



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PROJECT REFERENCE NO.
R-2247EB

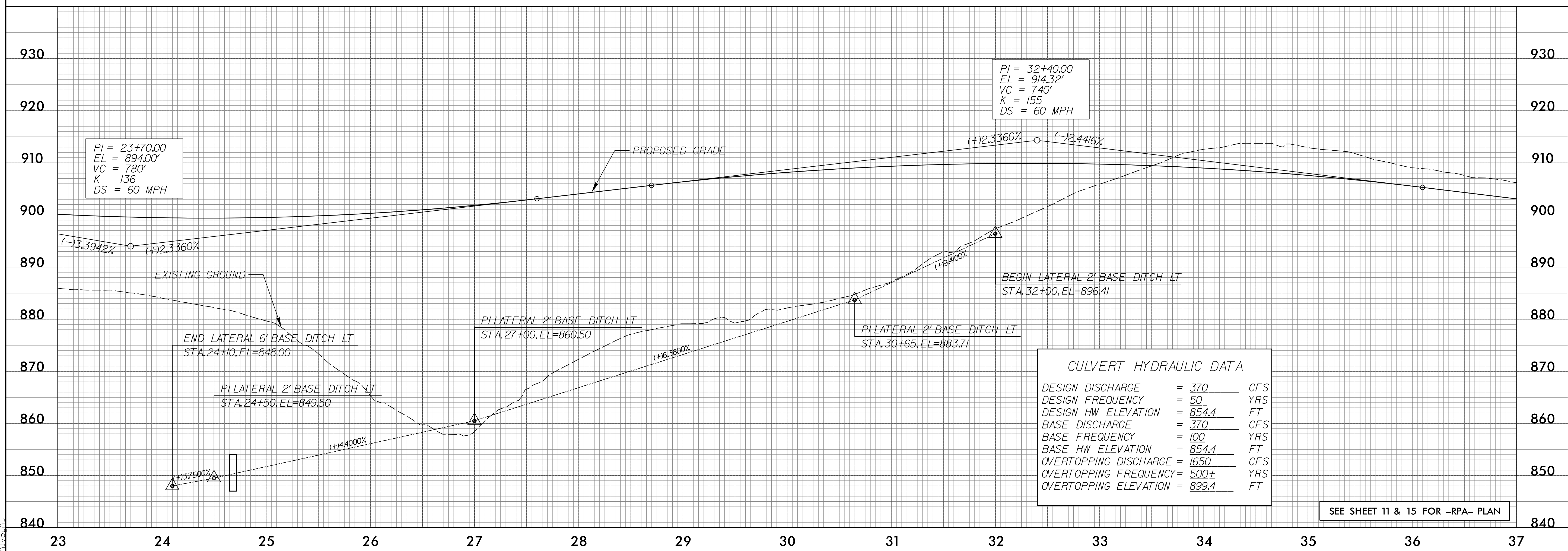
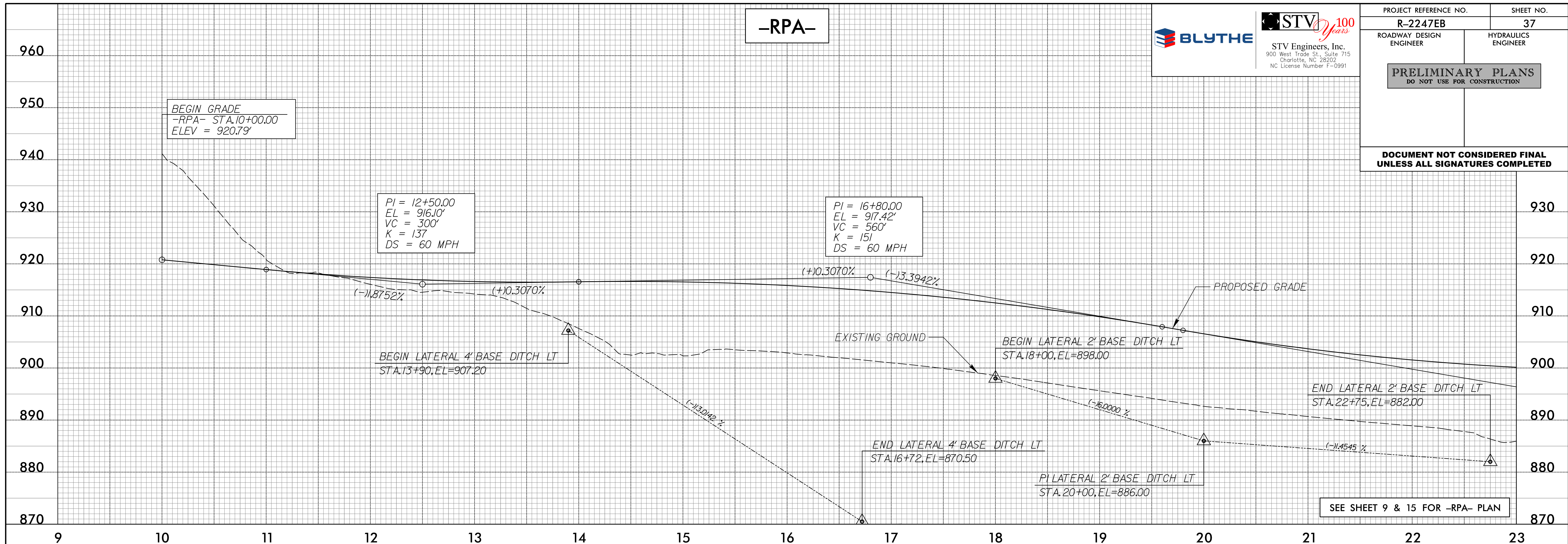
ROADWAY DESIGN ENGINEER

SHEET NO.
37

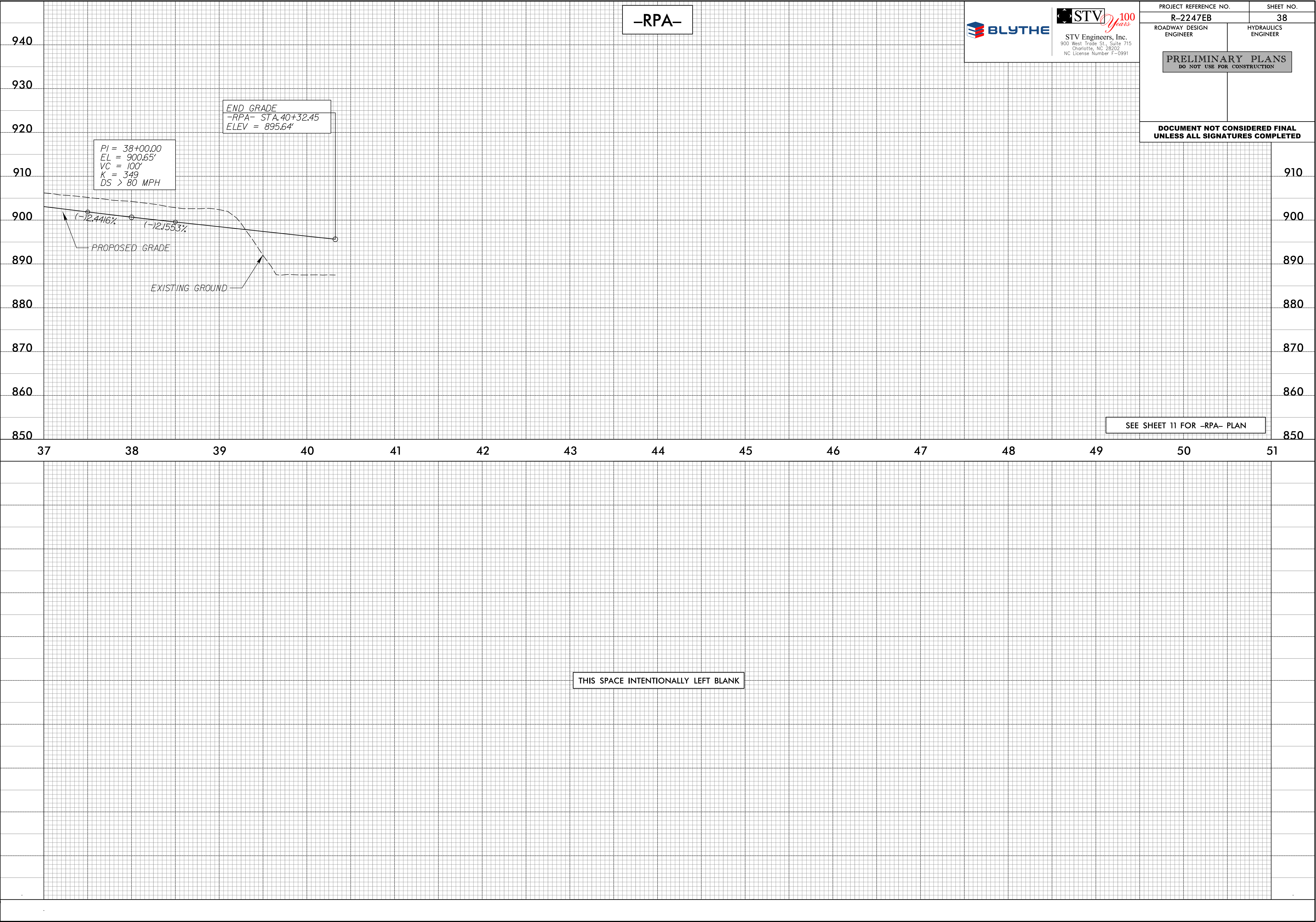
HYDRAULICS ENGINEER

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dlv060



-RPA-



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PROJECT REFERENCE NO. R-2247EB		SHEET NO. 38
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED		

PI = 38+00.00
EL = 900.65'
VC = 100'
K = 349
DS > 80 MPH

END GRADE
-RPA- STA. 40+32.45
ELEV = 895.64'

(-)2.4416%
(-)2.1553%
PROPOSED GRADE

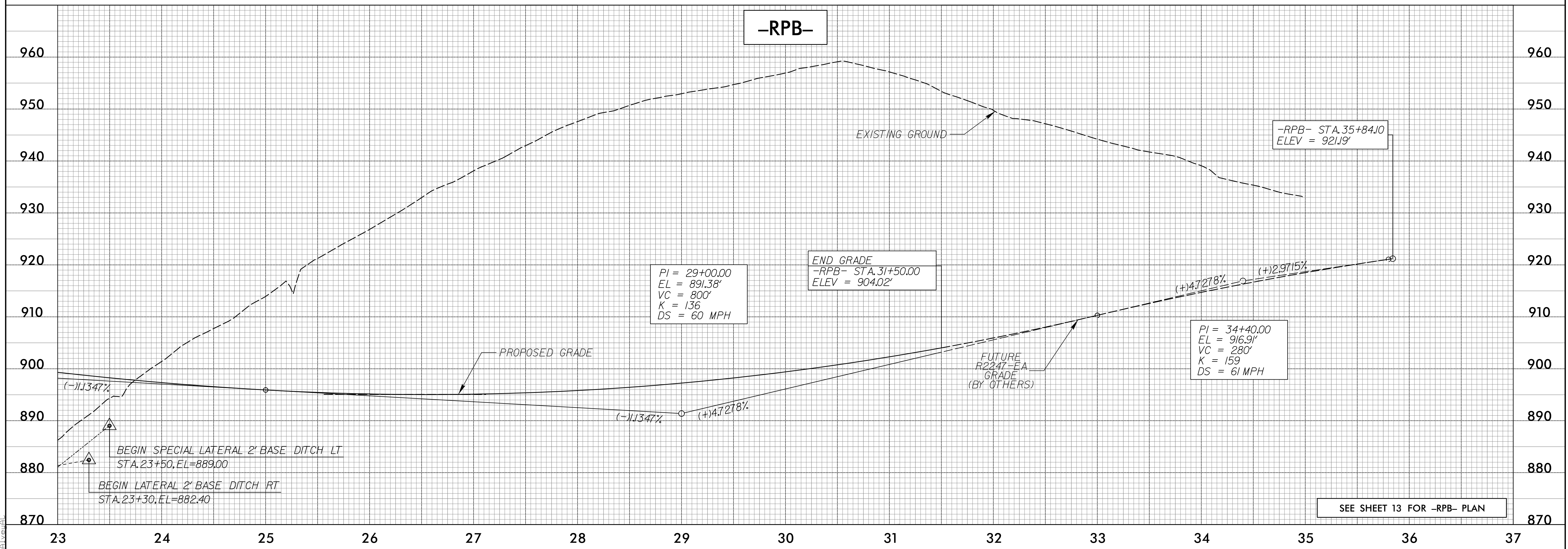
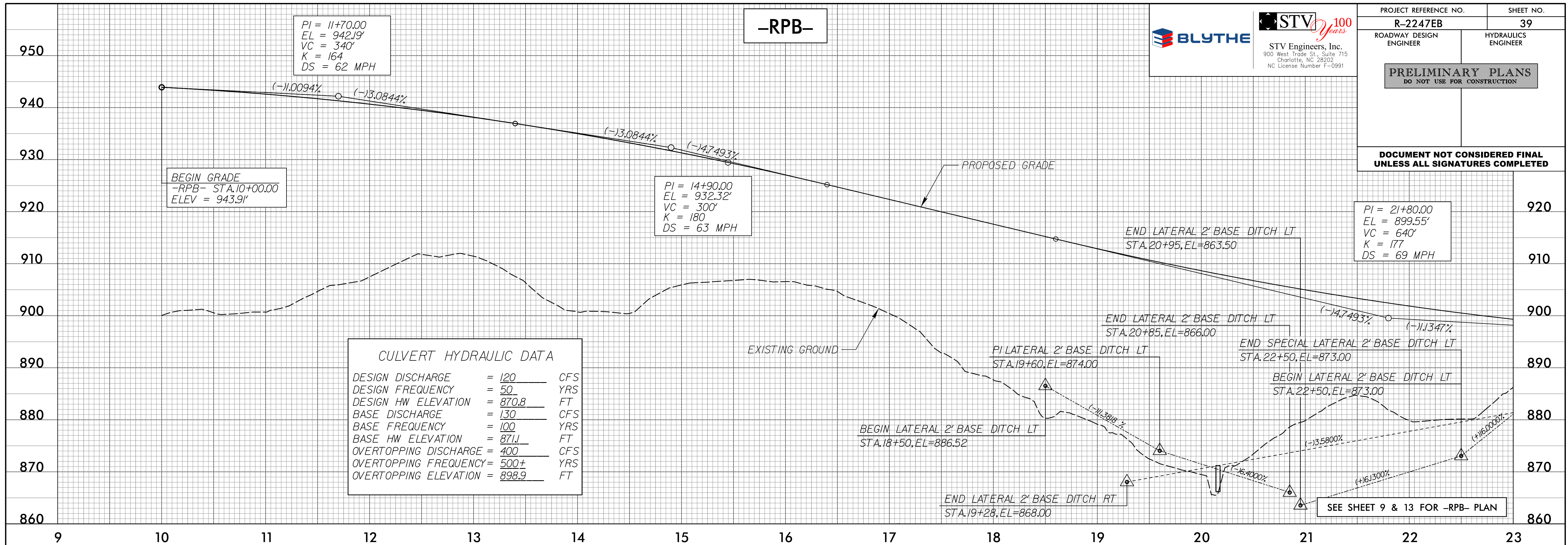
EXISTING GROUND

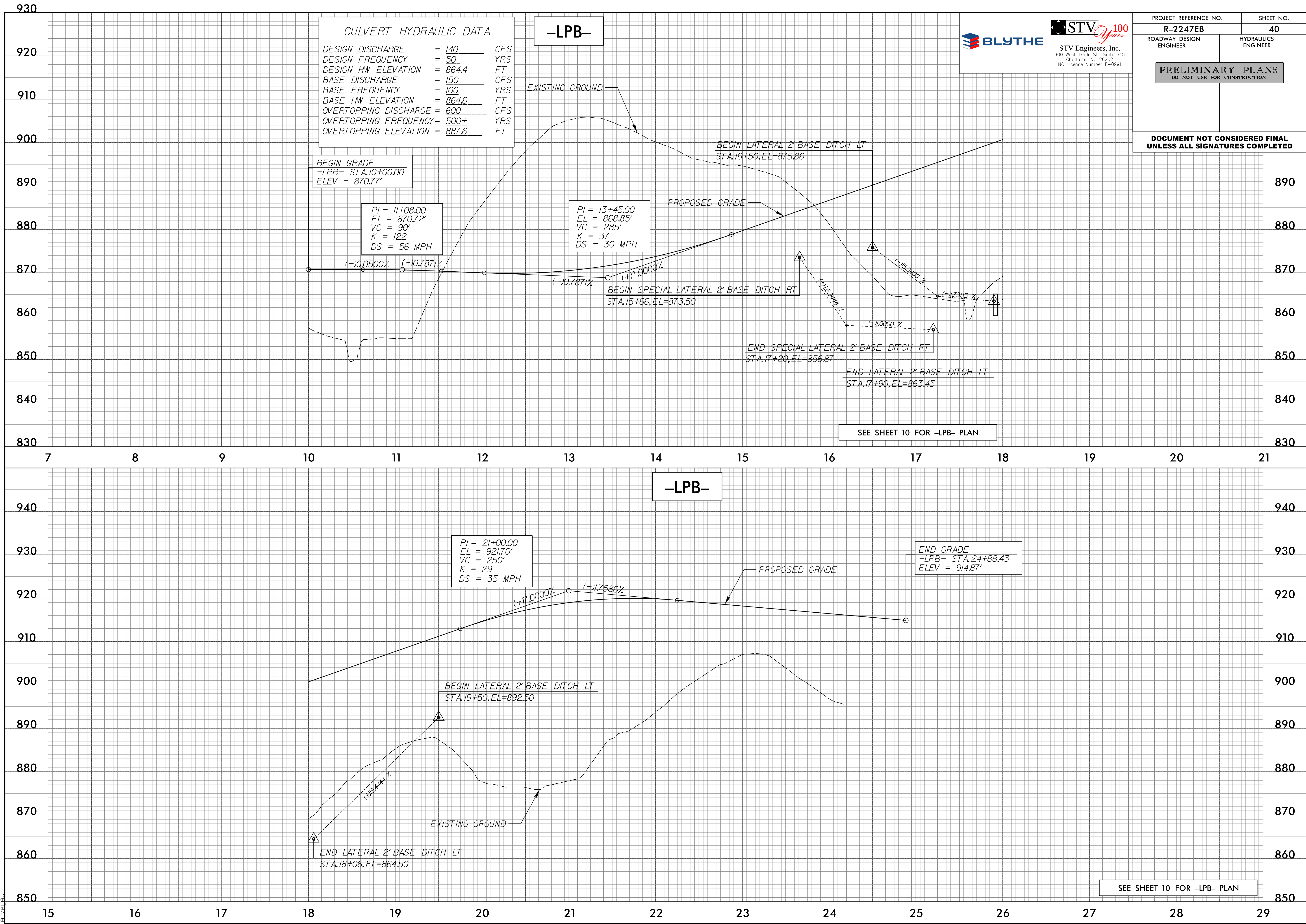
SEE SHEET 11 FOR -RPA- PLAN

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PRELIMINARY PLANS
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DOCUMENT NOT CONSIDERED FINAL
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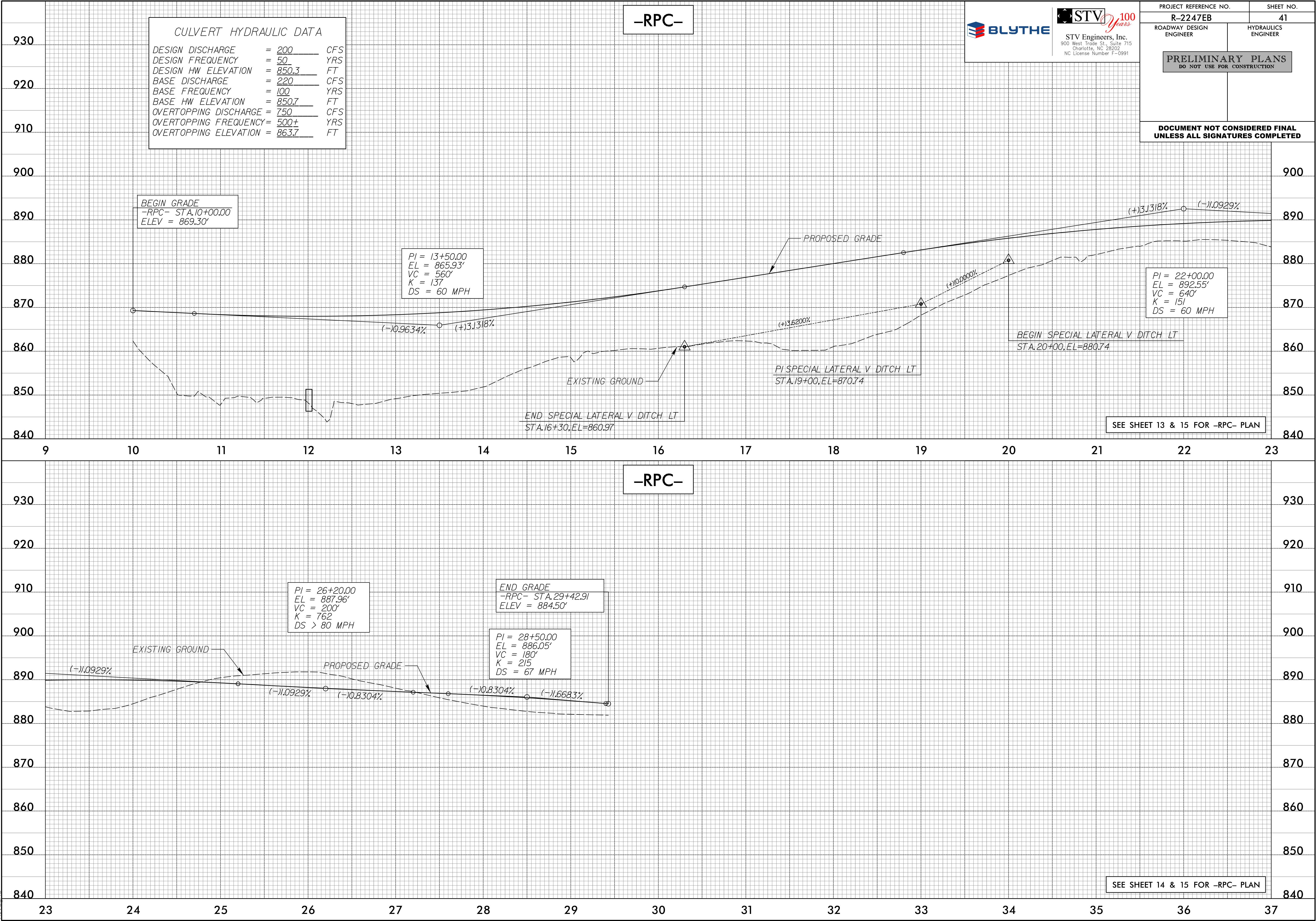




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PROJECT REFERENCE NO.		SHEET NO.	
R-2247EB		40	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			
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PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

41

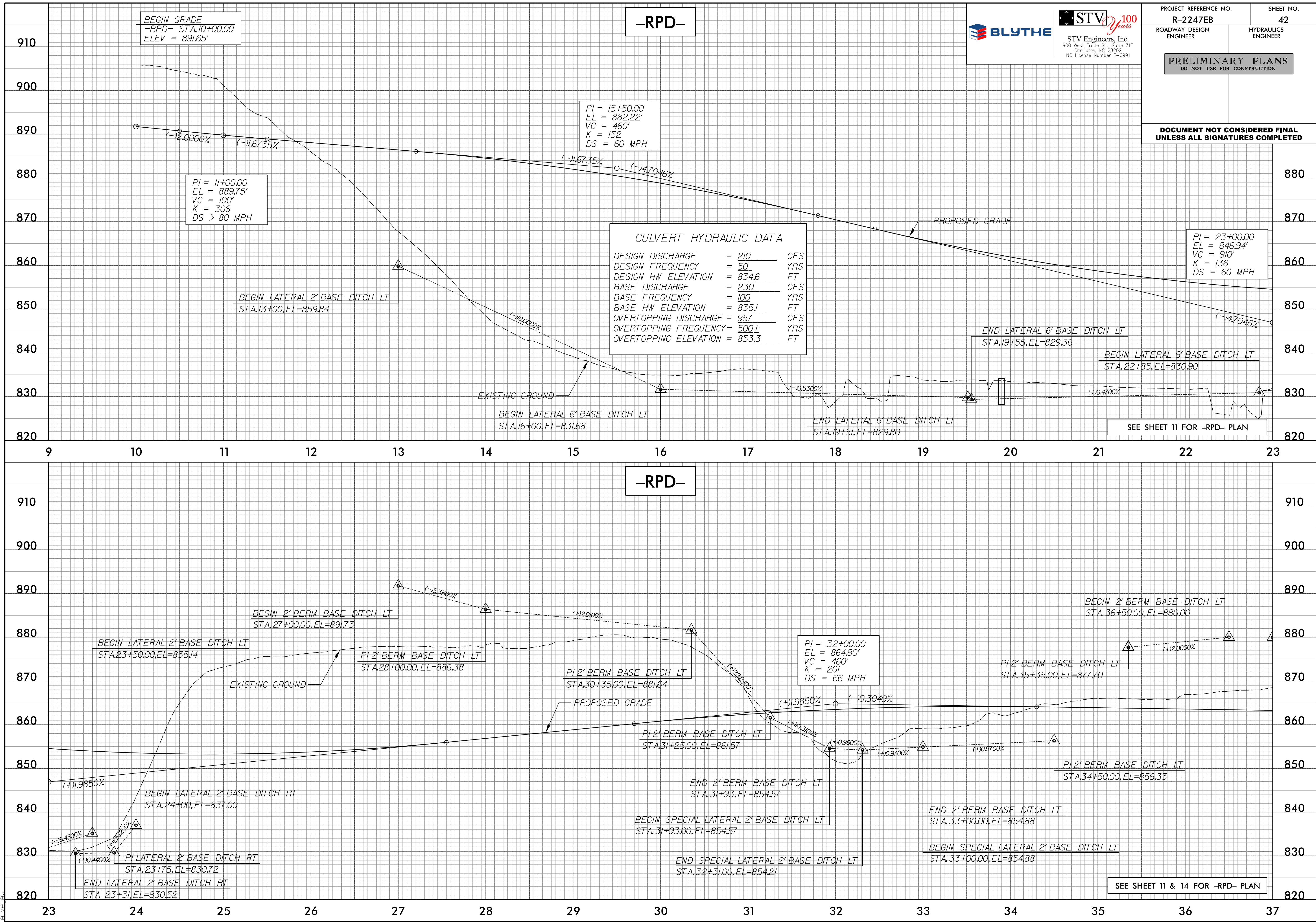
ROADWAY DESIGN
ENGINEER

HYDRAULICS
ENGINEER

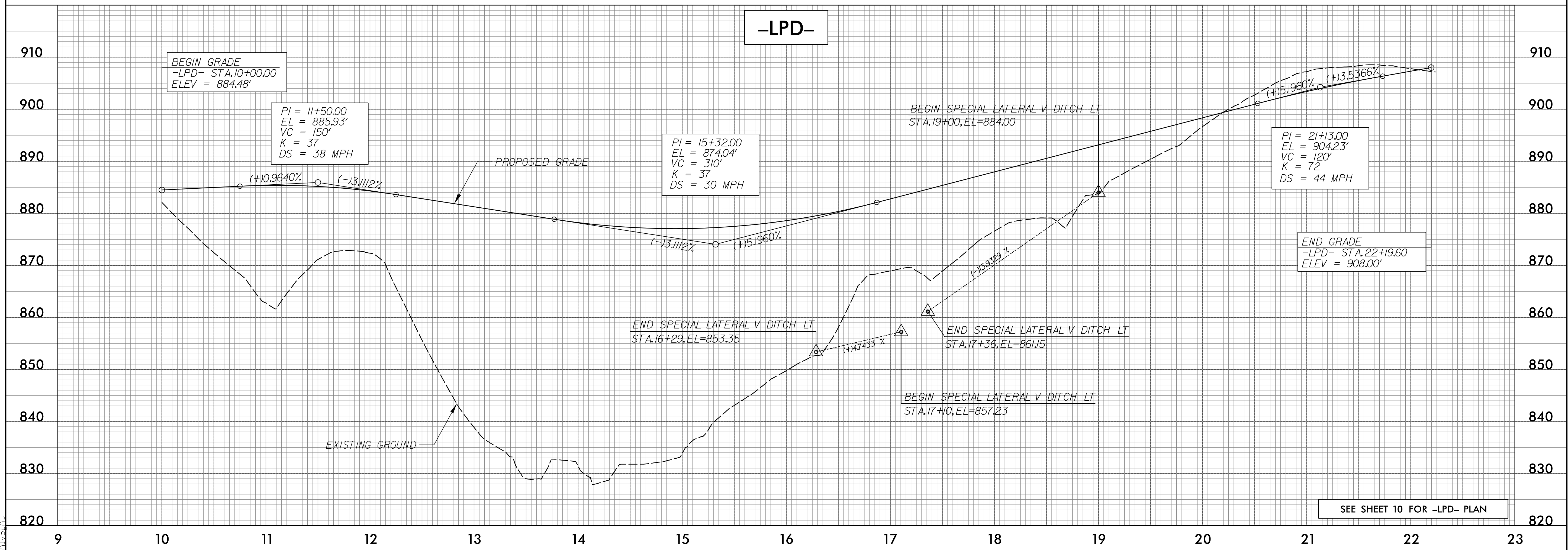
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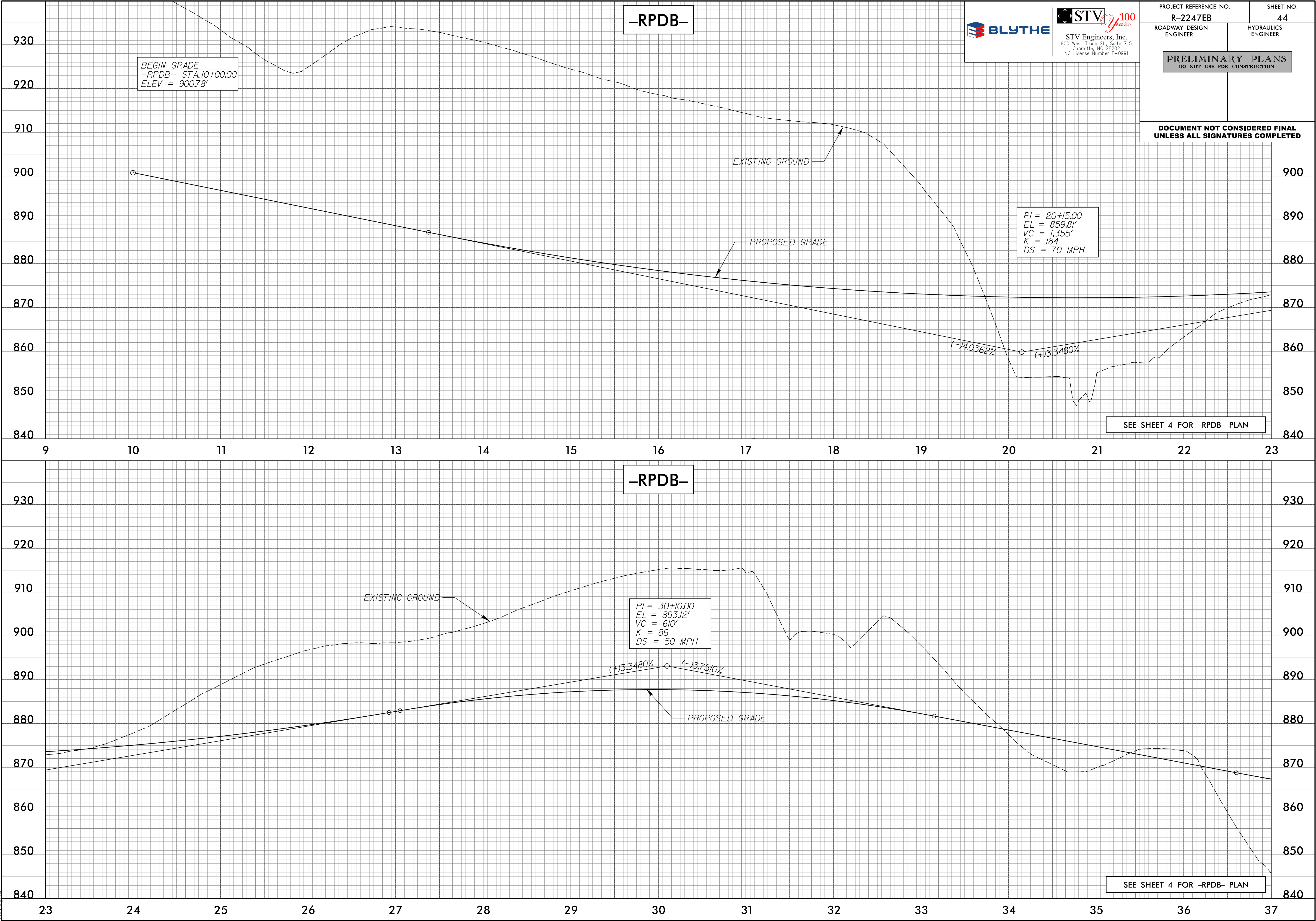


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dlv



SEE SHEET 10 FOR -LPD- PLAN

3/22/2018
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01 veldc



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PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

44

ROADWAY DESIGN
ENGINEER

HYDRAULICS
ENGINEER

PRELIMINARY PLANS
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R:\Roadway\Projects\PSHYR2247EB_rdy_psh44_PFL.dgn
dlv0606

-Y13-
ZIGLAR RD.



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NC License Number E-0991

PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

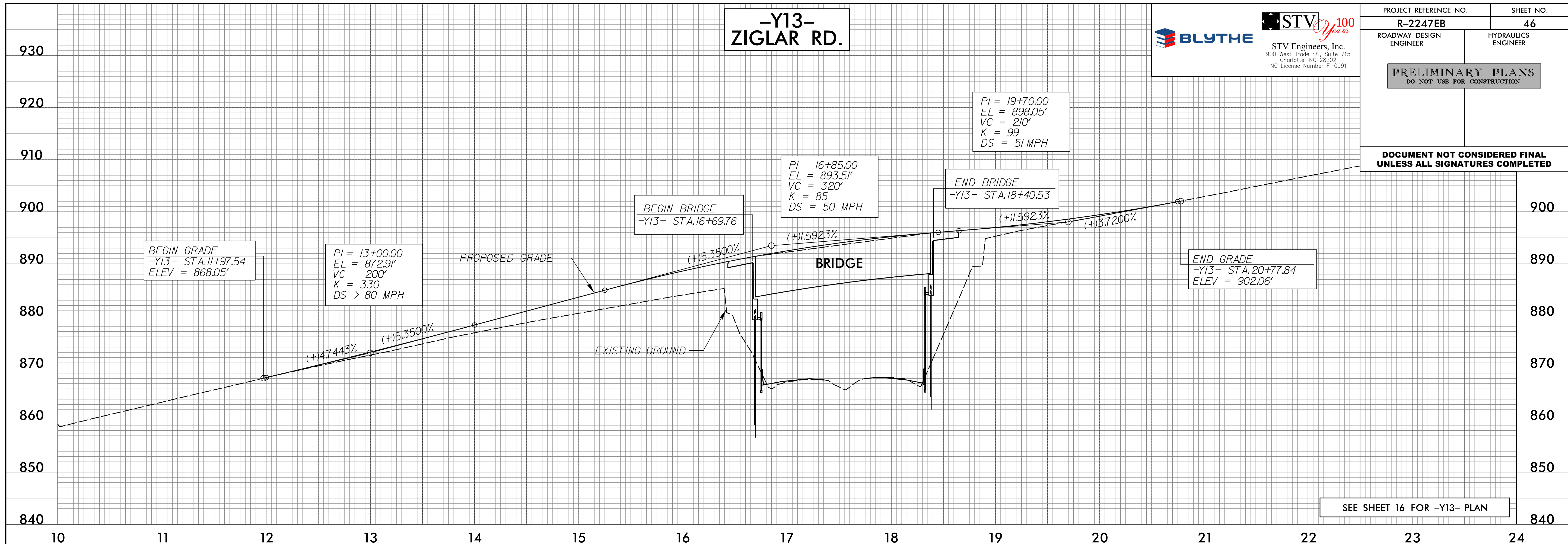
46

ROADWAY DESIGN
ENGINEER

HYDRAULICS
ENGINEER

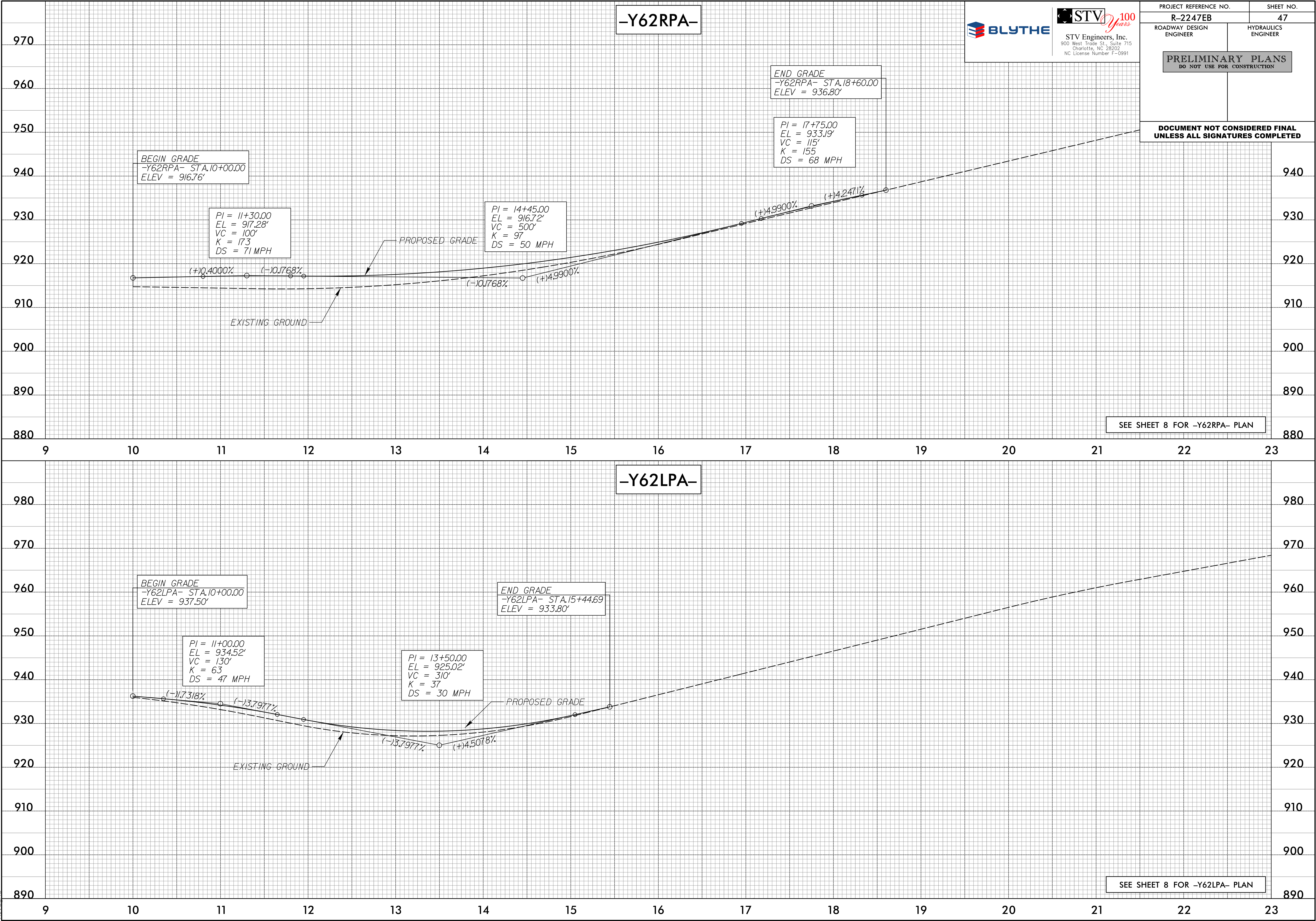
PRELIMINARY PLANS
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SEE SHEET 16 FOR -Y13- PLAN

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PROJECT REFERENCE NO. R-2247EB		SHEET NO. 47
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED		

3/22/2018
R:\060606\way\Pro\PSHYR2247EB_rdu_psh47_PFL.dgn
01 veldac

BLYTHE

STV

100

Years

STV Engineers, Inc.

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Charlotte, NC 28202

NC License Number E-0991

PROJECT REFERENCE NO.

R-2247EB

SHEET NO.

51

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

PRELIMINARY PLANS

DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL

UNLESS ALL SIGNATURES COMPLETED

-RPDDR1-

BEGIN GRADE
-RPDDR1- STA.10+04.00
ELEV = 853.21'

EXISTING GROUND

PROPOSED GRADE

END GRADE
-RPDDR1- STA.12+99.32
ELEV = 831.42'

Vertical Curve Data:
1. PI = 10+15.00, EL = 853.54', VC = 22', K = 3, DS = 15 MPH
2. PI = 10+40.00, EL = 852.54', VC = 28', K = 5, DS = 18 MPH
3. PI = 12+35.00, EL = 833.04', VC = 126', K = 17, DS = 20 MPH

Grades: (+)3.0000%, (-)4.0000%, (-)10.0000%, (-)10.0000%, (-)2.5187%

SEE SHEET 11 FOR -RPDDR1- PLAN

-RPDBDR1-

BEGIN GRADE
-RPDBDR1- STA.10+04.00
ELEV = 869.92'

EXISTING GROUND

PROPOSED GRADE

END GRADE
-RPDBDR1- STA.15+64.20
ELEV = 826.50'

Vertical Curve Data:
1. PI = 10+55.00, EL = 868.90', VC = 100', K = 12, DS = 25 MPH
2. PI = 14+60.00, EL = 828.40', VC = 140', K = 17, DS = 20 MPH

Grades: (-)2.0000%, (-)10.0000%, (-)10.0000%, (-)11.8236%

SEE SHEET 14 FOR -RPDBDR1- PLAN

3/22/2018
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