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, Sutie 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-Upon 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 sedimentaion and infiltration of runoff by providing additional attenuation. In ditches with slopes that made vegetative liners inpractable, 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)						

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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)						

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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?
4	-L- 65+50 M 36.225012 / -80.317576	(1)Beaver Dam Creek	0.0	6.0	6.0	0.4	35	200	2.21%	1.2	1.6	1.6	1.7	No	No
5	-L- 68+50 M 36.224488 / -80.316793	(1)Beaver Dam Creek	0.0	6.0	6.0	0.5	51	300	0.83%	1.8	1.2	2.3	1.4	No	No
5	-L- 68+50 M 36.224488 / -80.316793	(1)Beaver Dam Creek	0.0	6.0	6.0	0.5	50	300	1.25%	1.7	1.4	2.2	1.5	No	No
5	-L- 71+50 M 36.223934 / -80.316058	(1)Beaver Dam Creek	0.0	6.0	6.0	0.6	55	300	2.85%	1.8	1.9	2.3	2.0	No	No
5	-L- 74+50 M 36.223364 / -80.315324	(1)Beaver Dam Creek	0.0	6.0	6.0	0.8	82	400	2.66%	2.7	2.0	3.4	2.1	No	No
5	-L- 78+50 M 36.222560 / -80.314342	(1)Beaver Dam Creek	0.0	6.0	6.0	0.6	62	300	3.23%	2.0	2.0	2.6	2.2	No	No
5	-L- 81+50 M 36.221996 / -80.313675	(1)Beaver Dam Creek	0.0	6.0	6.0	0.6	65	300	3.14%	2.2	2.0	2.8	2.2	No	No
6	-L- 84+50 M 36.221396 / -80.312986	(1)Beaver Dam Creek	0.0	6.0	6.0	0.6	65	300	2.67%	2.2	1.9	2.8	2.1	No	No
6	-L- 87+50 M 36.220747 / -80.312358	(1)Beaver Dam Creek	0.0	6.0	6.0	0.7	67	300	2.23%	2.2	1.8	2.9	1.9	No	No
6	-L- 90+50 M 36.220104 / -80.311723	(1)Beaver Dam Creek	0.0	6.0	6.0	0.8	82	350	0.66%	2.8	1.3	3.5	1.4	No	No
7	-L- 98+50 M 36.218376 / -80.310146	(1)Beaver Dam Creek	0.0	6.0	6.0	1.1	109	450	0.73%	3.7	1.5	4.7	1.6	No	No
7	-L- 106+00 M 36.216654 / -80.308665	(1)Beaver Dam Creek	0.0	6.0	6.0	0.8	81	750	1.00%	2.5	1.5	3.2	1.6	No	No
7	-L- 109+70 M 36.215807 / -80.307924	(1)Beaver Dam Creek	0.0	6.0	6.0	0.4	40	370	1.17%	1.1	1.2	1.4	1.3	No	No
8	-L- 112+50 M 36.215170 / -80.307369	(1)Beaver Dam Creek	0.0	6.0	6.0	0.4	35	280	0.35%	1.0	0.7	1.2	0.8	No	No
8	-L- 112+50 M 36.215170 / -80.307369	(1)Beaver Dam Creek	0.0	6.0	6.0	0.1	7	65	0.13%	0.2	0.3	0.2	0.4	No	No
8	-L- 113+15 M 36.215046 / -80.307252	(1)Beaver Dam Creek	0.0	6.0	6.0	0.3	28	260	0.46%	0.8	0.8	1.0	0.8	No	No
8	-L- 115+75 M 36.214467 / -80.306781	(1)Beaver Dam Creek	0.0	6.0	6.0	0.5	45	425	1.30%	1.2	1.3	1.6	1.4	No	No
8	-L- 120+00 M 36.213499 / -80.305959	(1)Beaver Dam Creek	0.0	6.0	6.0	0.6	64	380	2.12%	1.1	1.5	1.4	1.6	No	No
8	-L- 123+80 M 36.212643 / -80.305229	(1)Beaver Dam Creek	0.0	6.0	6.0	0.4	43	410	1.79%	1.2	1.4	1.5	1.5	No	No

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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

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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

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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

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WBS Element: C204137 **TIP No.:** R-2247EB **County(ies):** Forsyth

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?
10	-WBBYP- 26+50 Rt 36.201983 / -80.300453	(2)Grassy Creek	0.0	6.0	4.0	0.9	86	400	1.44%	1.6	1.5	2.0	1.8	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: **TIP No.:** R-2247EB **County(ies):** Forsyth

Preformed Scour Holes and Energy Dissipators

Sheet No.	Station & Coordinates (Road and Non Road Projects)	Surface Water Body	Energy Dissipator Type	Riprap Type	Drainage Area (ac)	Conveyance Structure	Pipe/Structure Dimensions (in)	Q10 (cfs)	V10 (fps)	BMP Associated w/ Buffer Rules?
11	-WBBYP- STA. 63+05 LT 36.2039022, -80.2883330	(2)Grassy Creek	PSH	Class 'B'	0.7	Pipe	15	3.5	3.8	N/A

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.

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

Level Spreaders, Hazardous Spill Basins, and Forebays

Sheet No.	Station & Coordinates (Road and Non Road Projects)	Surface Water Body	Level Spreader, Hazardous Spill Basin, or Forebay?	Drainage Area (ac)	New Built-Upon Area (ac)	Required / Minimum Treatment			Treatment Achieved		BMP Associated w/ Buffer Rules?
10	-LPD- 16+12.40 RT 36.2011996, -80.2948557	(2)Grassy Creek	Forebay	9.98	3.42	0.1 inches of runoff from NBUA	1236.0	cf	5728.0	cf	N/A

*Hazardous spill basins are pollution prevention measures designed for spill containment rather than stormwater treatment. Under Required / Minimum Treatment and Treatment Achieved, provide the minimum required volume and the actual HSB volume, respectively. Refer to the NCDOT Stormwater Best Management Practices Toolbox (2014) for design guidance.

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

Other Best Management Practices

Sheet No.	Station & Coordinates (Road and Non Road Projects)	Surface Water Body	BMP Type	Drainage Area (ac)	New Built-Upon Area (ac)	Volume Treated (ac-ft)	Precipitation Depth Treated over NBUA (in)	BMP Associated w/ Buffer Rules?
9	-NB52- 69+01.64 RT 36.2059193/ -80.2984690	(2)Grassy Creek	Dry Detention Basin	21.1	7.4	0.53	0.90	No
10	-LPD- 16+18 RT 36.2010889/ -80.2945279	(2)Grassy Creek	Dry Detention Basin	10.0	3.4	0.66	2.44	No

Additional Comments

TIP PROJECT: R-2247EB

CONTRACT: C204137

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

FORSYTH COUNTY

PERMIT DRAWING
SHEET 1 OF 70

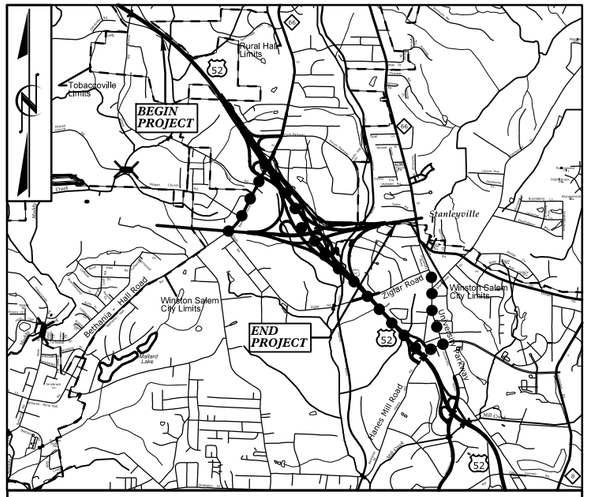
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2247EB	1	

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34409.3.17	NHP-0052(056)	P.E., ROW, UTILITIES & CONSTRUCTION

LOCATION: WINSTON-SALEM NORTHERN BELTWAY – INTERCHANGE AT US 52 (FUTURE I-74)

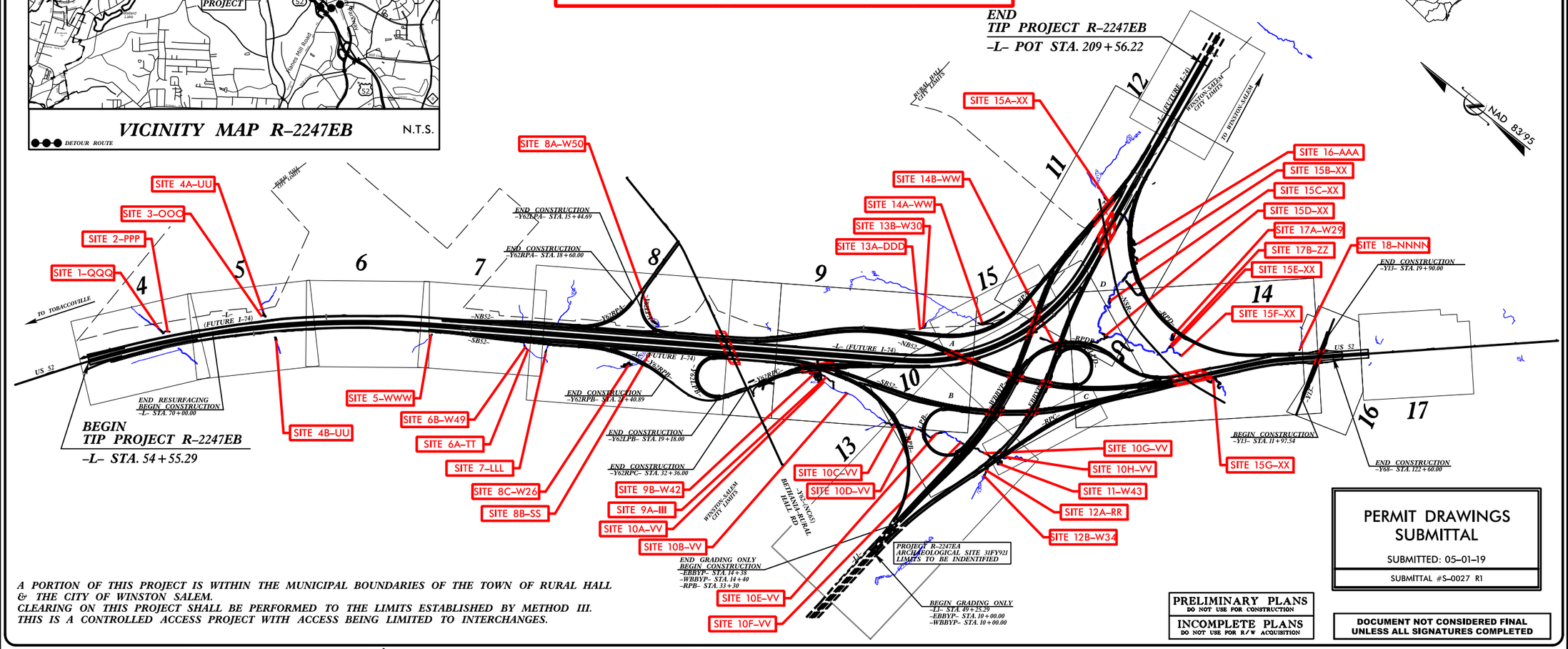
TYPE OF WORK: GRADING, DRAINAGE, PAVING, SIGNING AND STRUCTURES

WETLAND AND SURFACE WATER IMPACTS PERMIT



VICINITY MAP R-2247EB N.T.S.

DETOUR ROUTE



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.

PERMIT DRAWINGS SUBMITTAL
SUBMITTED: 05-01-19
SUBMITTAL #S-0027 R1

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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

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:

BLYTHE

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

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
AUGUST 21, 2018

LETTING DATE:
AUGUST 21, 2018

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 DEPARTMENT OF TRANSPORTATION

4/29/2019
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pugrims

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	4
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

BLYTHE

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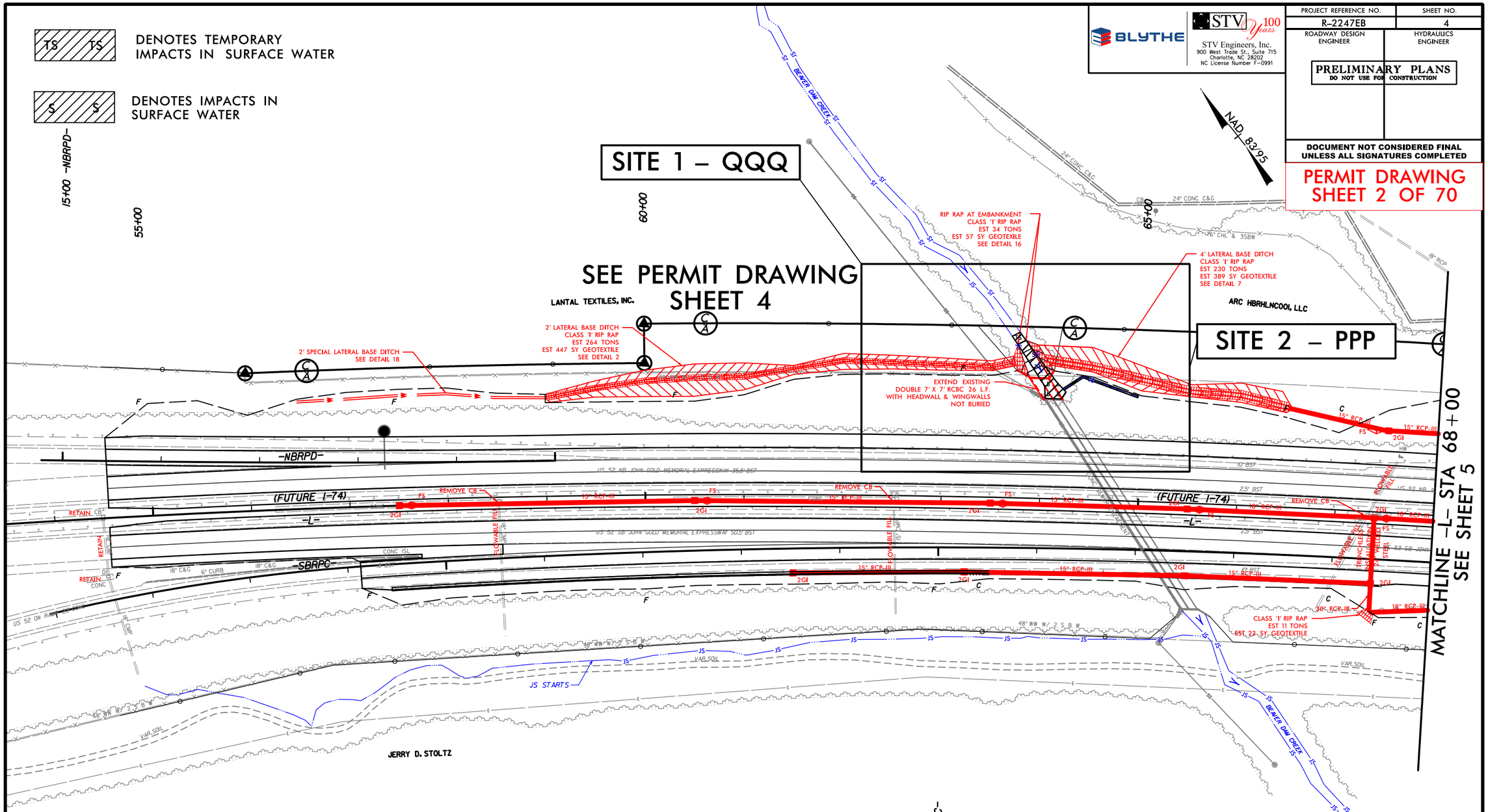
SHEET 2 OF 70

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S S DENOTES IMPACTS IN SURFACE WATER

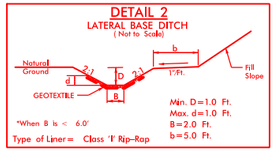


DETAIL 16
RIP RAP AT EMBANKMENT
(Not to Scale)

Type of Liner= CL 'I' Rip-Rap

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

DETAIL 2
LATERAL BASE DITCH
(Not to Scale)



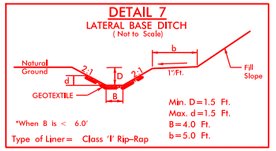
Min. D=1.0 Ft.
Max. d=1.0 Ft.
B=2.0 Ft.
b=5.0 Ft.

*When B is < 6.0'

Type of Liner= Class 'I' Rip-Rap

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

DETAIL 7
LATERAL BASE DITCH
(Not to Scale)



Min. D=1.5 Ft.
Max. d=1.5 Ft.
B=4.0 Ft.
b=5.0 Ft.

*When B is < 6.0'

Type of Liner= Class 'I' Rip-Rap

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

4/29/2019
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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	4A
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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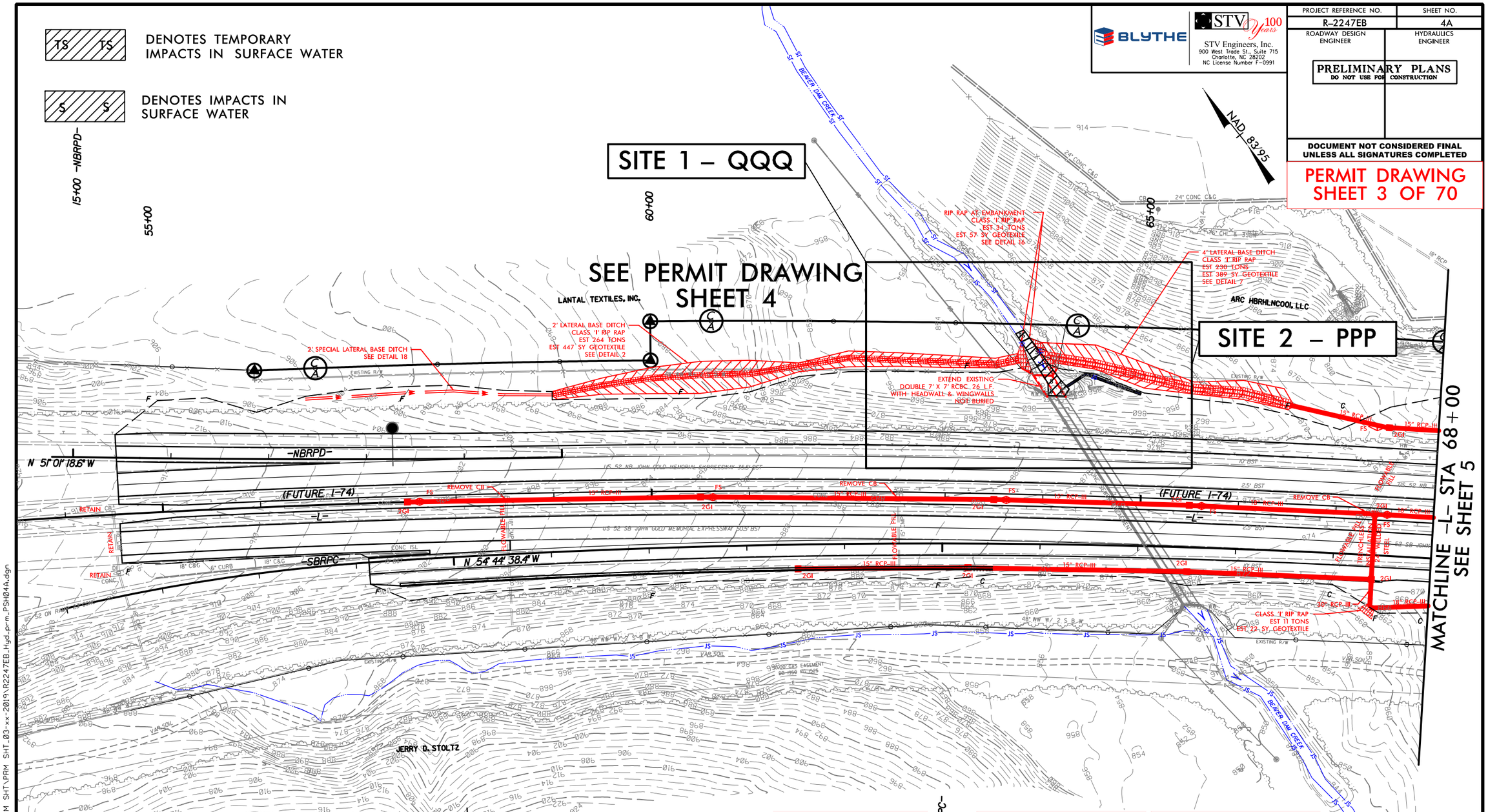
SHEET 3 OF 70

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S S DENOTES IMPACTS IN SURFACE WATER

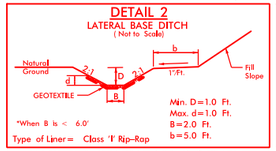


DETAIL 16
RIP RAP AT EMBANKMENT
(Not to Scale)

Type of Liner= CL 'I' Rip-Rap

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

DETAIL 2
LATERAL BASE DITCH
(Not to Scale)



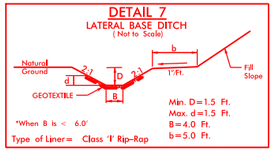
*When B is < 6.0'

Min. D=1.0 Ft.
Max. d=1.0 Ft.
B=2.0 Ft.
b=5.0 Ft.

Type of Liner= Class 'I' Rip-Rap

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

DETAIL 7
LATERAL BASE DITCH
(Not to Scale)



*When B is < 6.0'

Min. D=1.5 Ft.
Max. d=1.5 Ft.
B=4.0 Ft.
b=5.0 Ft.

Type of Liner= Class 'I' Rip-Rap

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

4/29/2019
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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	4B
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

BLYTHE

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Charlotte, NC 28202
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PERMIT DRAWING
SHEET 4 OF 70

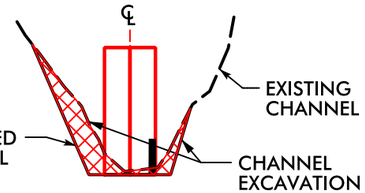
10 5 0 10 20
PLANS

NAD 83/95

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S S DENOTES IMPACTS IN SURFACE WATER

DETAIL 16A
CULVERT CHANNEL RELOCATION AT INLET
(Not to Scale)



JS

SS

BEAVER DAM CREEK

TS

CHANNEL RELOCATION/
BANK STABILIZATION
CLASS 'I' RIP RAP
EST 24 TONS
EST 34 SY GEOTEXILE
SEE DETAIL 16 & 16A

C
A

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

CHANNEL RELOCATION/
BANK STABILIZATION
CLASS 'I' RIP RAP
EST 18 TONS
EST 25 SY GEOTEXILE
SEE DETAIL 16 & 16A

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

TS

JS

SS

S S
S S

8" DIP

JS

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

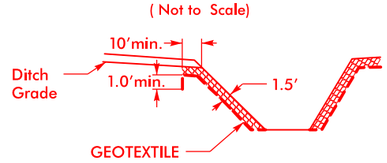
S

S

SITE 2 – PPP

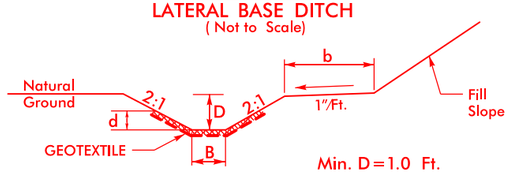
SITE 1 – QQQ

DETAIL 16
RIP RAP AT EMBANKMENT
(Not to Scale)



Type of Liner = CL 'I' Rip-Rap

DETAIL 2
LATERAL BASE DITCH
(Not to Scale)



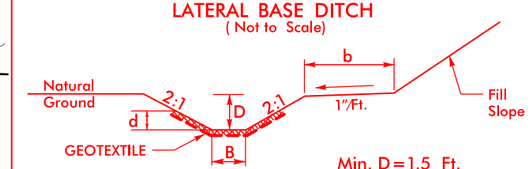
Min. D = 1.0 Ft.
Max. d = 1.0 Ft.
B = 2.0 Ft.
b = 5.0 Ft.

*When B is < 6.0'

Type of Liner = Class 'I' Rip-Rap

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

DETAIL 7
LATERAL BASE DITCH
(Not to Scale)



Min. D = 1.5 Ft.
Max. d = 1.5 Ft.
B = 4.0 Ft.
b = 5.0 Ft.

*When B is < 6.0'

Type of Liner = Class 'I' Rip-Rap

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

(FUTURE I-74) -L-

4/29/2019
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PERMIT DRAWING
SHEET 5 OF 70

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	4C
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
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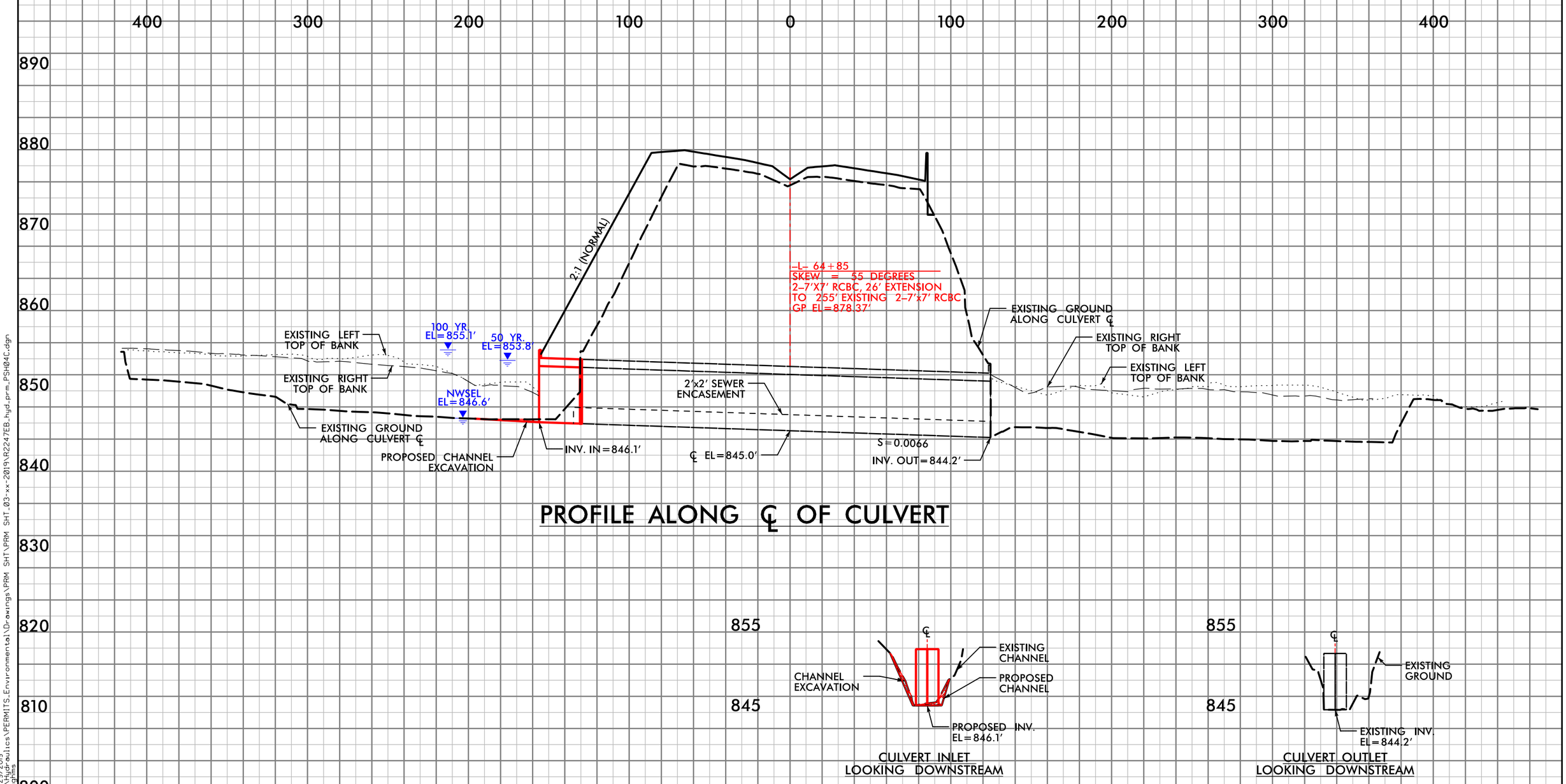
SITE 1 – QQQ



6/23/16

4/29/2019
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pugh

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	5
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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Charlotte, NC 28202
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PERMIT DRAWING
SHEET 6 OF 70

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S S DENOTES IMPACTS IN SURFACE WATER

NAD 83/95

SITE 3 – OOO

SITE 4A – UU

SITE 4B – UU

SEE PERMIT DRAWING SHEET 8

SEE PERMIT DRAWING SHEET 9

MATCHLINE –L– STA 68+00 SEE SHEET 4

MATCHLINE –L– STA 82+00 SEE SHEET 6

70+00

75+00

80+00

ARC HBRHLNC001, LLC

JERRY D. STOLTZ

UT TO BEAVER DAM CREEK

RIP RAP AT EMBANKMENT
CLASS 'I' RIP RAP
EST 38 TONS
EST 66 SY GEOTEXILE
SEE DETAIL 16

EXTEND EXISTING
SINGLE 8' X 7' RCBC 30 L.F.
WITH HEADWALL & WINGWALLS
SUPPLEMENT WITH 60" TRENCHLESS
NOT BURIED

2' LATERAL BASE DITCH
CLASS 'I' RIP RAP
EST 105 TONS
EST 177 SY GEOTEXTILE
SEE DETAIL 3

4' LATERAL BASE DITCH
CLASS 'I' RIP RAP
EST 330 TONS
EST 559 SY GEOTEXTILE
SEE DETAIL 9

24" RCP-III
JB w/MH

(FUTURE I-74) –L–

US 52 NB JOHN GOLD MEMORIAL EXPRESSWAY 37.5' BST

US 52 SB JOHN GOLD MEMORIAL EXPRESSWAY 38' BST

15" RCP-III 2GI

18" RCP-III

REMOVE CB

FLOWABLE FILL

15" ELBOWS

24" W/ ELBOWS

TRENCHLESS INSTALLATION 24" WELDED STEEL

LATERAL 'V' DITCH
CLASS 'I' RIP RAP
EST 72 TONS
EST 121 SY GEOTEXTILE
SEE DETAIL 50

STANDARD 'V' DITCH
CLASS 'I' RIP RAP
EST 72 TONS
EST 122 SY GEOTEXTILE
SEE DETAIL 49

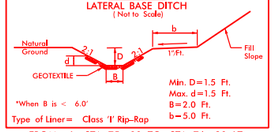
RETAIN EXISTING 8' X 7' RCBC
SUPPLEMENT WITH 60" TRENCHLESS
WITH HEADWALL & WINGWALLS
NOT BURIED

OUTLET CHANNEL PROTECTION
73 TONS CL 'I' RIP RAP
123 SY GEOTEXTILE
SEE DETAIL 43

TOE PROTECTION
SEE DETAIL 35

VAR. SOIL

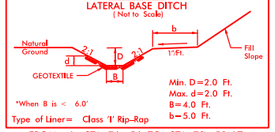
DETAIL 3
LATERAL BASE DITCH
(Not to Scale)



Min. D=1.5 Ft.
Max. d=1.5 Ft.
B=2.0 Ft.
b=5.0 Ft.
*When B is < 6.0'
Type of Liner= Class 'I' Rip-Rap

FROM –L– STA. 75+00 TO STA. 76+30 LT

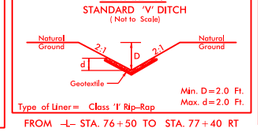
DETAIL 9
LATERAL BASE DITCH
(Not to Scale)



Min. D=2.0 Ft.
Max. d=2.0 Ft.
B=4.0 Ft.
b=5.0 Ft.
*When B is < 6.0'
Type of Liner= Class 'I' Rip-Rap

FROM –L– STA. 76+56 TO STA. 79+50 LT

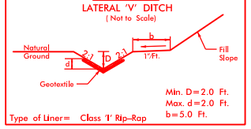
DETAIL 49
STANDARD 'V' DITCH
(Not to Scale)



Min. D=2.0 Ft.
Max. d=2.0 Ft.
Type of Liner= Class 'I' Rip-Rap

FROM –L– STA. 76+50 TO STA. 77+40 RT

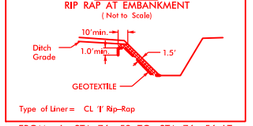
DETAIL 50
LATERAL 'V' DITCH
(Not to Scale)



Min. D=2.0 Ft.
Max. d=2.0 Ft.
b=5.0 Ft.
Type of Liner= Class 'I' Rip-Rap

FROM –L– STA. 75+50 TO STA. 76+50 RT

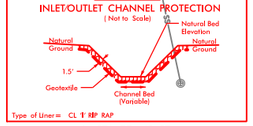
DETAIL 16
RIP RAP AT EMBANKMENT
(Not to Scale)



Type of Liner= CL 'I' Rip-Rap

FROM –L– STA. 76+52 TO STA. 76+56 LT

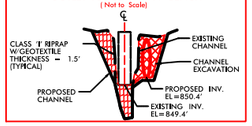
DETAIL 43
INLET/OUTLET CHANNEL PROTECTION
(Not to Scale)



Type of Liner= CL 'I' RIP RAP

–L– STA. 77+42 RT

OUTLET FLOOD PLAIN BENCH
(Not to Scale)



50 25 0 50 100
PLANS

4/29/2019
R:\Hydraulics\PERMITS_Environmental\Drawings\PRM SHT\PRM SHT_03-xx-2019\R2247EB_Hyd_prm_PSH05.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	5A
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

BLYTHE

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

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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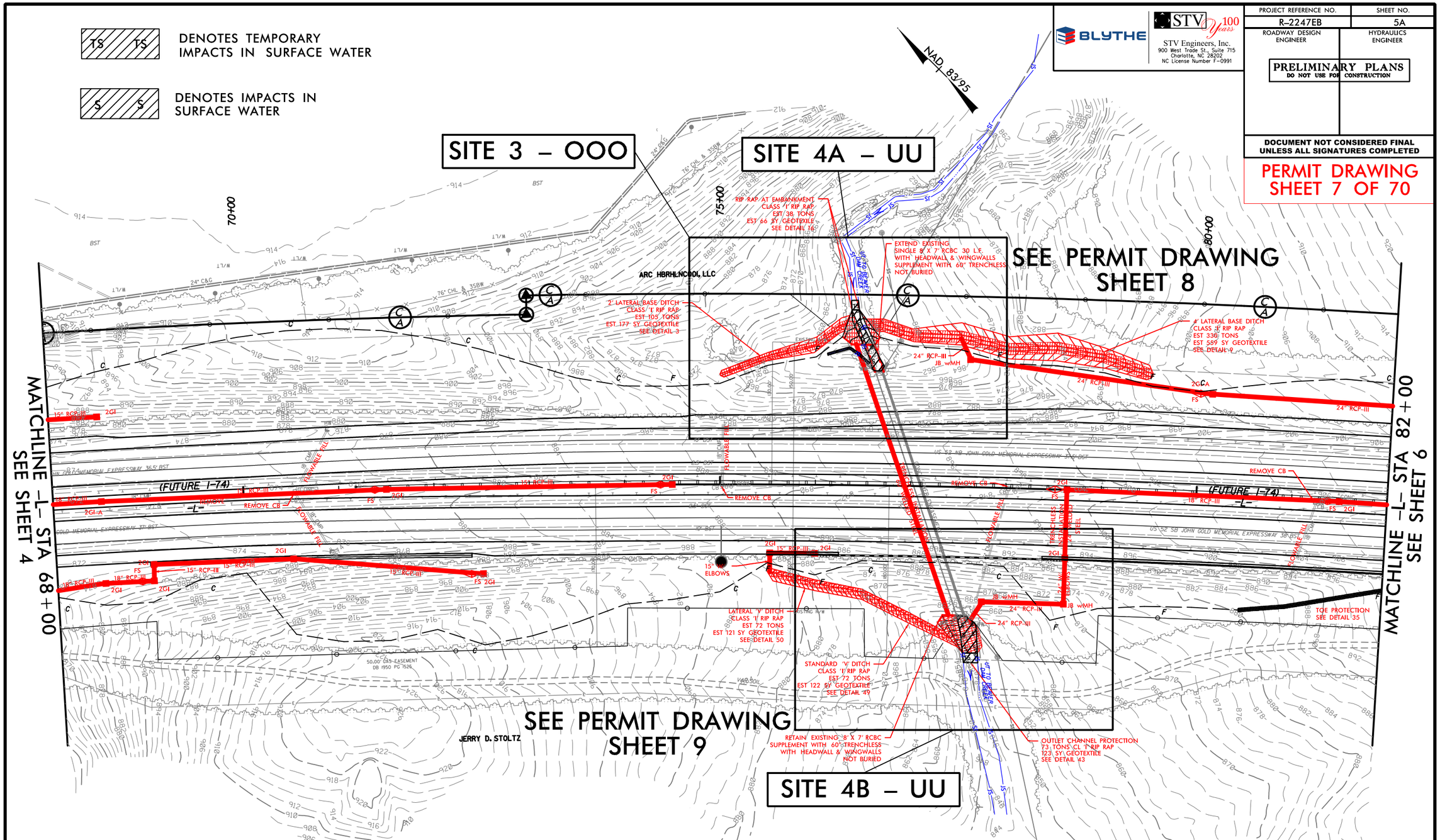
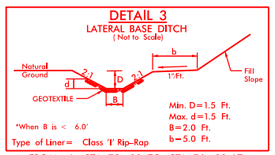
PERMIT DRAWING SHEET 7 OF 70

TS TS — DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S S — DENOTES IMPACTS IN SURFACE WATER

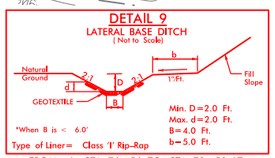


DETAIL 3
LATERAL BASE DITCH
(Not to Scale)



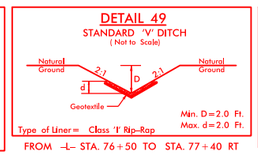
FROM –L– STA. 75+00 TO STA. 76+30 LT

DETAIL 9
LATERAL BASE DITCH
(Not to Scale)



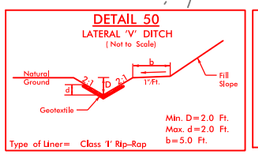
FROM –L– STA. 76+56 TO STA. 79+50 LT

DETAIL 49
STANDARD 'V' DITCH
(Not to Scale)



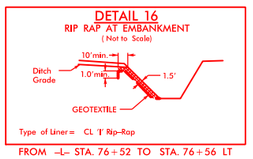
FROM –L– STA. 76+50 TO STA. 77+40 RT

DETAIL 50
LATERAL 'V' DITCH
(Not to Scale)



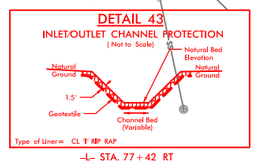
FROM –L– STA. 75+50 TO STA. 76+50 RT

DETAIL 16
RIP RAP AT EMBANKMENT
(Not to Scale)



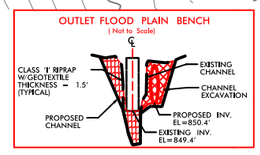
FROM –L– STA. 76+52 TO STA. 76+56 LT

DETAIL 43
INLET/OUTLET CHANNEL PROTECTION
(Not to Scale)



–L– STA. 77+42 RT

OUTLET FLOOD PLAIN BENCH
(Not to Scale)



50 25 0 50 100
PLANS

4/29/2019
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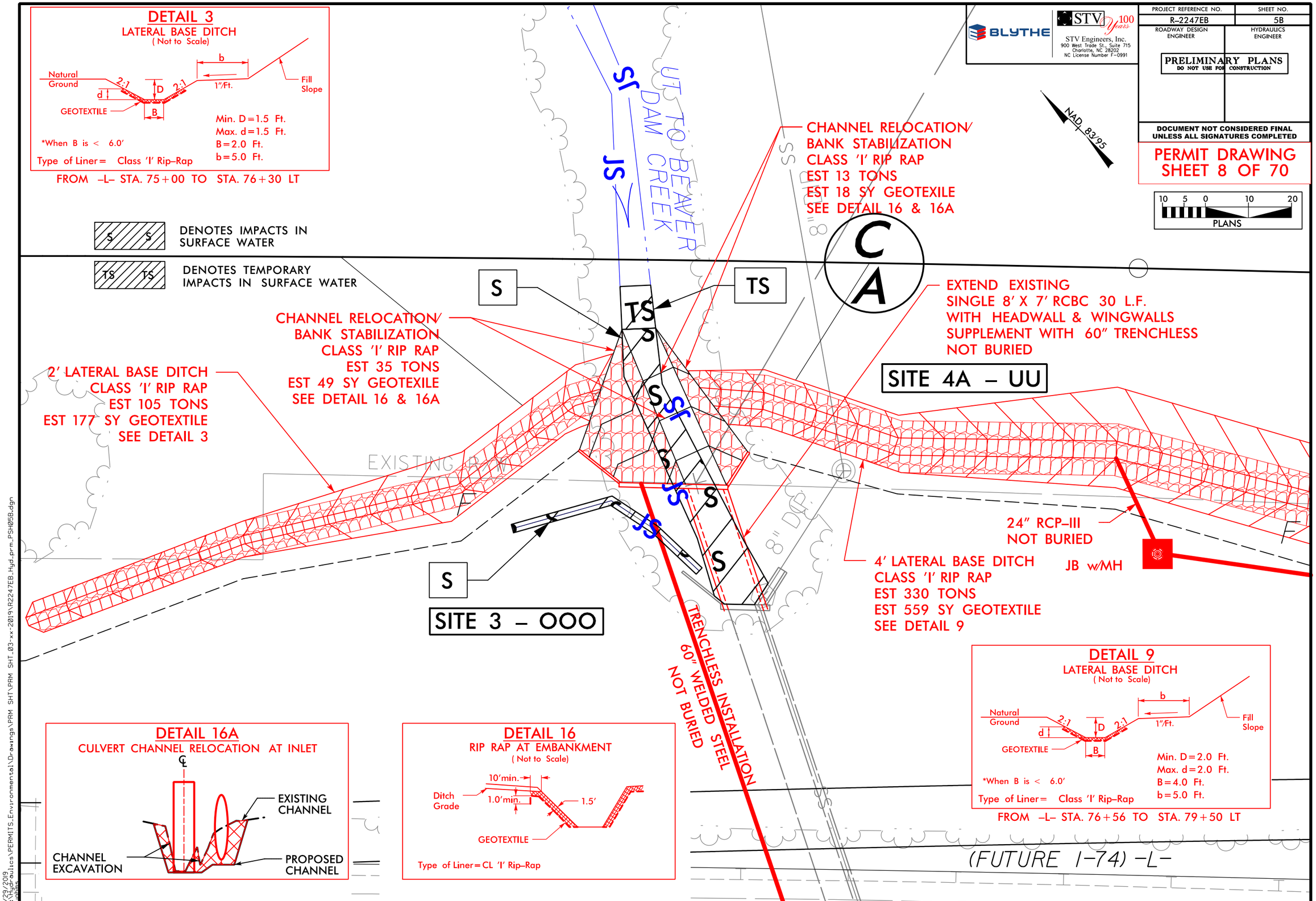
Plotted:



DETAIL 3
LATERAL BASE DITCH
(Not to Scale)
Natural Ground
2:1
D
2:1
b
1"/Ft.
Fill Slope
d
GEOTEXTILE
B
Min. D=1.5 Ft.
Max. d=1.5 Ft.
B=2.0 Ft.
b=5.0 Ft.
*When B is < 6.0'
Type of Liner= Class 'I' Rip-Rap
FROM -L- STA. 75+00 TO STA. 76+30 LT
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
UT TO BEAVER DAM CREEK
CHANNEL RELOCATION/ BANK STABILIZATION CLASS 'I' RIP RAP EST 13 TONS EST 18 SY GEOTEXILE SEE DETAIL 16 & 16A
NAD 83/95
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 70
10 5 0 10 20
PLANS
C
A
S
TS
CHANNEL RELOCATION/ BANK STABILIZATION CLASS 'I' RIP RAP EST 35 TONS EST 49 SY GEOTEXILE SEE DETAIL 16 & 16A
EXTEND EXISTING SINGLE 8' X 7' RCBC 30 L.F. WITH HEADWALL & WINGWALLS SUPPLEMENT WITH 60" TRENCHLESS NOT BURIED
SITE 4A - UU
2' LATERAL BASE DITCH CLASS 'I' RIP RAP EST 105 TONS EST 177 SY GEOTEXTILE SEE DETAIL 3
EXISTING R/W
24" RCP-III NOT BURIED
JB w/MH
4' LATERAL BASE DITCH CLASS 'I' RIP RAP EST 330 TONS EST 559 SY GEOTEXTILE SEE DETAIL 9
SITE 3 - OOO
TRENCHLESS INSTALLATION 60" WELDED STEEL NOT BURIED
DETAIL 9
LATERAL BASE DITCH
(Not to Scale)
Natural Ground
2:1
D
2:1
b
1"/Ft.
Fill Slope
d
GEOTEXTILE
B
Min. D=2.0 Ft.
Max. d=2.0 Ft.
B=4.0 Ft.
b=5.0 Ft.
*When B is < 6.0'
Type of Liner= Class 'I' Rip-Rap
FROM -L- STA. 76+56 TO STA. 79+50 LT
DETAIL 16A
CULVERT CHANNEL RELOCATION AT INLET
EXISTING CHANNEL
CHANNEL EXCAVATION
PROPOSED CHANNEL
DETAIL 16
RIP RAP AT EMBANKMENT
(Not to Scale)
10'min.
Ditch Grade
1.0'min.
1.5'
GEOTEXTILE
Type of Liner=CL 'I' Rip-Rap
(FUTURE I-74) -L-

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	5C
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

BLYTHE

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PRELIMINARY PLANS
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PERMIT DRAWING
SHEET 9 OF 70

10 5 0 10 20
PLANS

NAD 83/95

(FUTURE I-74) -L-

2GI

24" W/ ELBOWS

TRENCHLESS INSTALLATION
60" WELDED STEEL

JB w/MH

24" RCP-III

JB w/MH

SITE 4B – UU

24" RCP-III
NOT BURIED

S

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

LATERAL 'V' DITCH
CLASS 'I' RIP RAP
EST 72 TONS
EST 121 SY GEOTEXTILE
SEE DETAIL 50

STANDARD 'V' DITCH
CLASS 'I' RIP RAP
EST 72 TONS
EST 122 SY GEOTEXTILE
SEE DETAIL 49

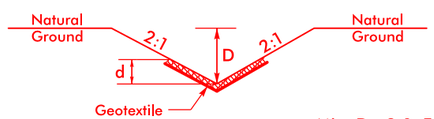
OUTLET CHANNEL PROTECTION/
RIP RAP FILL
73 TONS CL 'I' RIP RAP
123 SY GEOTEXTILE
SEE DETAIL 43

RETAIN EXISTING 8' X 7' RCBC
SUPPLEMENT WITH 60" TRENCHLESS
WITH HEADWALL & WINGWALLS
NOT BURIED

TS

UT TO BEAVER DAM CREEK

DETAIL 49
STANDARD 'V' DITCH
(Not to Scale)

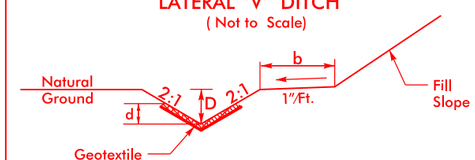


Min. D=2.0 Ft.
Max. d=2.0 Ft.

Type of Liner= Class 'I' Rip-Rap

FROM –L– STA. 76+50 TO STA. 77+40 RT

DETAIL 50
LATERAL 'V' DITCH
(Not to Scale)

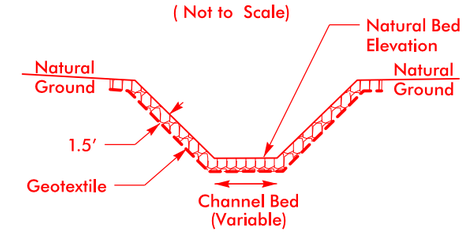


Min. D=2.0 Ft.
Max. d=2.0 Ft.
b=5.0 Ft.

Type of Liner= Class 'I' Rip-Rap

FROM –L– STA. 75+50 TO STA. 76+50 RT

DETAIL 43
OUTLET CHANNEL PROTECTION
(Not to Scale)



Type of Liner= CL 'I' RIP RAP

–L– STA. 77+50 RT

4/29/2019
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PERMIT DRAWING
SHEET 10 OF 70

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	5D
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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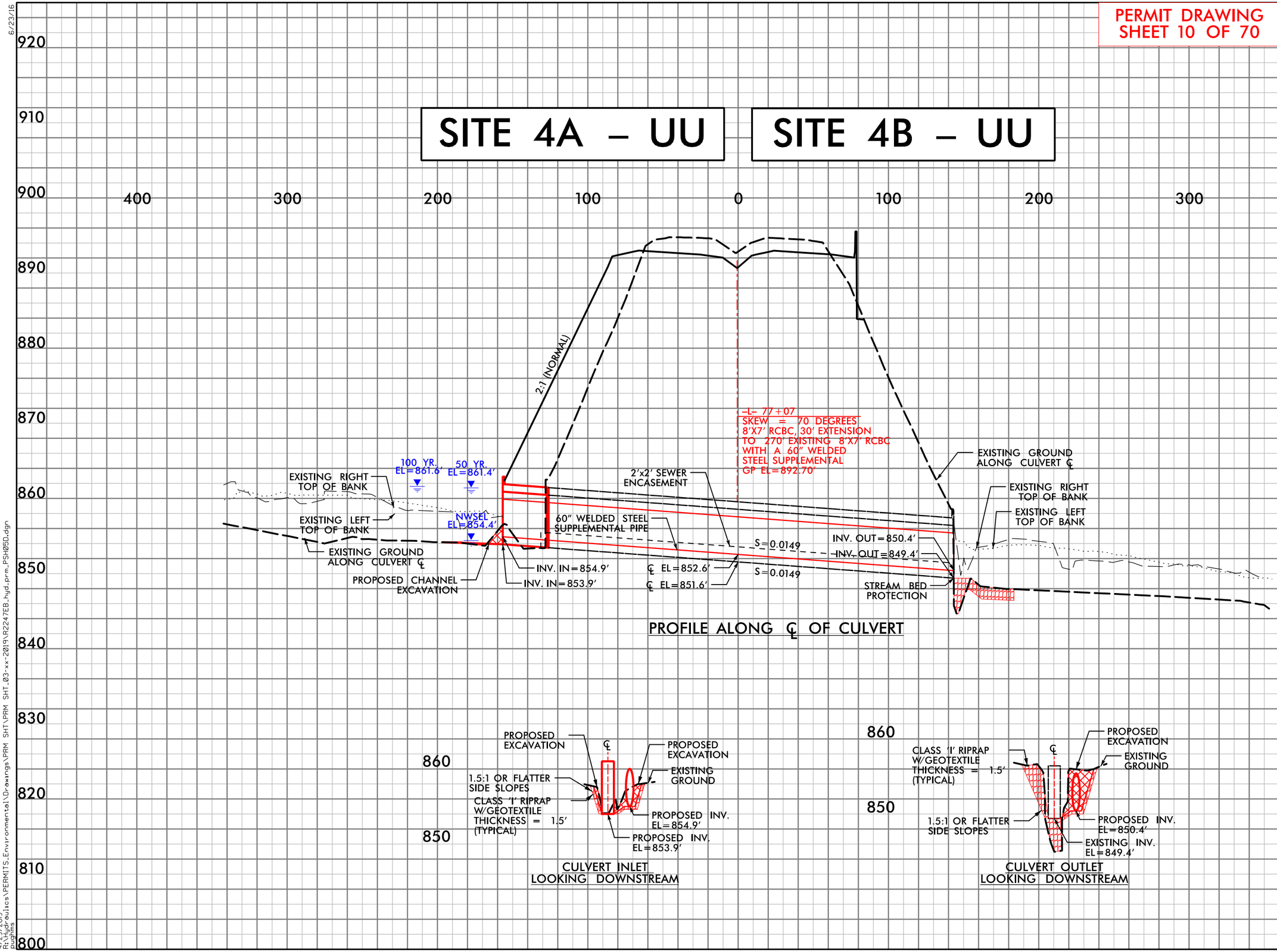
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SITE 4A – UU

SITE 4B – UU



6/23/16

4/29/2019
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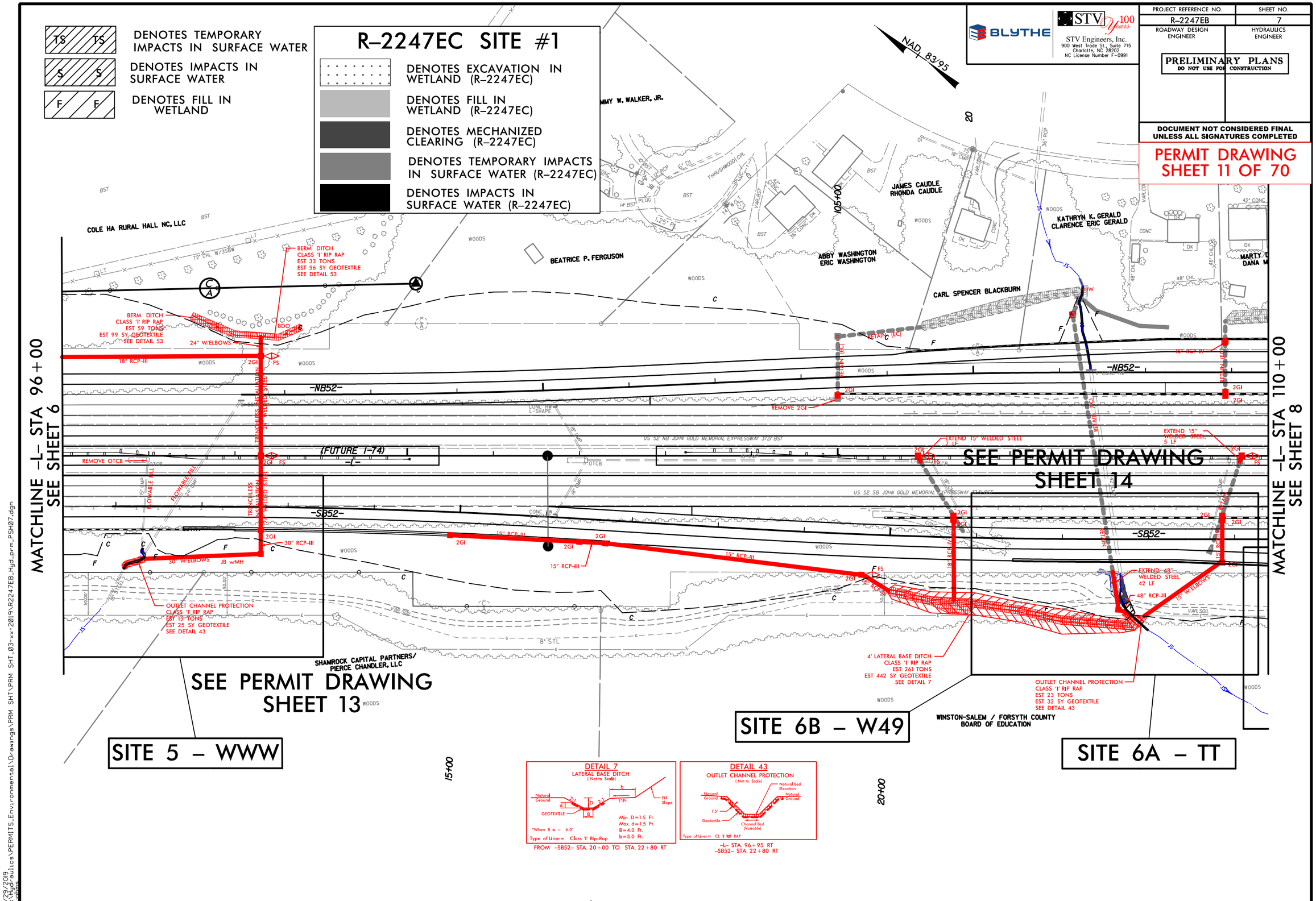

DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
R-2247EC SITE #1
DENOTES EXCAVATION IN WETLAND (R-2247EC)
DENOTES FILL IN WETLAND (R-2247EC)
DENOTES MECHANIZED CLEARING (R-2247EC)
DENOTES TEMPORARY IMPACTS IN SURFACE WATER (R-2247EC)
DENOTES IMPACTS IN SURFACE WATER (R-2247EC)
BLYTHE
STV 100 Years
STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number F-0991
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 70
NAD 83/95
MATCHLINE -L- STA 96+00 SEE SHEET 6
MATCHLINE -L- STA 110+00 SEE SHEET 8
COLE HA RURAL HALL NC, LLC
BEATRICE P. FERGUSON
JAMES CAUDLE
RHONDA CAUDLE
ABBY WASHINGTON
ERIC WASHINGTON
CARL SPENCER BLACKBURN
KATHRYN K. GERALD
CLARENCE ERIC GERALD
SHAMROCK CAPITAL PARTNERS/ PIERCE CHANDLER, LLC
WINSTON-SALEM / FORSYTH COUNTY BOARD OF EDUCATION
BERM DITCH CLASS 'I' RIP RAP EST 33 TONS EST 56 SY GEOTEXTILE SEE DETAIL 53
BERM DITCH CLASS 'I' RIP RAP EST 59 TONS EST 99 SY GEOTEXTILE SEE DETAIL 53
24" W/ELBOWS
18" RCP-III
-NB52-
-SB52-
(FUTURE I-74)
-L-
REMOVE OTCB
REMOVE 2GI
EXTEND 15" WELDED STEEL 7 LF
EXTEND 15" WELDED STEEL 5 LF
EXTEND 48" WELDED STEEL 42 LF
48" RCP-III
15" RCP-III
30" RCP-III
30" W/ELBOWS
15" W/ELBOWS
OUTLET CHANNEL PROTECTION CLASS 'I' RIP RAP EST 15 TONS EST 25 SY GEOTEXTILE SEE DETAIL 43
4' LATERAL BASE DITCH CLASS 'I' RIP RAP EST 261 TONS EST 442 SY GEOTEXTILE SEE DETAIL 7
OUTLET CHANNEL PROTECTION CLASS 'I' RIP RAP EST 23 TONS EST 32 SY GEOTEXTILE SEE DETAIL 43
SEE PERMIT DRAWING SHEET 14
SEE PERMIT DRAWING SHEET 13
SITE 5 – WWW
SITE 6B – W49
SITE 6A – TT
DETAIL 7
LATERAL BASE DITCH
(Not to Scale)
Natural Ground
GEOTEXTILE
Fill Slope
Min. D=1.5 Ft.
Max. d=1.5 Ft.
B=4.0 Ft.
b=5.0 Ft.
*When B is < 6.0'
Type of Liner= Class 'I' Rip-Rap
FROM -SB52- STA. 20+00 TO STA. 22+80 RT
DETAIL 43
OUTLET CHANNEL PROTECTION
(Not to Scale)
Natural Bed Elevation
Natural Ground
Geotextile
Channel Bed (Variable)
Type of Liner= CL 'I' RIP RAP
-L- STA. 96+95 RT
-SB52- STA. 22+80 RT

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	7A
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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Charlotte, NC 28202
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PRELIMINARY PLANS
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PERMIT DRAWING
SHEET 12 OF 70

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S S DENOTES IMPACTS IN SURFACE WATER

F F DENOTES FILL IN WETLAND

R-2247EC SITE #1

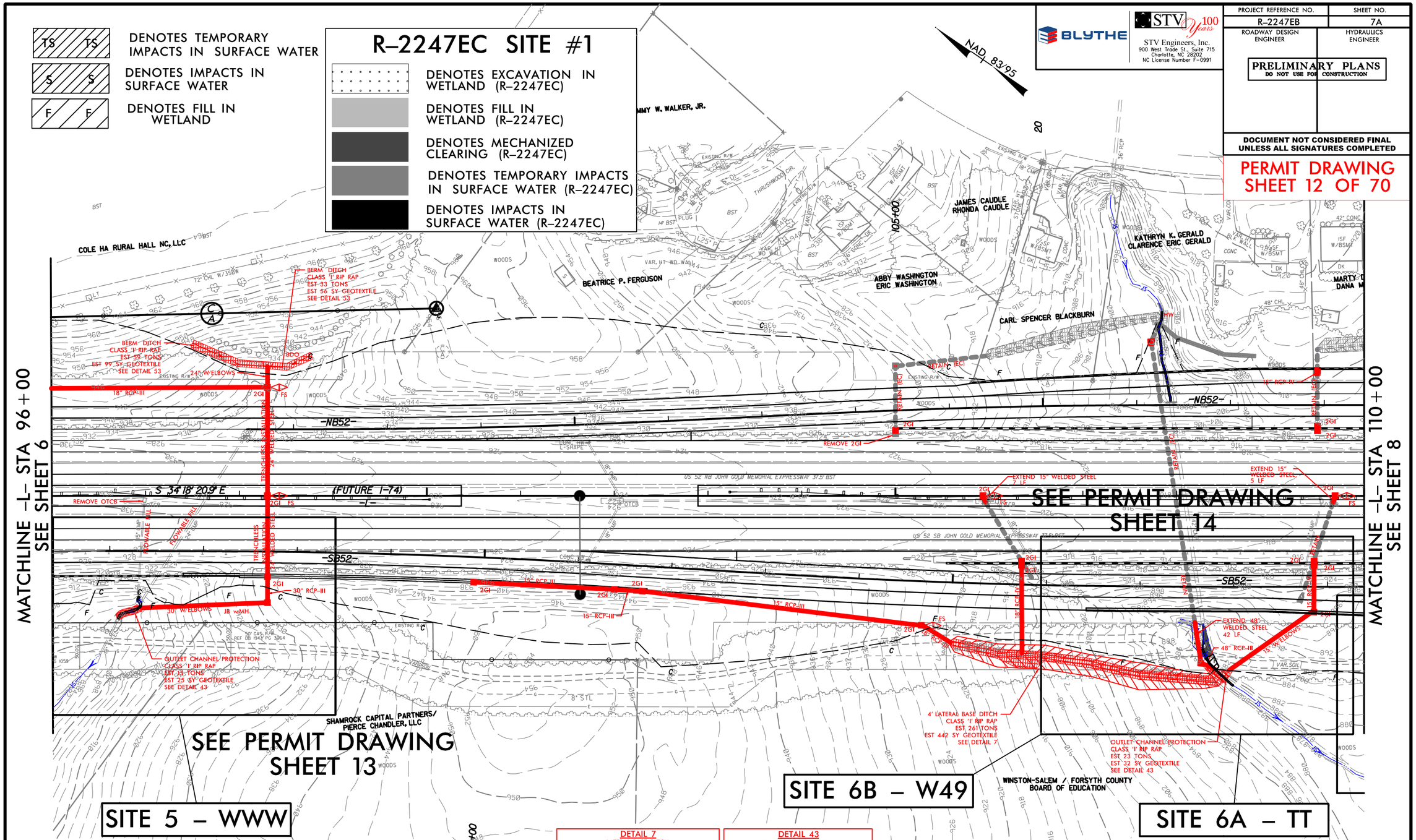
DENOTES EXCAVATION IN WETLAND (R-2247EC)

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)



DETAIL 7
LATERAL BASE DITCH
(Not to Scale)

Natural Ground; GEOTEXTILE; d; D; B; b; 2.5:1; 1:1 Ft.; Fill Slope

*When B is < 6.0'

Min. D=1.5 Ft.
Max. d=1.5 Ft.
B=4.0 Ft.
b=5.0 Ft.

Type of Liner= Class 'I' Rip-Rap

FROM -SB52- STA. 20+00 TO STA. 22+80 RT

DETAIL 43
OUTLET CHANNEL PROTECTION
(Not to Scale)

Natural Ground; Natural Bed Elevation; 1.5'; Geotextile; Channel Bed (Variable)

Type of Liner= CL 'I' RIP RAP

-L- STA. 96+95 RT
-SB52- STA. 22+80 RT

4/23/2019
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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	7B
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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Charlotte, NC 28202
NC License Number F-0991

PRELIMINARY PLANS
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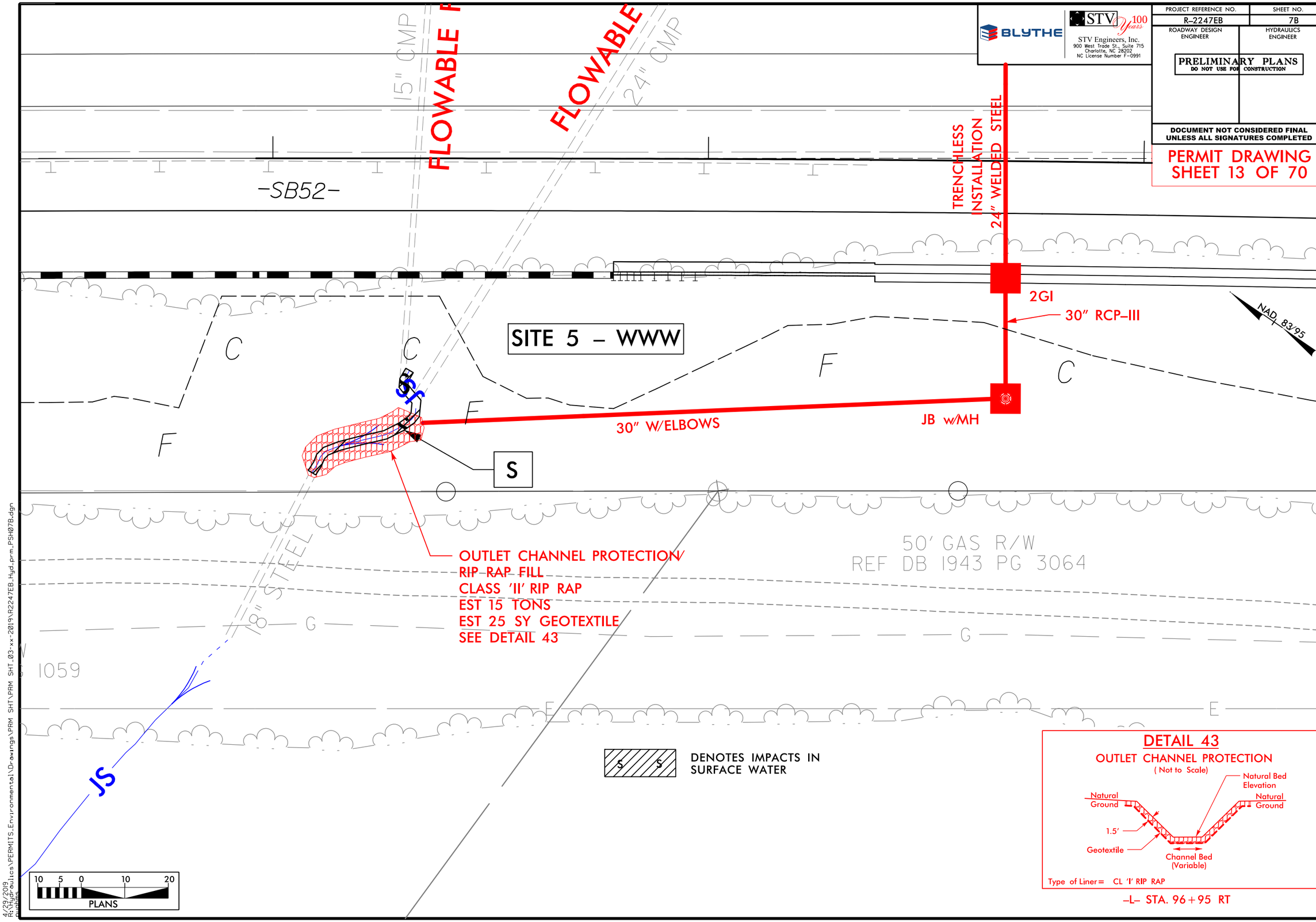
SHEET 13 OF 70



DETAIL 43
OUTLET CHANNEL PROTECTION
(Not to Scale)

Type of Liner = CL 'I' RIP RAP

-L- STA. 96+95 RT

4/29/2019
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STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number F-0991

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	7C
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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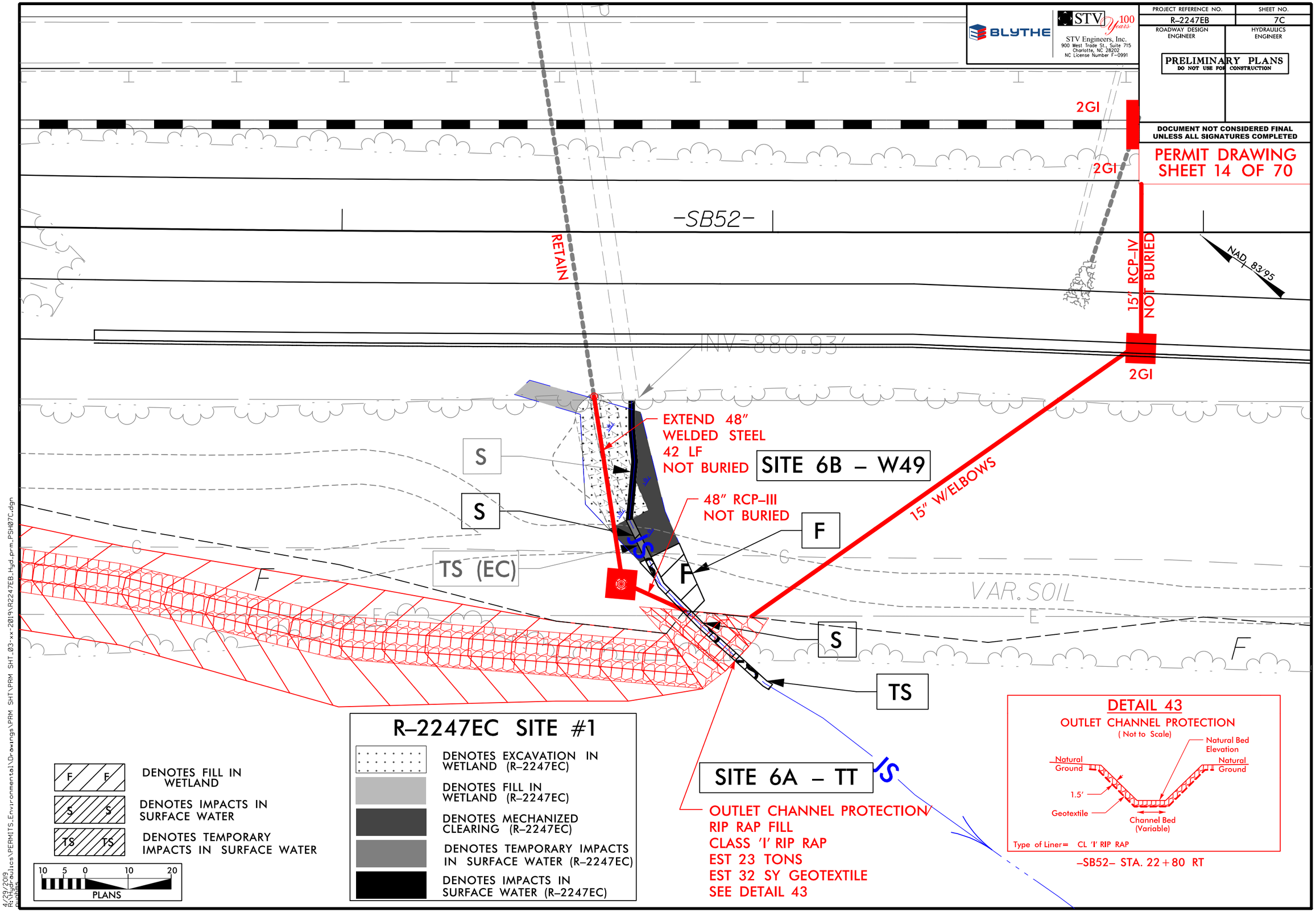
PERMIT DRAWING
SHEET 14 OF 70



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6/23/16

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

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PERMIT DRAWING
SHEET 15 OF 70

4/29/2019
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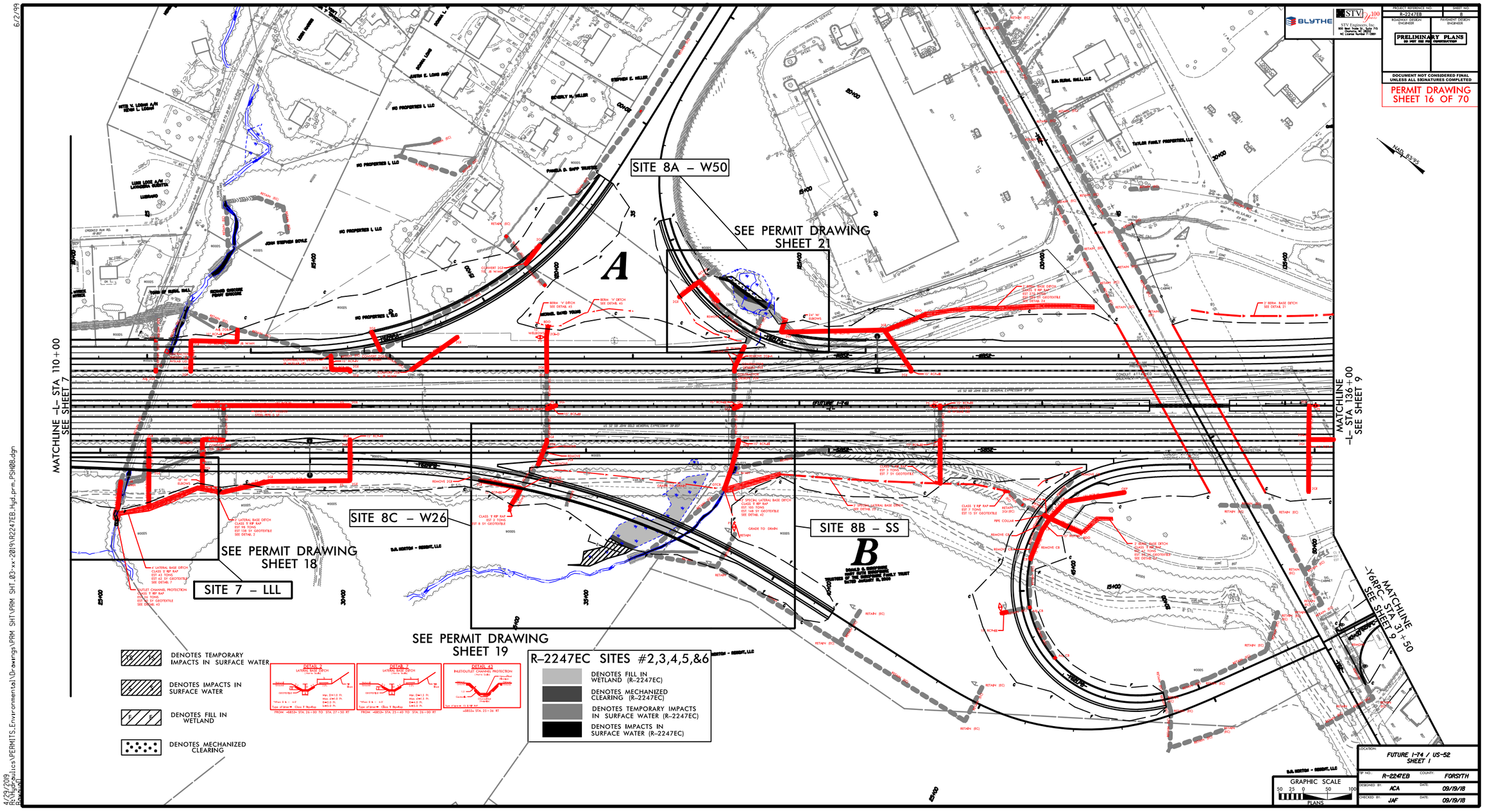
pughms

6/2/99



BLYTHE

STV Engineers, Inc.
100 Shoreline, Suite 300
Mooresville, NC 28115
NC License Number F-1381

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	8
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

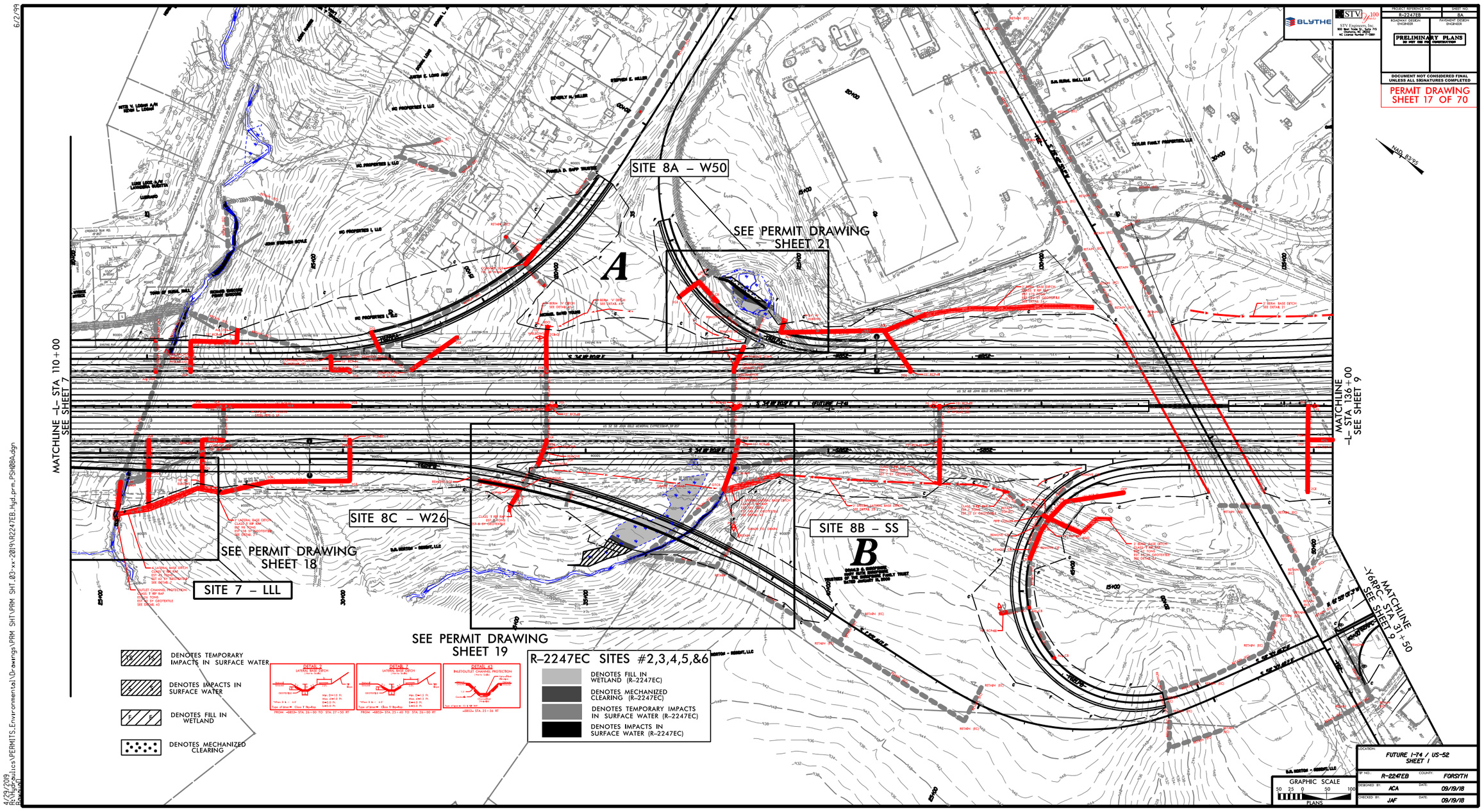
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 16 OF 70

LOCATION:	FUTURE I-74 / US-52 SHEET 1		
TIP NO.:	R-2247EB	COUNTY:	FORSYTH
DESIGNED BY:	ACA	DATE:	09/19/18
CHECKED BY:	JAF	DATE:	09/19/18

4/29/2019
R:\Hydraulics\PERMITS_Environmental\Drawings\PRM SHT\PRM SHT_03-xx-2019\R2247EB_Hyd_prm_PSH08.dgn
rcrawford



BLYTHE

STV Engineers, Inc.
500 West Main St., Suite 715
Chattanooga, TN 37402
NC License Number F-1091

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	8A
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 17 OF 70

NAD 83/95

LOCATION:	FUTURE I-74 / US-52 SHEET 1
TIP NO.: R-2247EB	COUNTY: FORSYTH
DESIGNED BY: ACA	DATE: 09/19/18
CHECKED BY: JAF	DATE: 09/19/18

6/2/99

4/29/2019
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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	8B
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

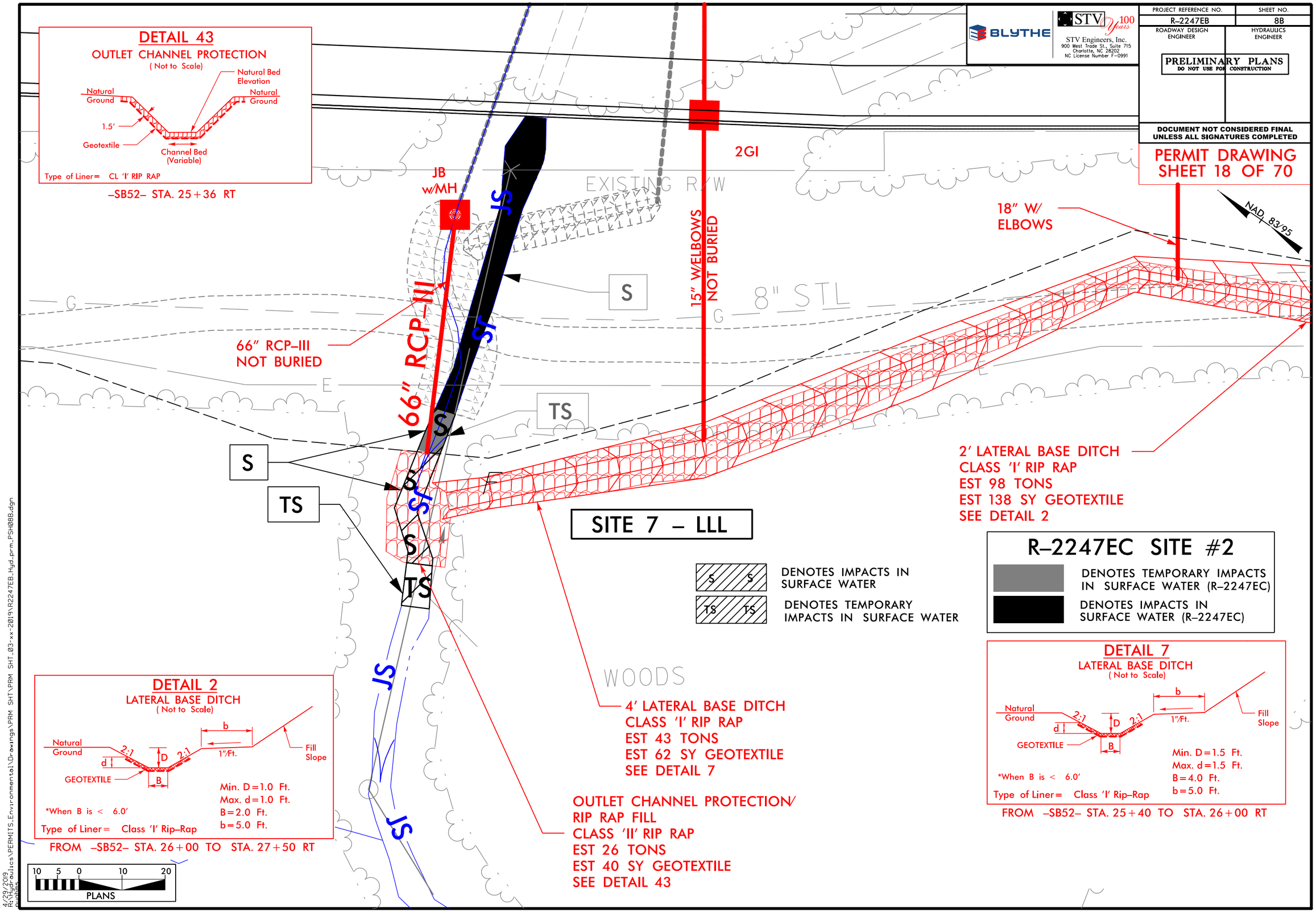
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 18 OF 70

DETAIL 43
OUTLET CHANNEL PROTECTION
(Not to Scale)

Type of Liner= CL 'I' RIP RAP

–SB52– STA. 25+36 RT



DETAIL 2
LATERAL BASE DITCH
(Not to Scale)

Natural Ground, 2:1, d, D, 2:1, b, 1"/Ft., Fill Slope, GEOTEXTILE, B

Min. D=1.0 Ft.
Max. d=1.0 Ft.
B=2.0 Ft.
b=5.0 Ft.

*When B is < 6.0'

Type of Liner= Class 'I' Rip–Rap

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

DETAIL 7
LATERAL BASE DITCH
(Not to Scale)

Natural Ground, 2:1, d, D, 2:1, b, 1"/Ft., Fill Slope, GEOTEXTILE, B

Min. D=1.5 Ft.
Max. d=1.5 Ft.
B=4.0 Ft.
b=5.0 Ft.

*When B is < 6.0'

Type of Liner= Class 'I' Rip–Rap

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

4/29/2019
R:\Hydraulics\PERMITS_Environmental\Drawings\PRM SHT\PRM SHT_03-xx-2019\R2247EB_Hyd_prm_PSH08B.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	8C
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

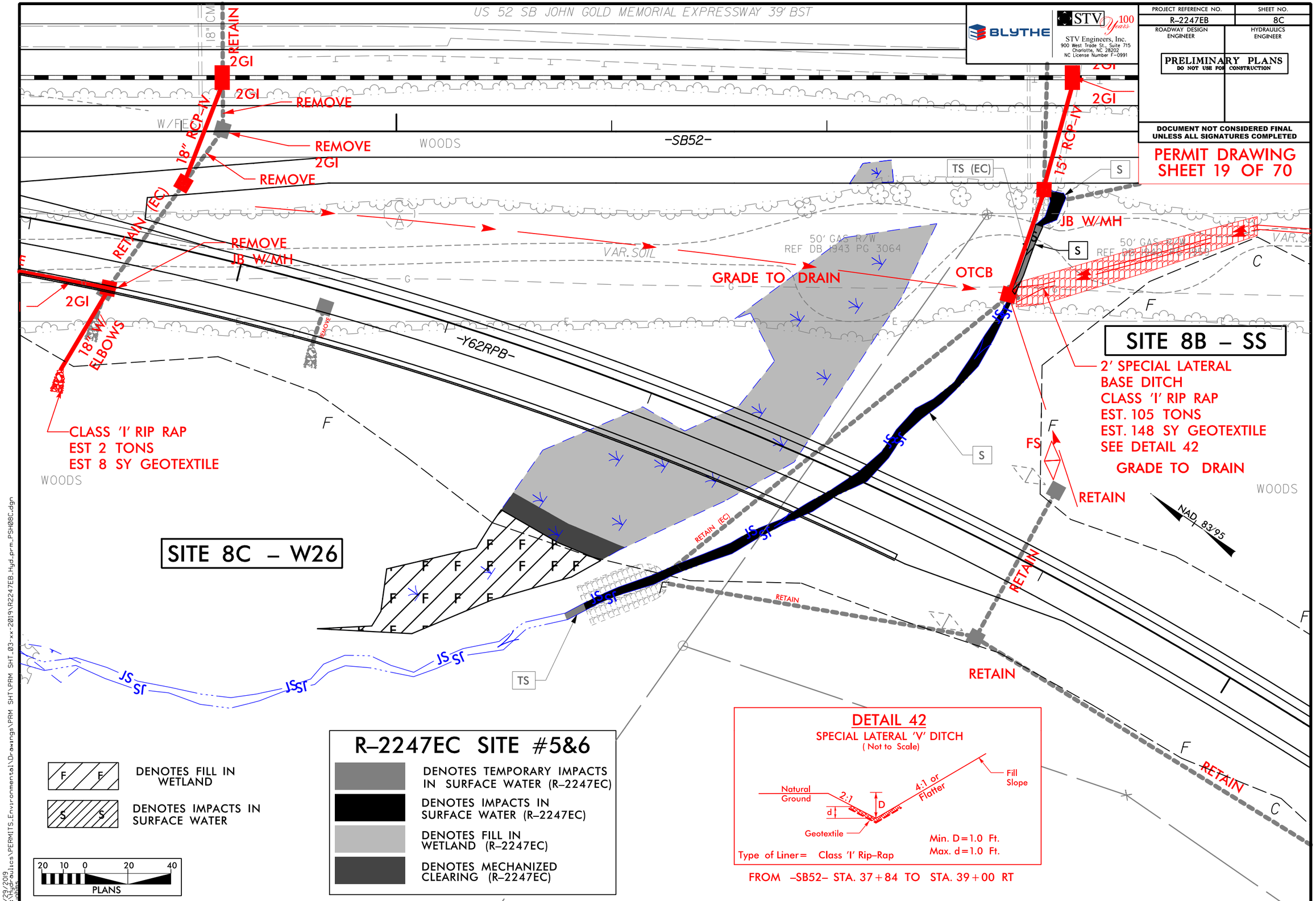
BLYTHE

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

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 19 OF 70



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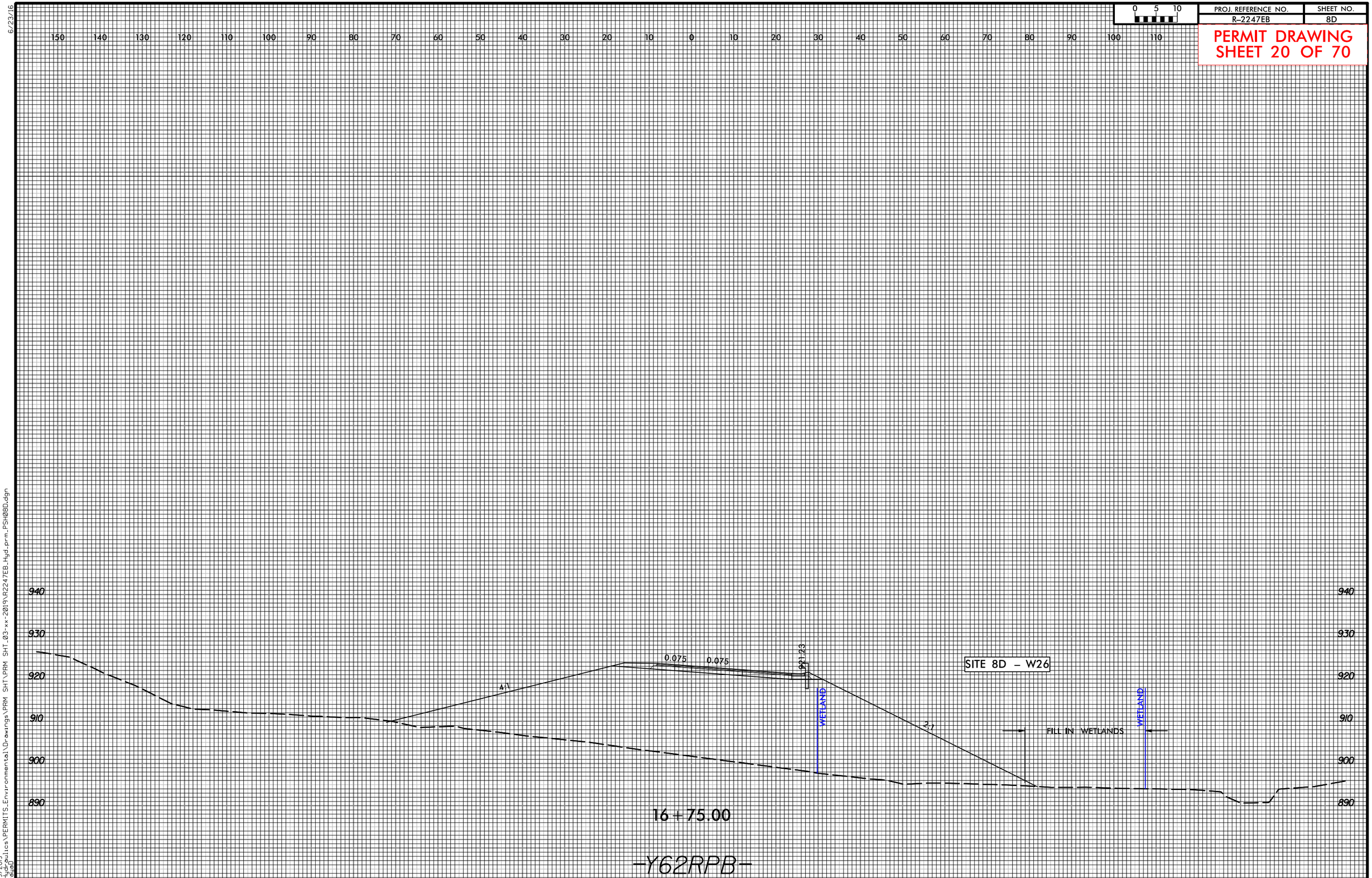

6/23/16

4/29/2019
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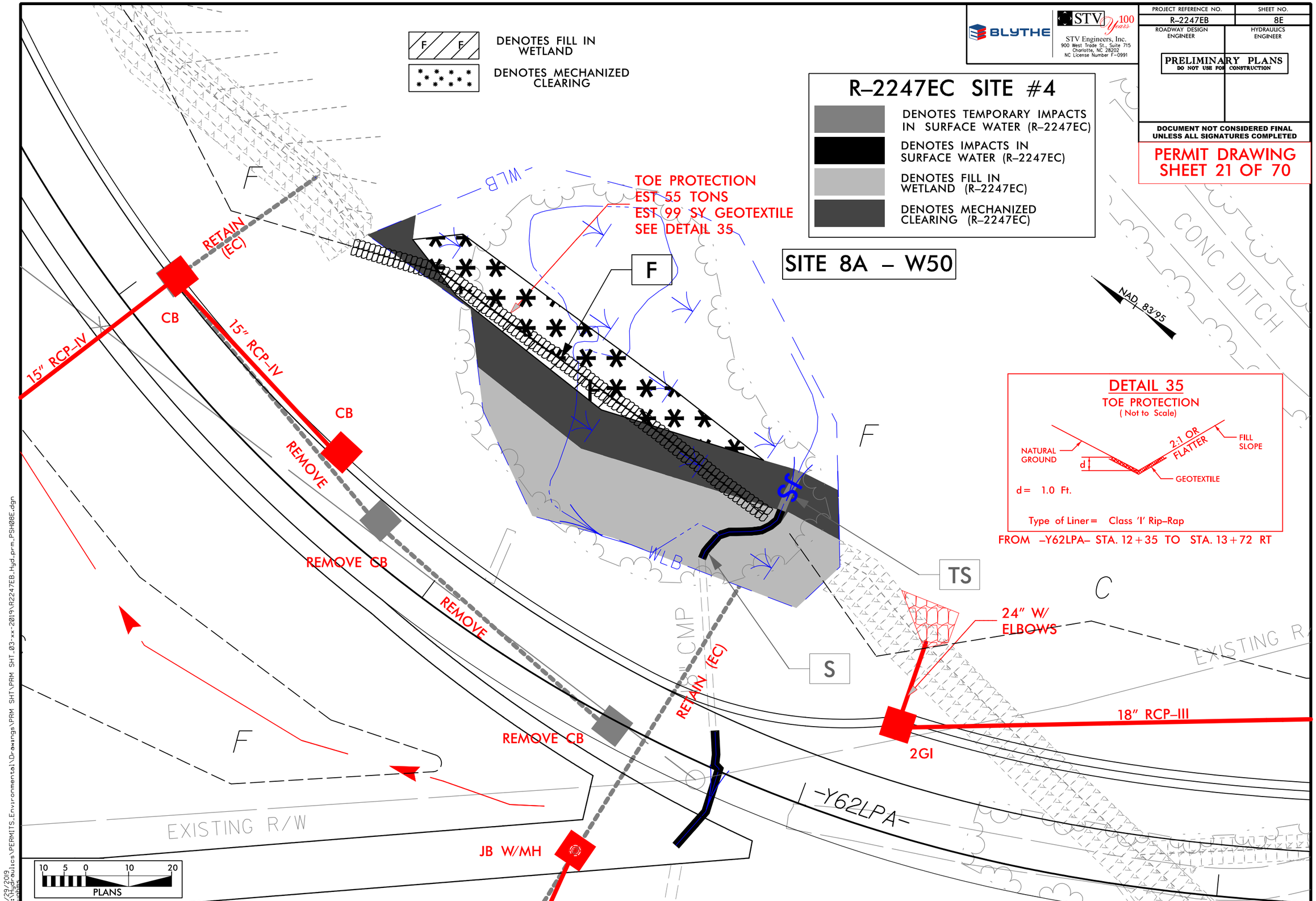

BLYTHE

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	8E
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
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SHEET 21 OF 70

4/29/2019
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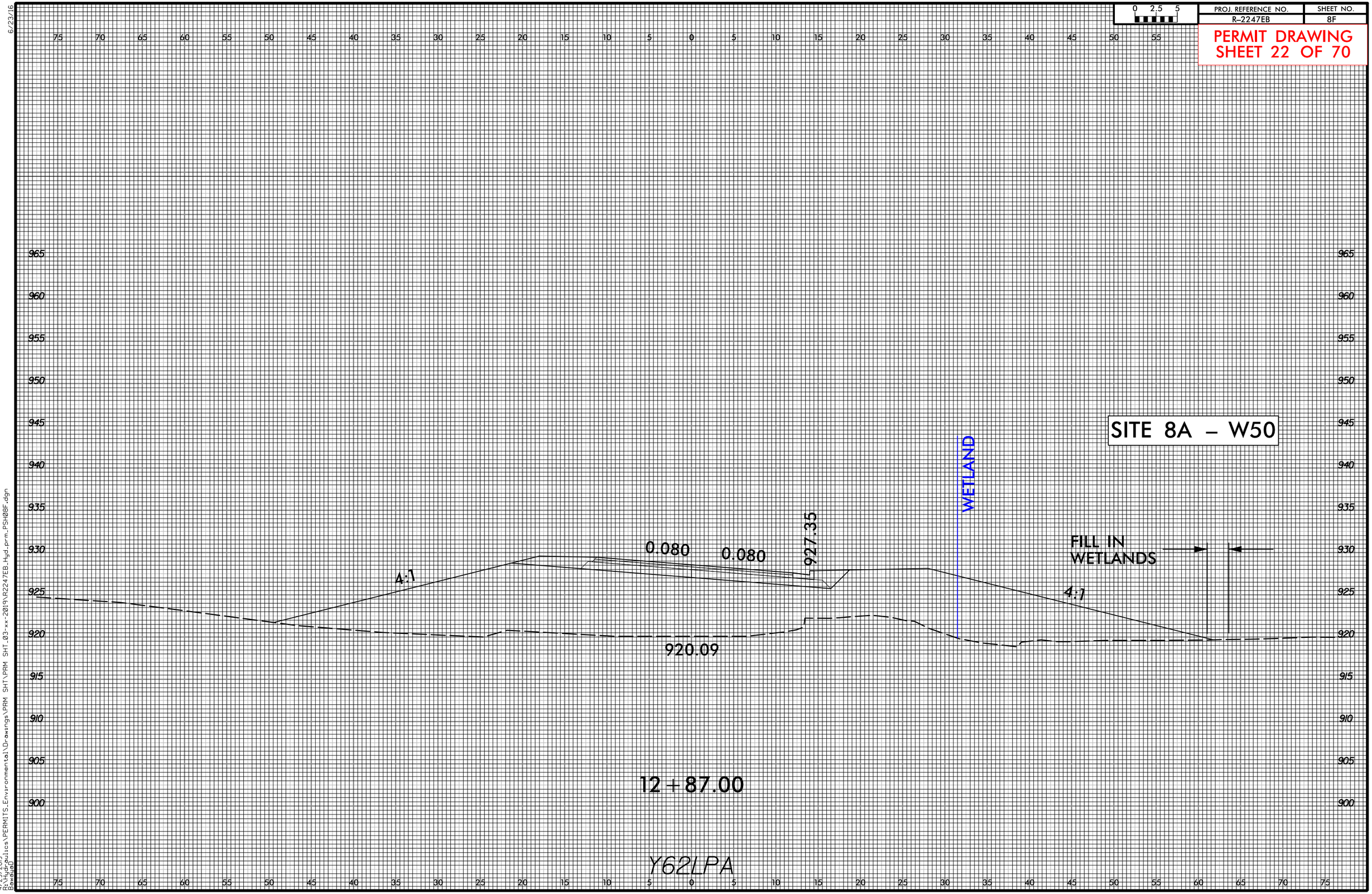

6/23/16

4/29/2019
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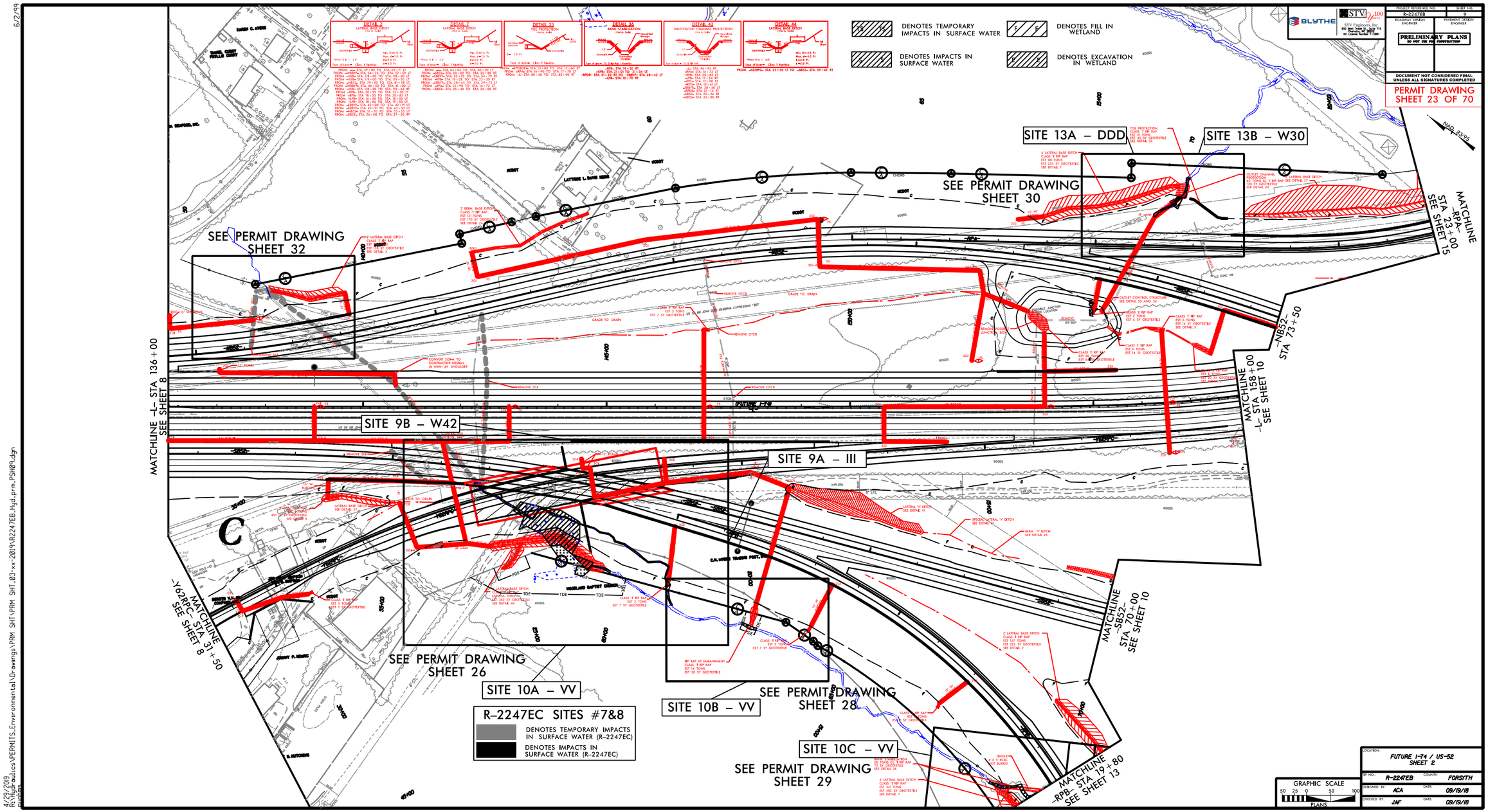

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING SHEET 23 OF 70

LOCATION:	FUTURE I-74 / US-52 SHEET 2
TIP NO.: R-2247EB	COUNTY: FORSYTH
DESIGNED BY: ACA	DATE: 09/19/18
CHECKED BY: JAF	DATE: 09/19/18

6/2/99

4/29/2019
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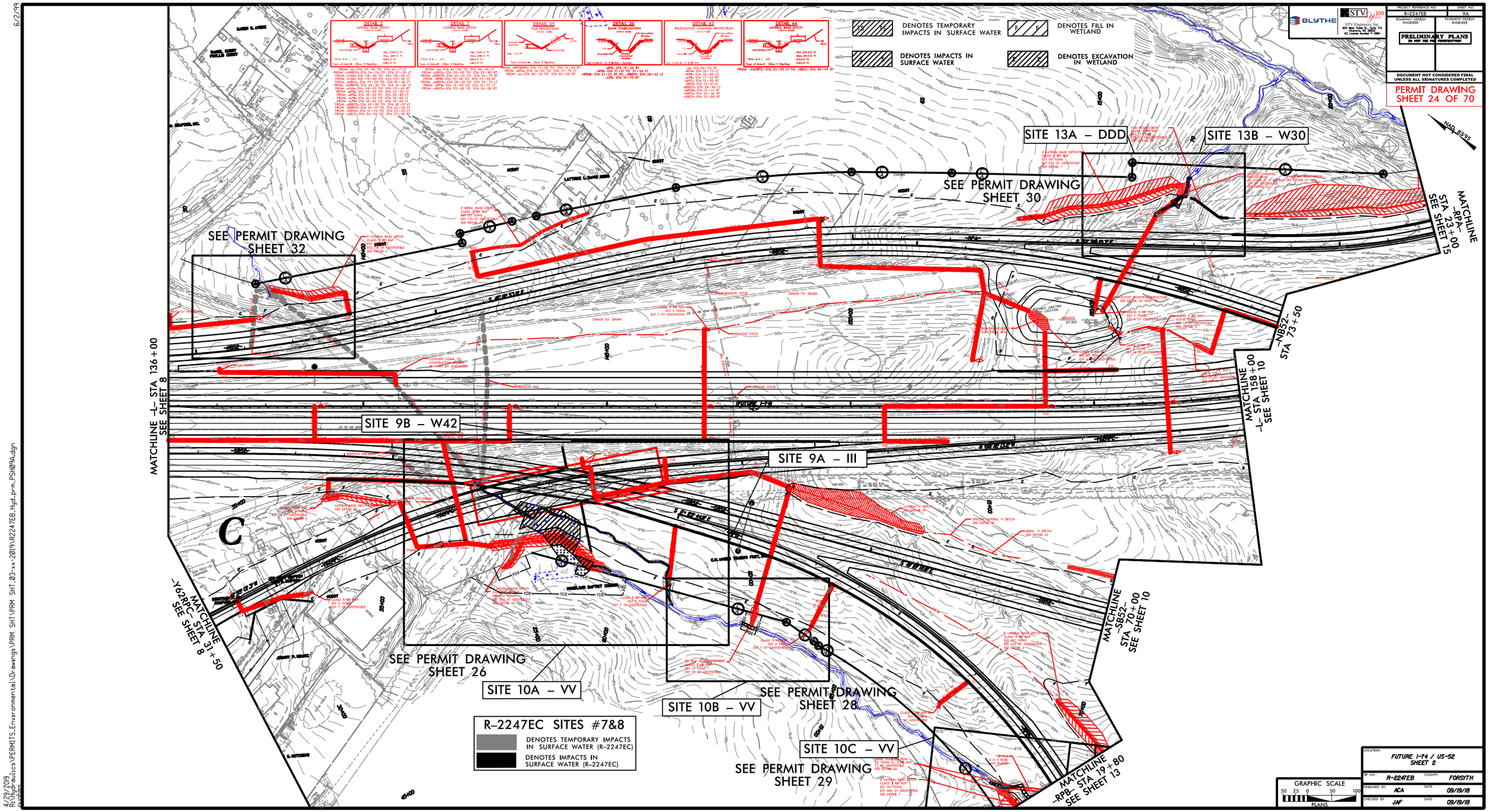

BLYTHE

STV Engineers, Inc.
500 West Main St. Suite 715
Clarksburg, WV 26301
NC License Number F-1081

PROJECT REFERENCE NO. R-2247EB
SHEET NO. 9A
ROADWAY DESIGN ENGINEER
PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 24 OF 70

NAD 83/95

LOCATION: FUTURE I-74 / US-52 SHEET 2

TIP NO.: R-2247EB
COUNTY: FORSYTH
DESIGNED BY: ACA
DATE: 09/19/18
CHECKED BY: JAF
DATE: 09/19/18

6/2/99

4/29/2019
R:\Hydraulics\PERMITS_Environmental\Drawings\PRM SHT\PRM SHT_03-xx-2019\R2247EB_Hyd_prm_PSH09A.dgn

PERMIT DRAWING
SHEET 25 OF 70

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	9B
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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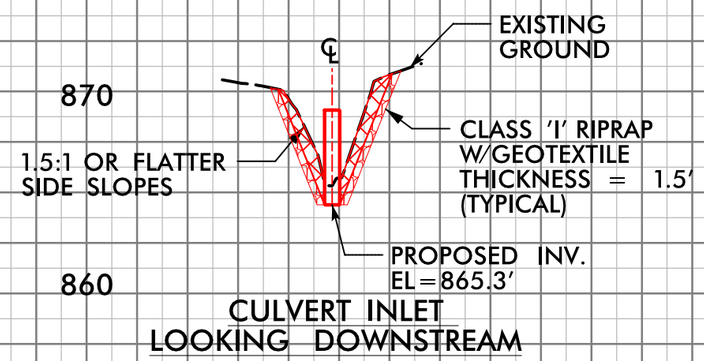
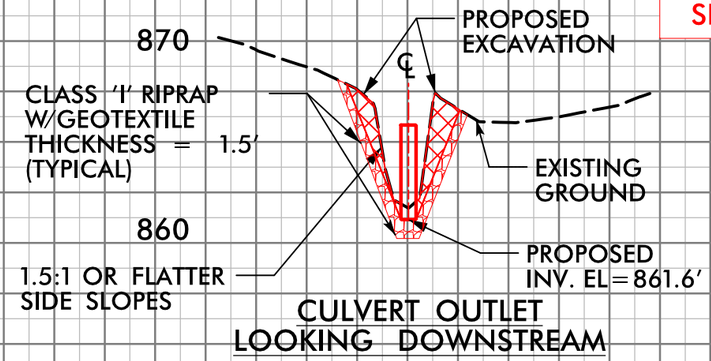
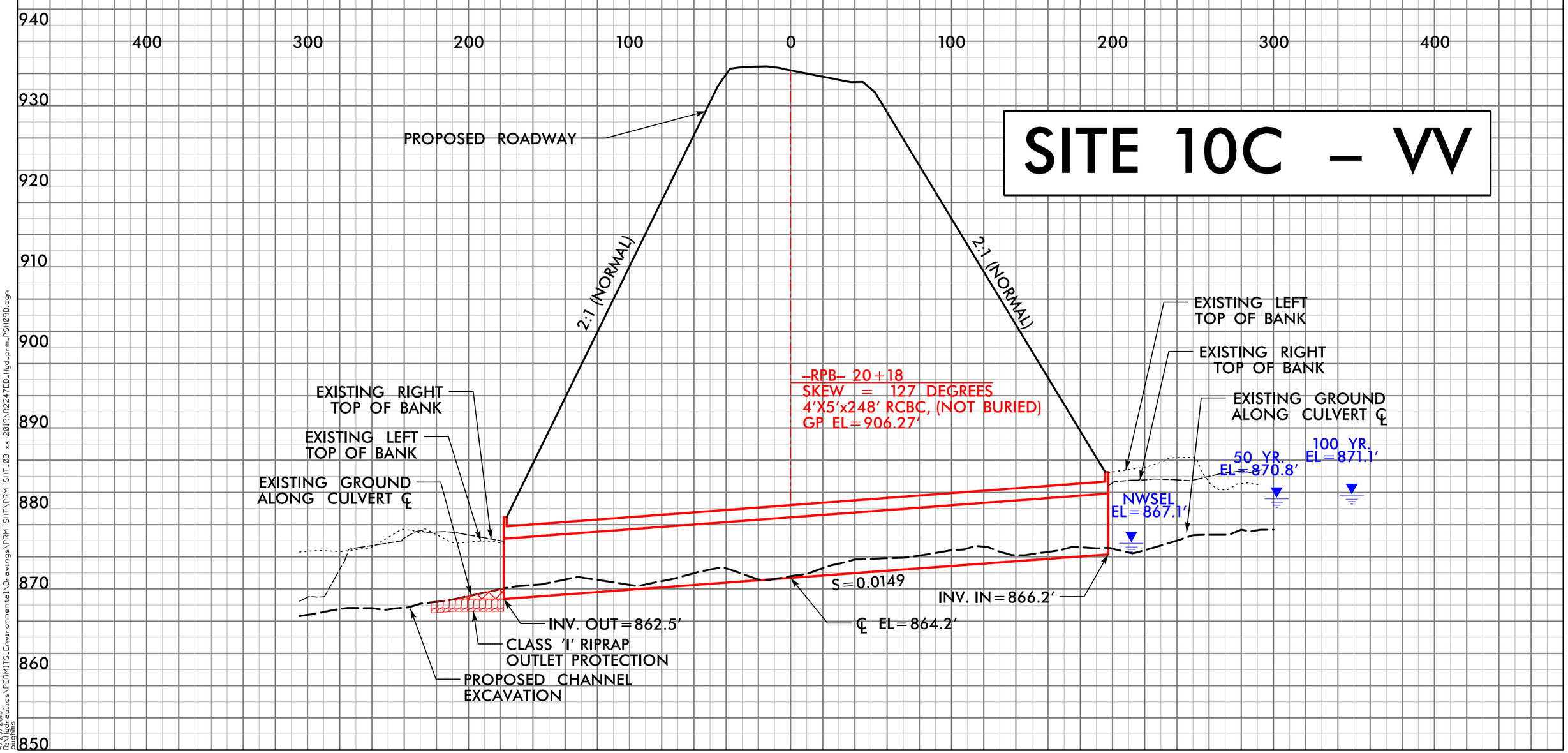
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED







SITE 10C – VV

6/23/16

4/29/2019
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pughns

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	9C
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

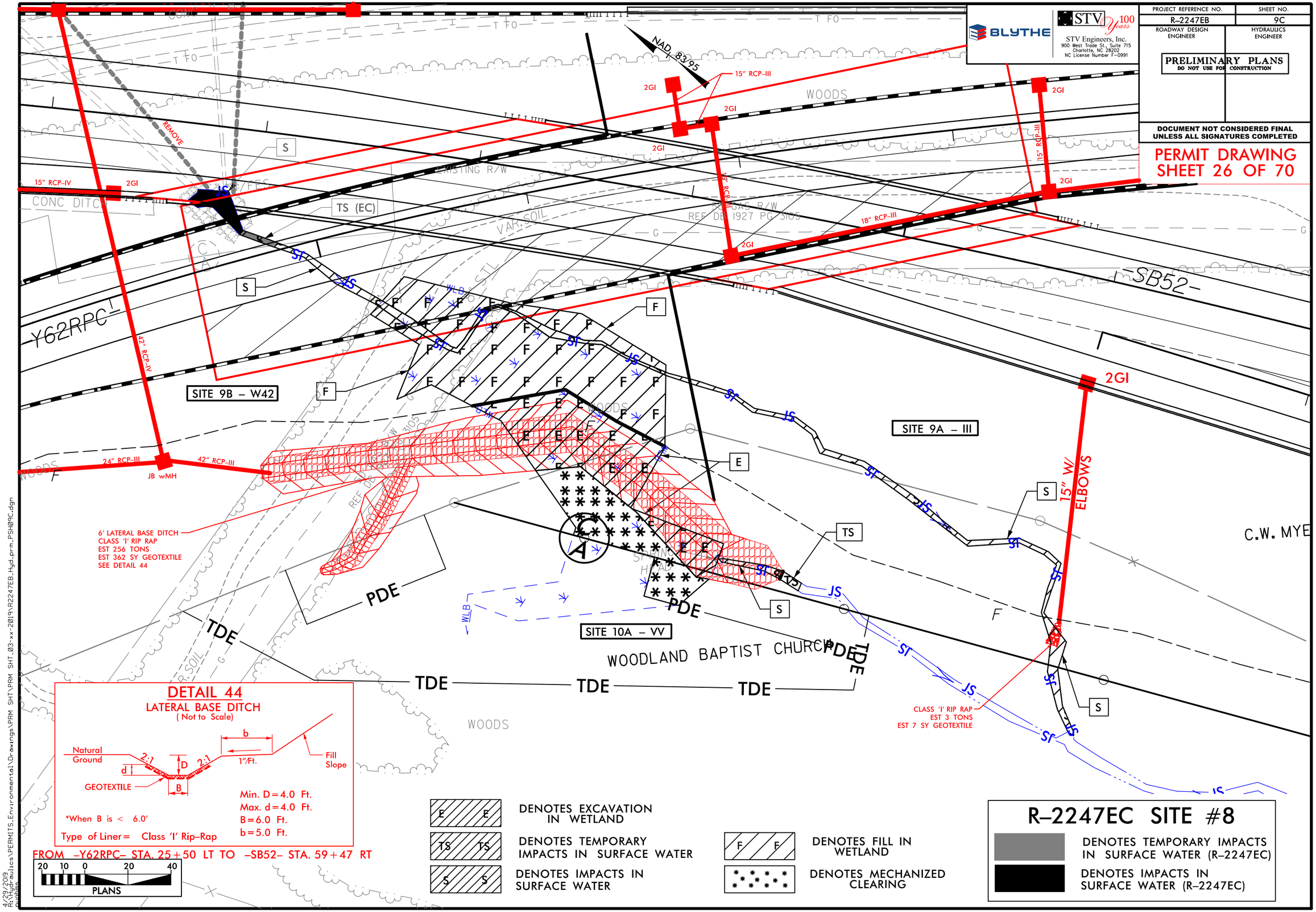
BLYTHE

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

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 26 OF 70



4/29/2019
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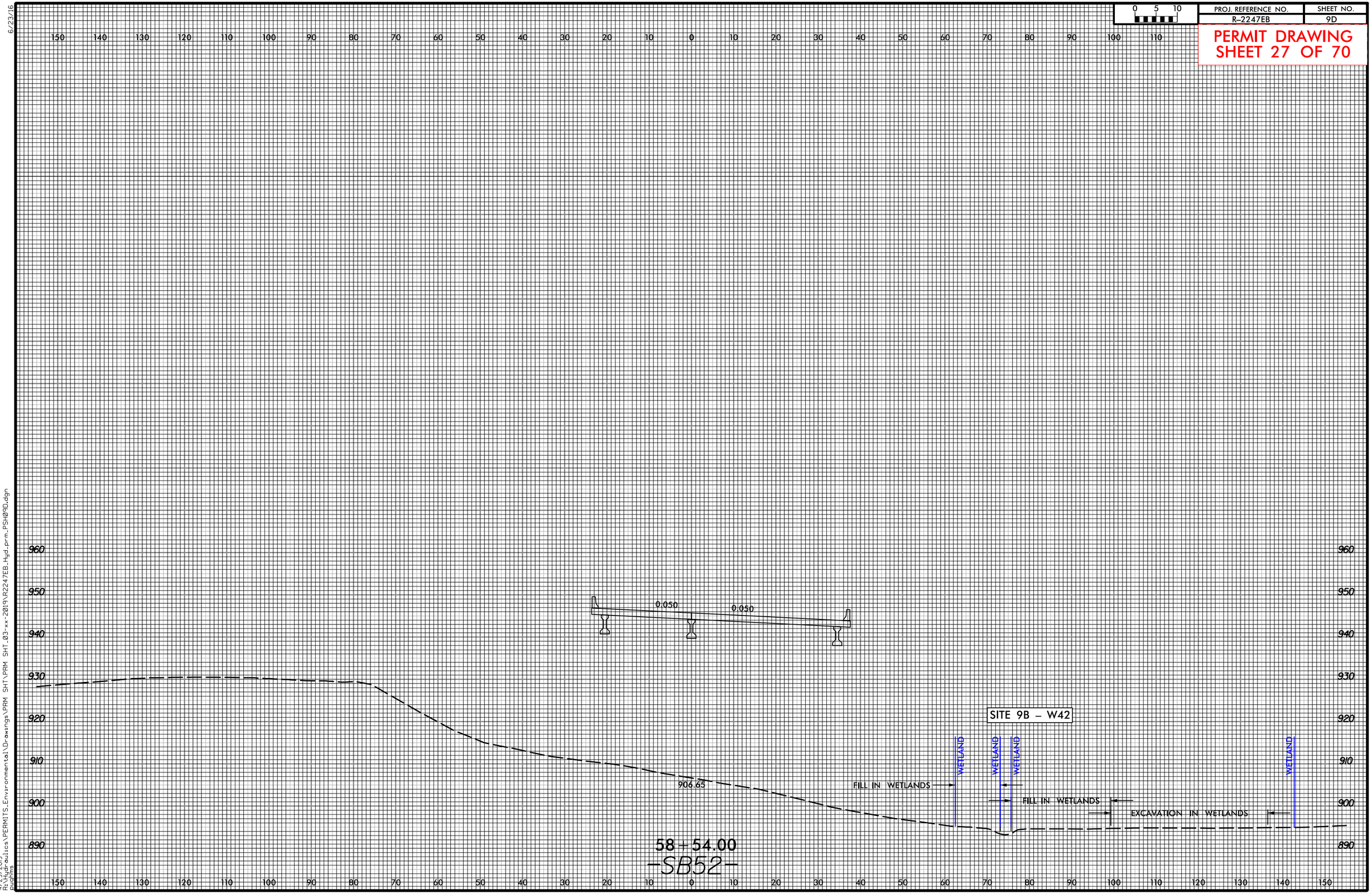
6/23/16

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

0 5 10

PERMIT DRAWING
SHEET 27 OF 70



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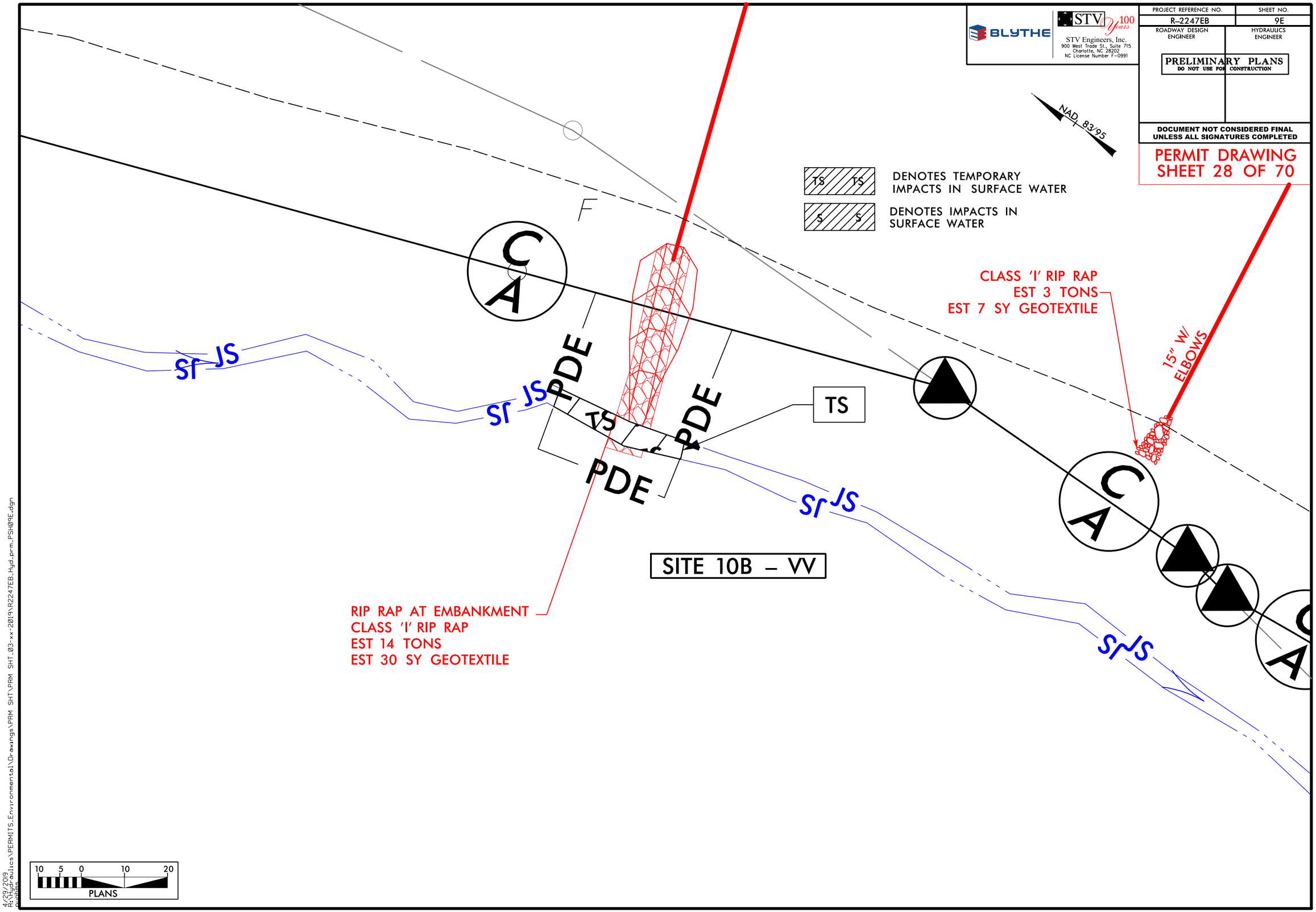
pughins



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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	9F
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

BLYTHE

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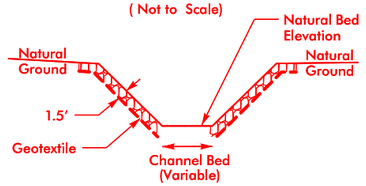
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number F-0991

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 29 OF 70

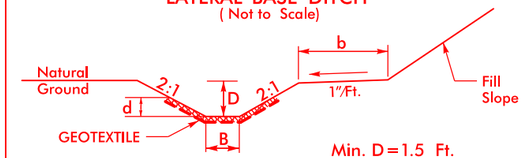
DETAIL 36
BANK STABILIZATION
(Not to Scale)



Type of Liner= CL 'I' Rip-Rap - Keyed-In

-RPB- STA. 19+30 RT
-RPB- STA. 21+01 TO 21+34 LT

DETAIL 7
LATERAL BASE DITCH
(Not to Scale)



*When B is < 6.0'

Min. D=1.5 Ft.
Max. d=1.5 Ft.
B=4.0 Ft.
b=5.0 Ft.

Type of Liner= Class 'I' Rip-Rap

FROM -RPB- STA. 19+28 TO STA. 23+30 RT

SITE 10C - VV

NAD 83/95

-RPB-

TS

S

SINGLE
4' X 5' RCBC
NOT BURIED

CHANNEL RELOCATION/
BANK STABILIZATION
50 TONS CL 'I' RIP RAP
72 SY GEOTEXTILE
SEE DETAIL 36 & 36A

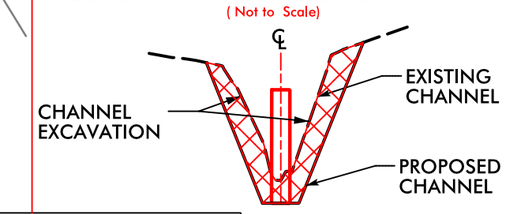
4' LATERAL BASE DITCH
CLASS 'I' RIP RAP
EST 341 TONS
EST 482 SY GEOTEXTILE
SEE DETAIL 7

2GI

15" W/
ELBOWS

MATCHLINE
SEE PERMIT DRAWING SHEET 38

DETAIL 36A
CULVERT CHANNEL RELOCATION AT INLET
(Not to Scale)



TA. 19+30 RT
+01 TO 21+34 LT

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S S DENOTES IMPACTS IN SURFACE WATER

10 5 0 10 20
PLANS

4/29/2019
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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	9G
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

BLYTHE

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

PRELIMINARY PLANS
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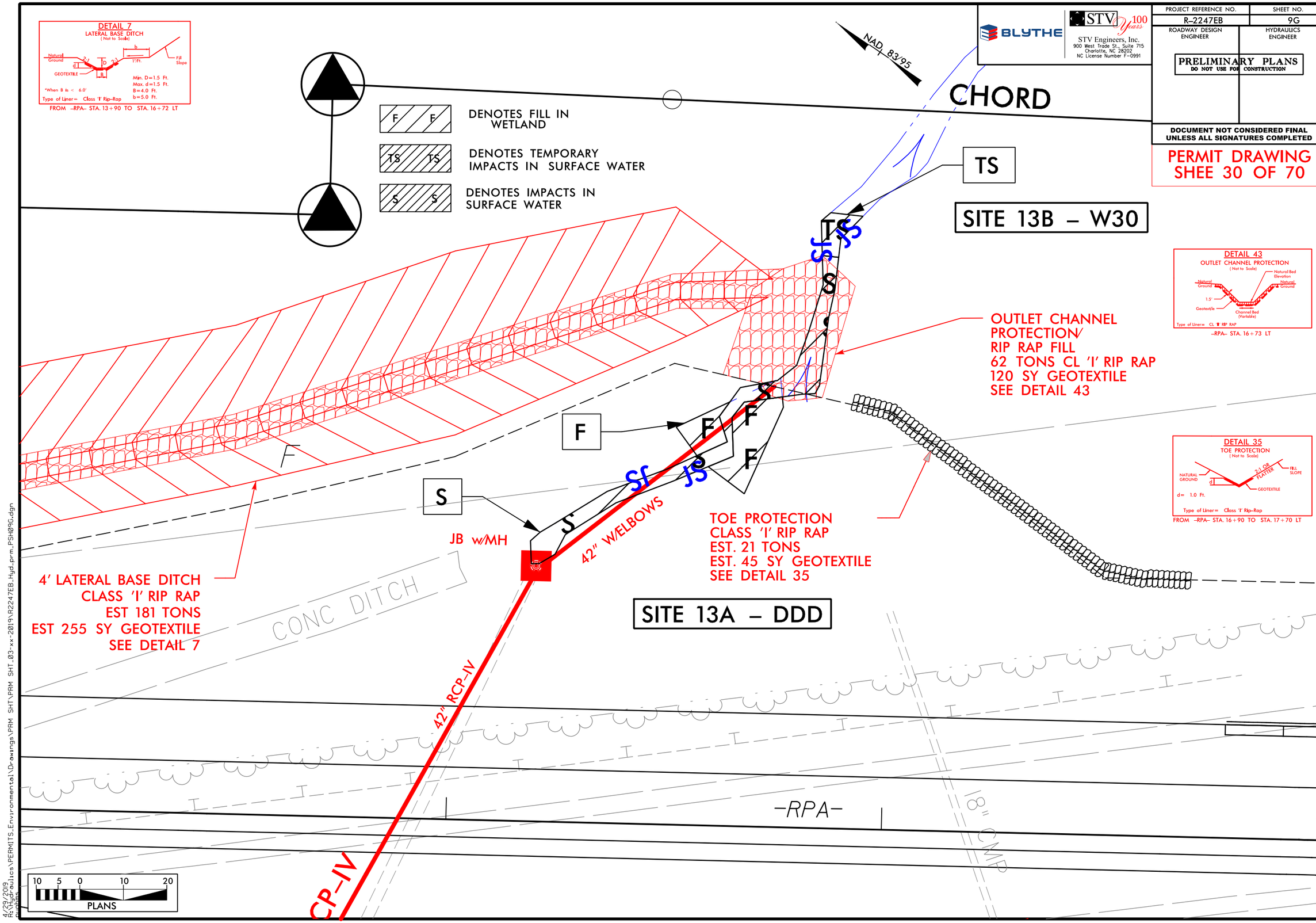
PERMIT DRAWING
SHEE 30 OF 70



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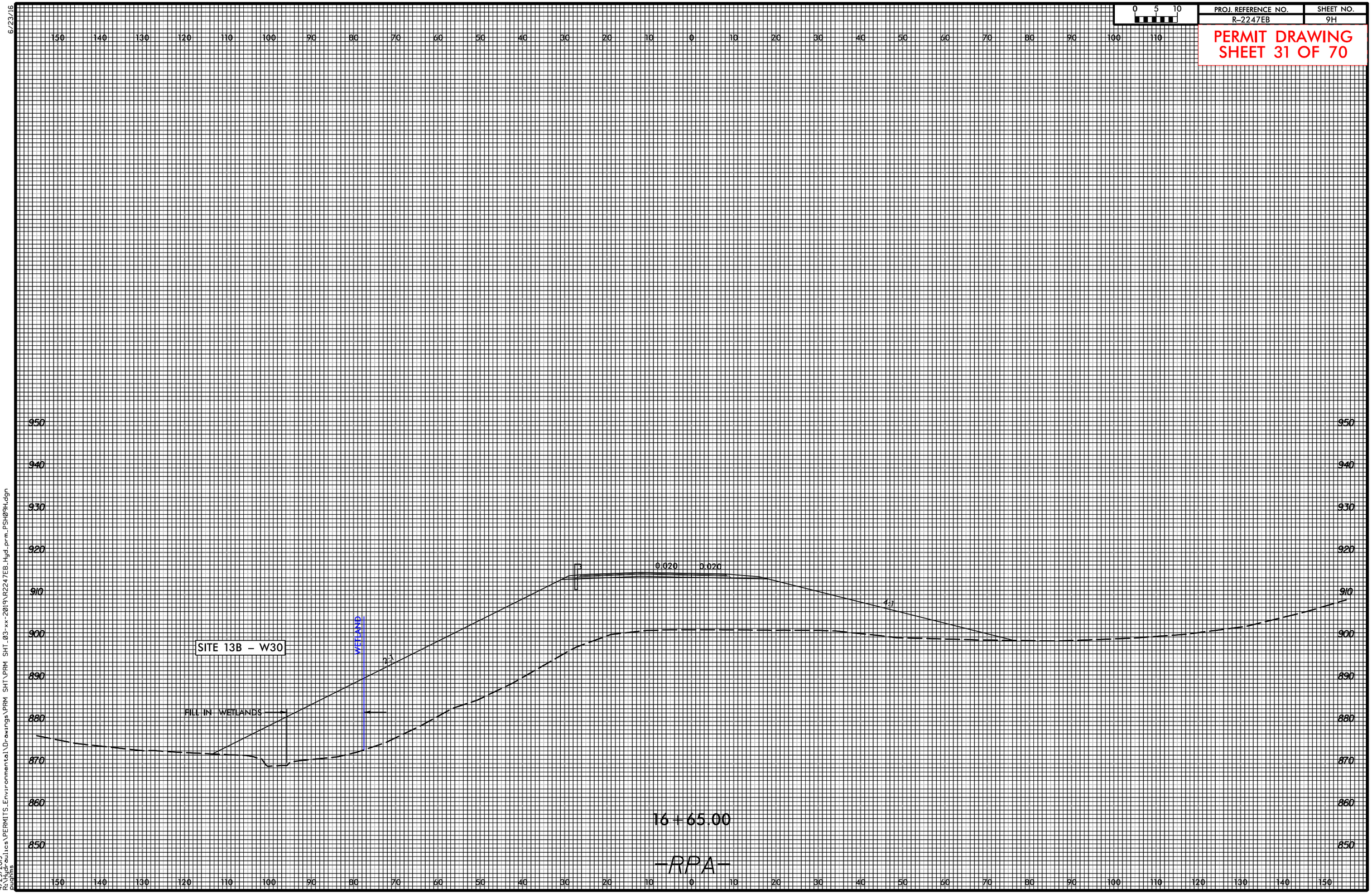

6/23/16

4/29/2019
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R–2247EC SITE #7

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

DENOTES IMPACTS IN SURFACE WATER (R–2247EC)

BLYTHE

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

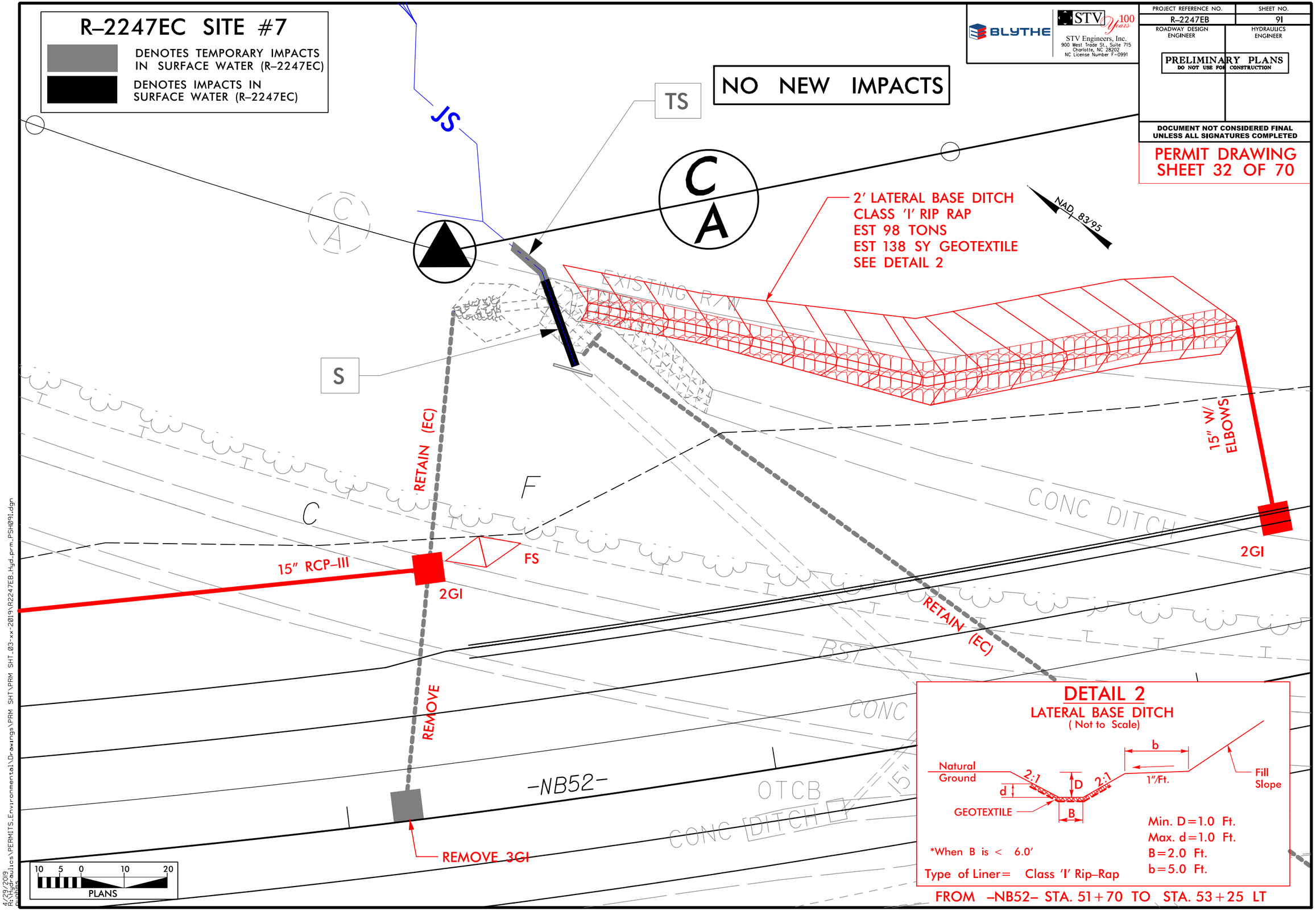
PROJECT REFERENCE NO.	SHEET NO.
R–2247EB	91
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 32 OF 70

NO NEW IMPACTS



DETAIL 2
LATERAL BASE DITCH
(Not to Scale)

Min. D=1.0 Ft.
Max. d=1.0 Ft.
B=2.0 Ft.
b=5.0 Ft.

*When B is < 6.0'

Type of Liner= Class 'I' Rip–Rap

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

4/29/2019
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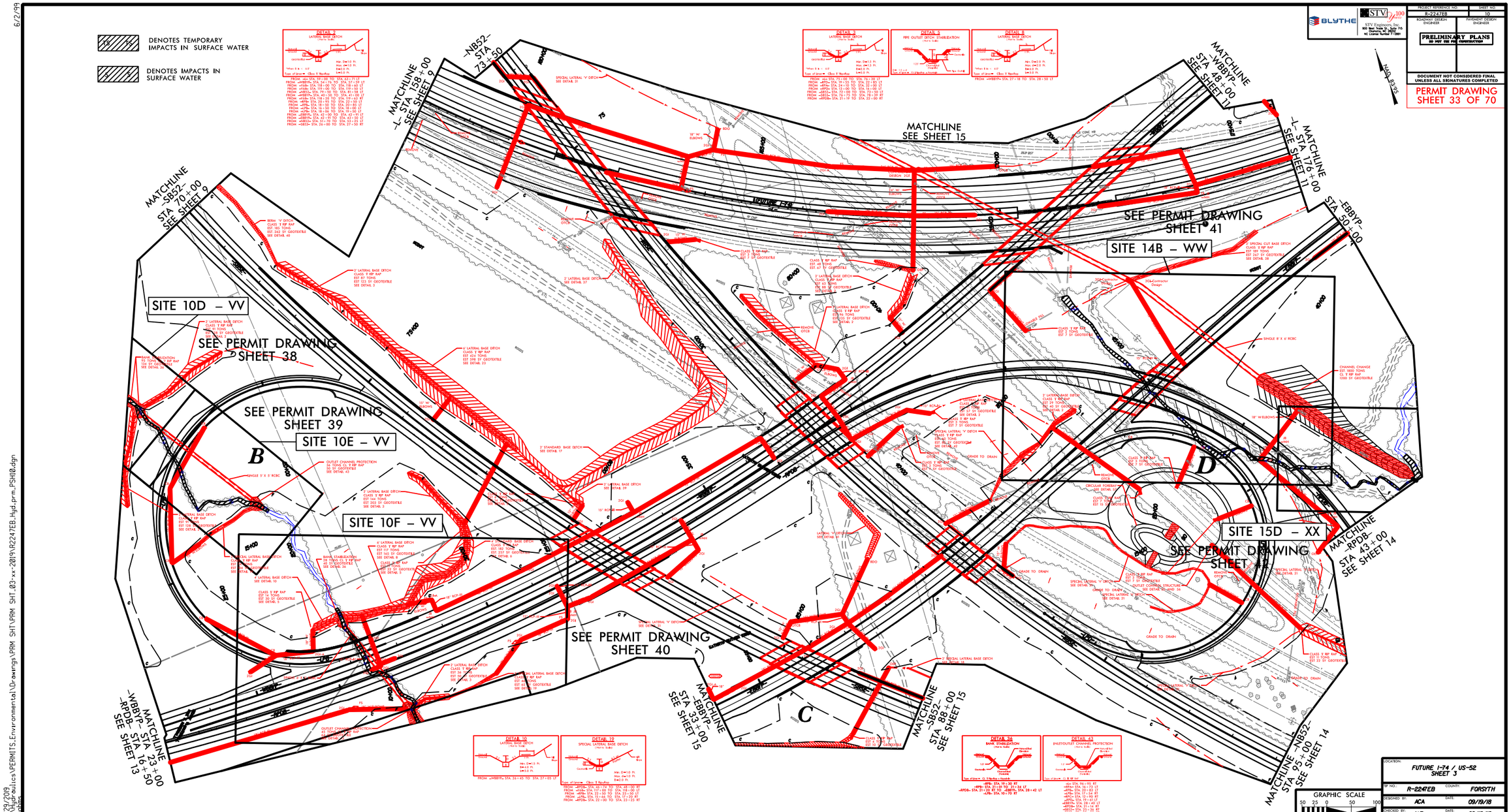

BLYTHE

STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number F-1091

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	10
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 33 OF 70

NAD 83/95

LOCATION:	FUTURE I-74 / US-52 SHEET 3
TIP NO.: R-2247EB	COUNTY: FORSYTH
DESIGNED BY: ACA	DATE: 09/19/18
CHECKED BY: JAF	DATE: 09/19/18

GRAPHIC SCALE
50 25 0 50 100
PLANS

6/2/99

4/29/2019
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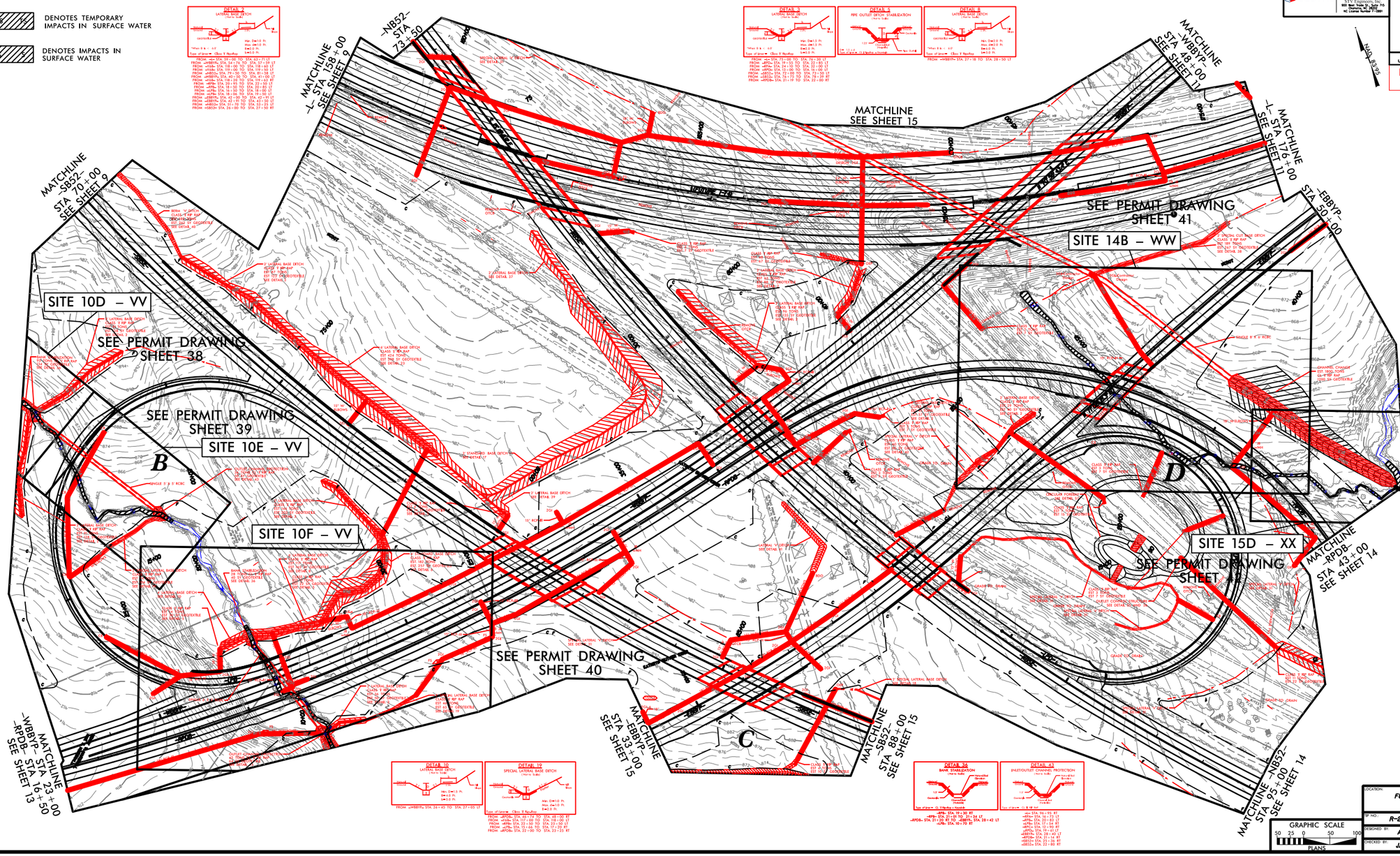
6/2/99

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES IMPACTS IN SURFACE WATER



BLYTHE

STV Engineers, Inc. 100 Year
800 Blue Lake, NC 28202 704
NC License Number F-1380

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	10A
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 34 OF 70

N.G.S. 8/29

LOCATION: FUTURE I-74 / US-52 SHEET 3

TIP NO.	COUNTY
R-2247EB	FORSYTH
DESIGNED BY: ACA	DATE: 09/19/18
CHECKED BY: JAF	DATE: 09/19/18

GRAPHIC SCALE
50 25 0 50 100
PLANS

4/29/2019
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6/23/16

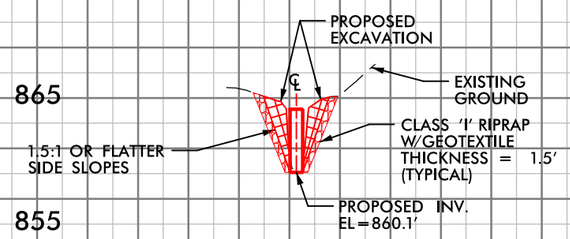
PERMIT DRAWING
SHEET 35 OF 70

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	10B
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

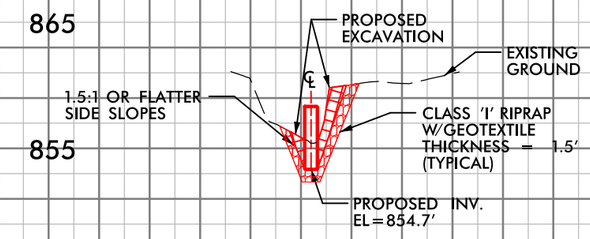
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

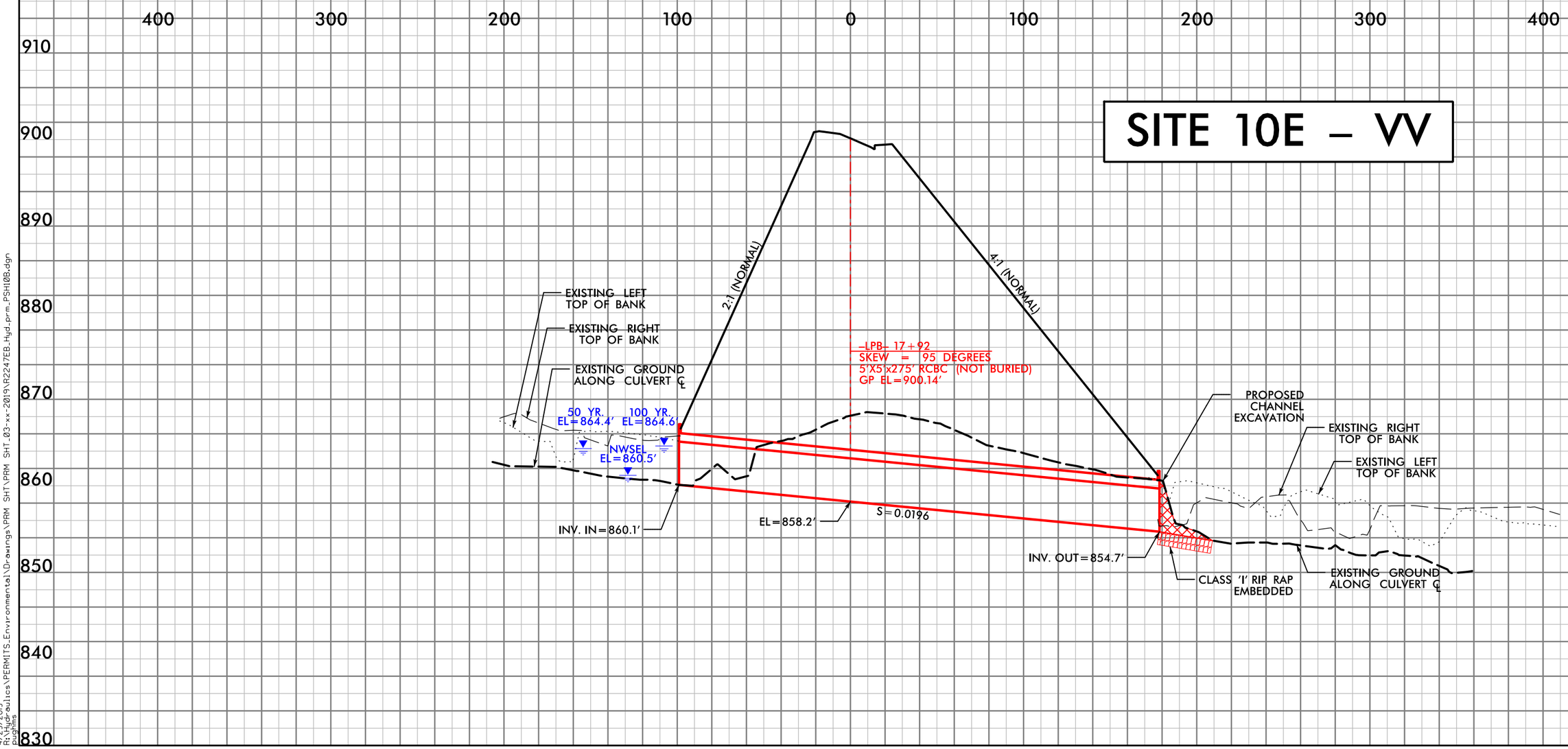


CULVERT INLET
LOOKING DOWNSTREAM



CULVERT OUTLET
LOOKING DOWNSTREAM

SITE 10E – VV



4/29/2019
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pughms

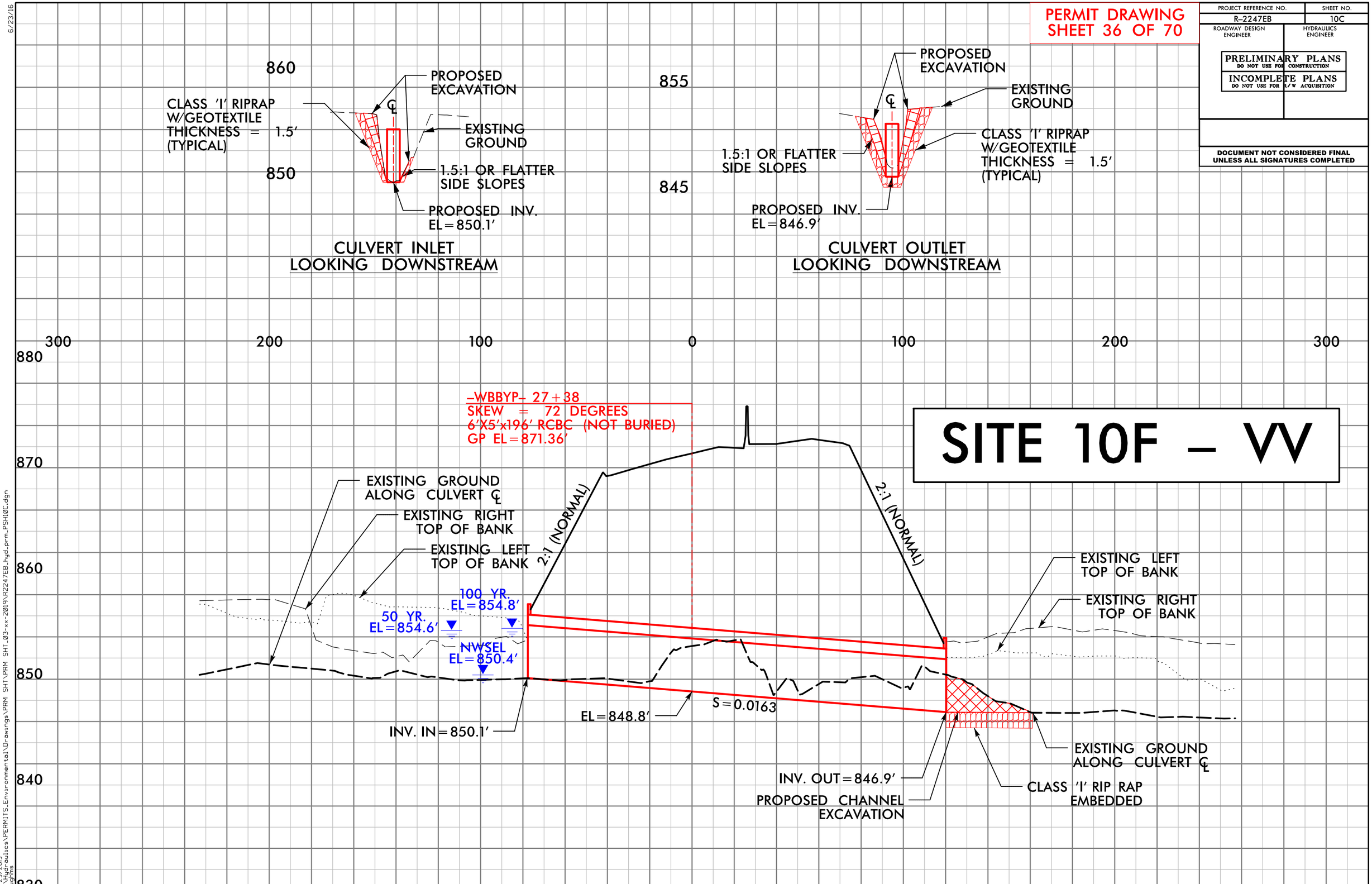
PERMIT DRAWING
SHEET 36 OF 70

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



6/23/16

4/29/2019
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pughms

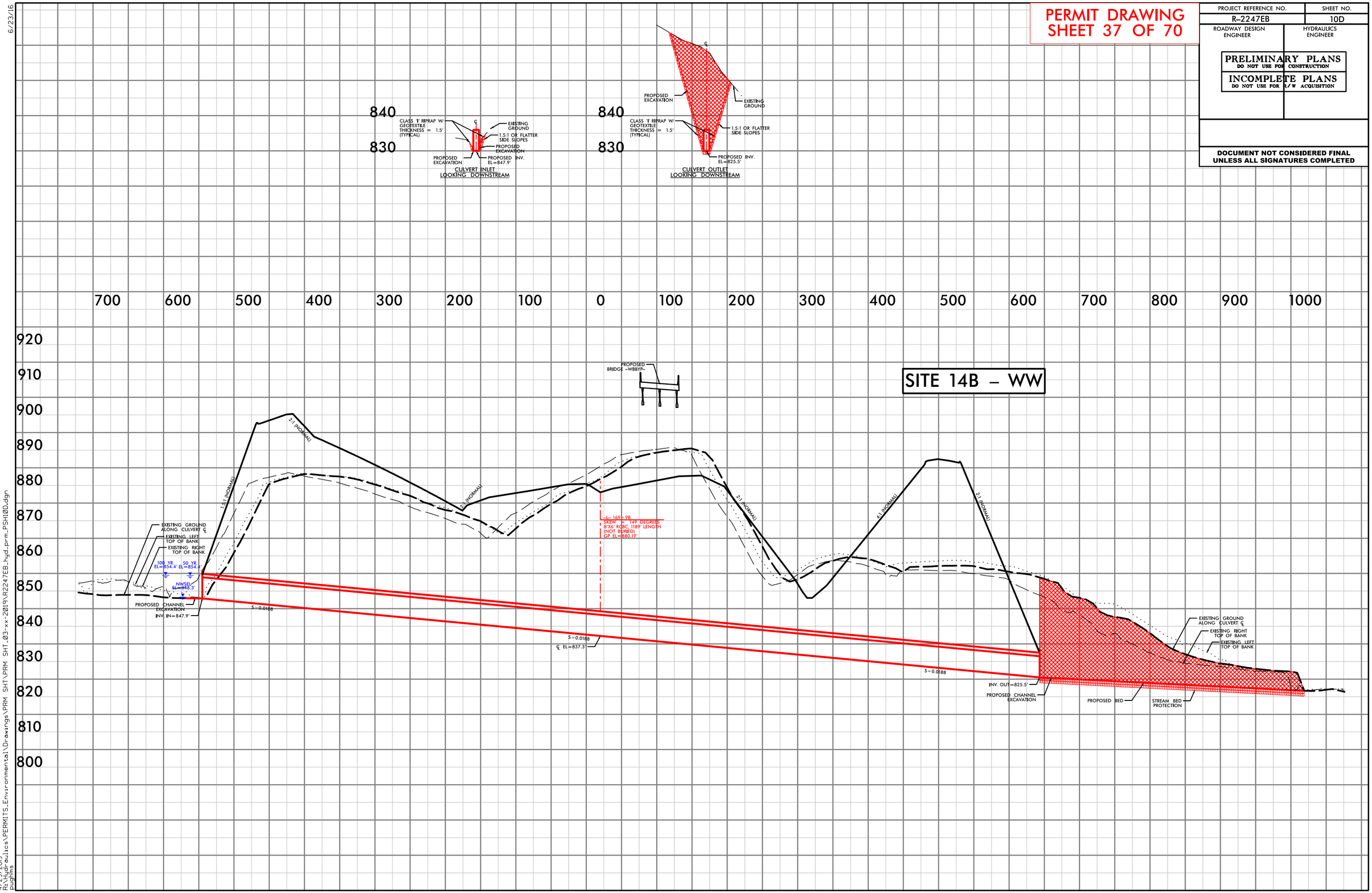
PERMIT DRAWING
SHEET 37 OF 70

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



6/23/16

4/29/2019
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pughins

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	10E
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

BLYTHE

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

PRELIMINARY PLANS
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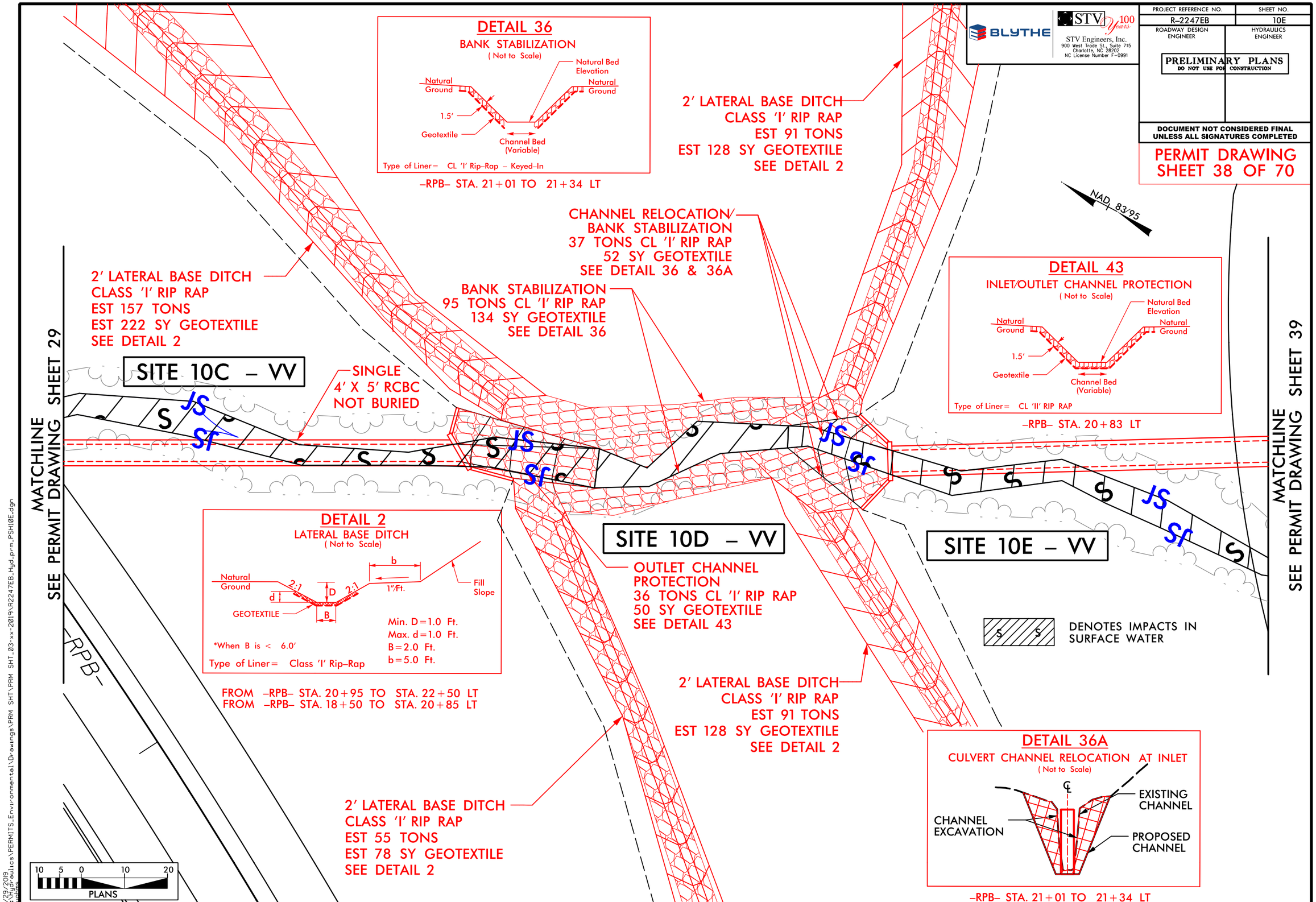
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 38 OF 70



4/29/2019
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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	10F
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

BLYTHE

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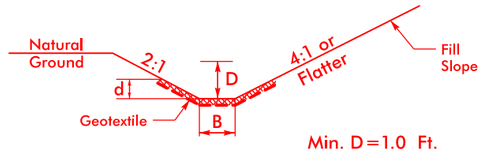
STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number F-0991

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 39 OF 70

DETAIL 19
SPECIAL LATERAL BASE DITCH
(Not to Scale)

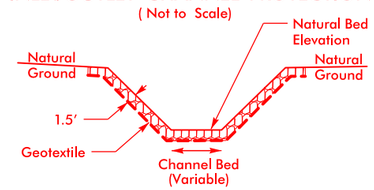


Min. D=1.0 Ft.
Max. d=1.0 Ft.
B=2.0 Ft.

Type of Liner= Class 'I' Rip-Rap

FROM -LPB- STA. 15+66 TO STA. 17+20 RT

DETAIL 43
INLET/OUTLET CHANNEL PROTECTION
(Not to Scale)



Type of Liner= CL 'II' RIP RAP

-LPB- STA. 17+54 RT

TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S DENOTES IMPACTS IN SURFACE WATER

SITE 10E – VV

MATCHLINE SEE PERMIT DRAWING SHEET 38

-LPB-

CB

15" RCP-III

CB

OUTLET CHANNEL PROTECTION
36 TONS CL 'I' RIP RAP
50 SY GEOTEXTILE
SEE DETAIL 43

SINGLE 5' X 5' RCBC
NOT BURIED

S

TS

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

NAD 83/95

10 5 0 10 20
PLANS

4/29/2019
R:\Hydraulics\PERMITS_Environmental\Drawings\PRM SHT\PRM SHT_03-xx-2019\R2247EB_Hyd_prm_PSH10F.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	10G
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

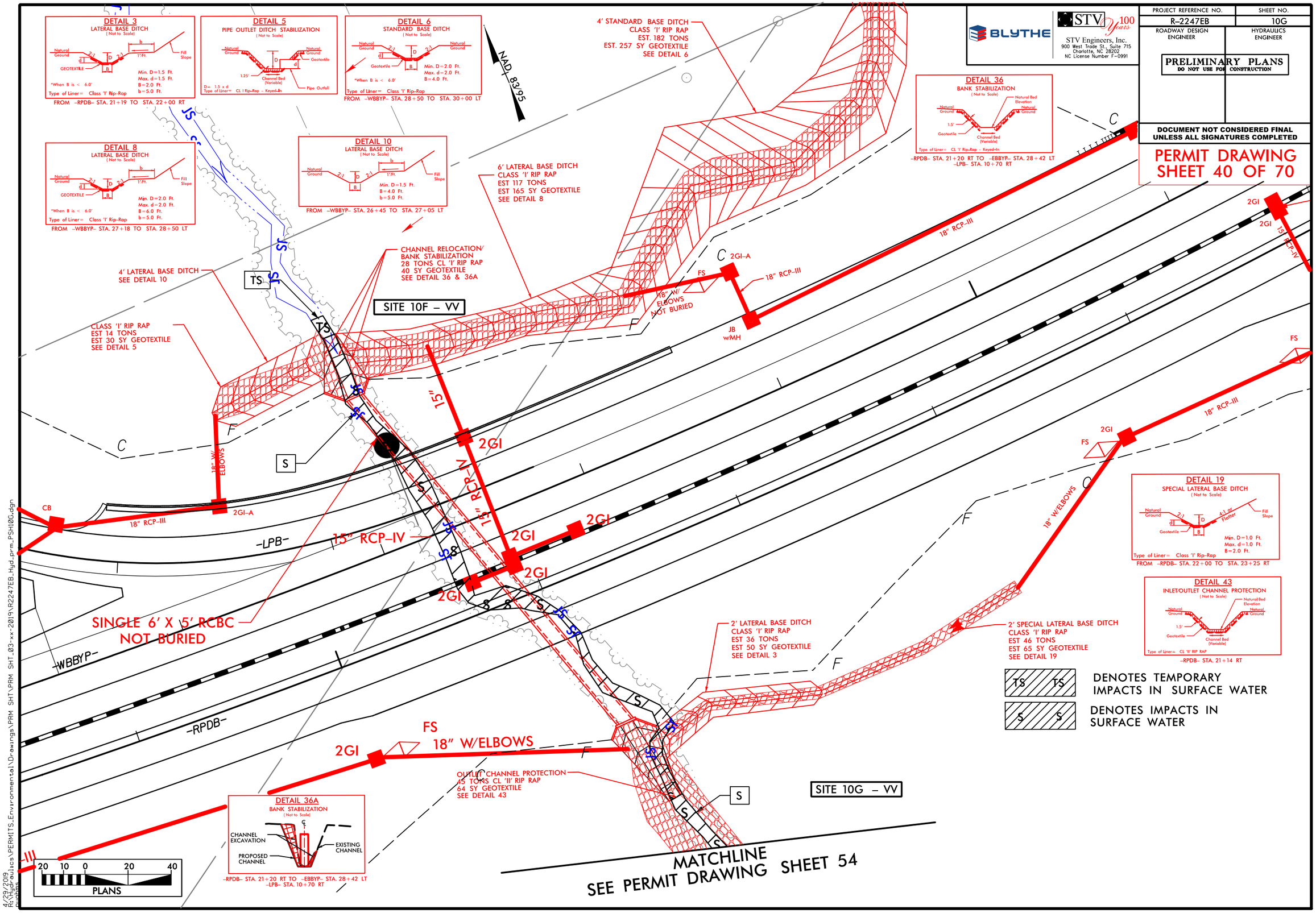
BLYTHE

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

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 40 OF 70



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Original

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	10H
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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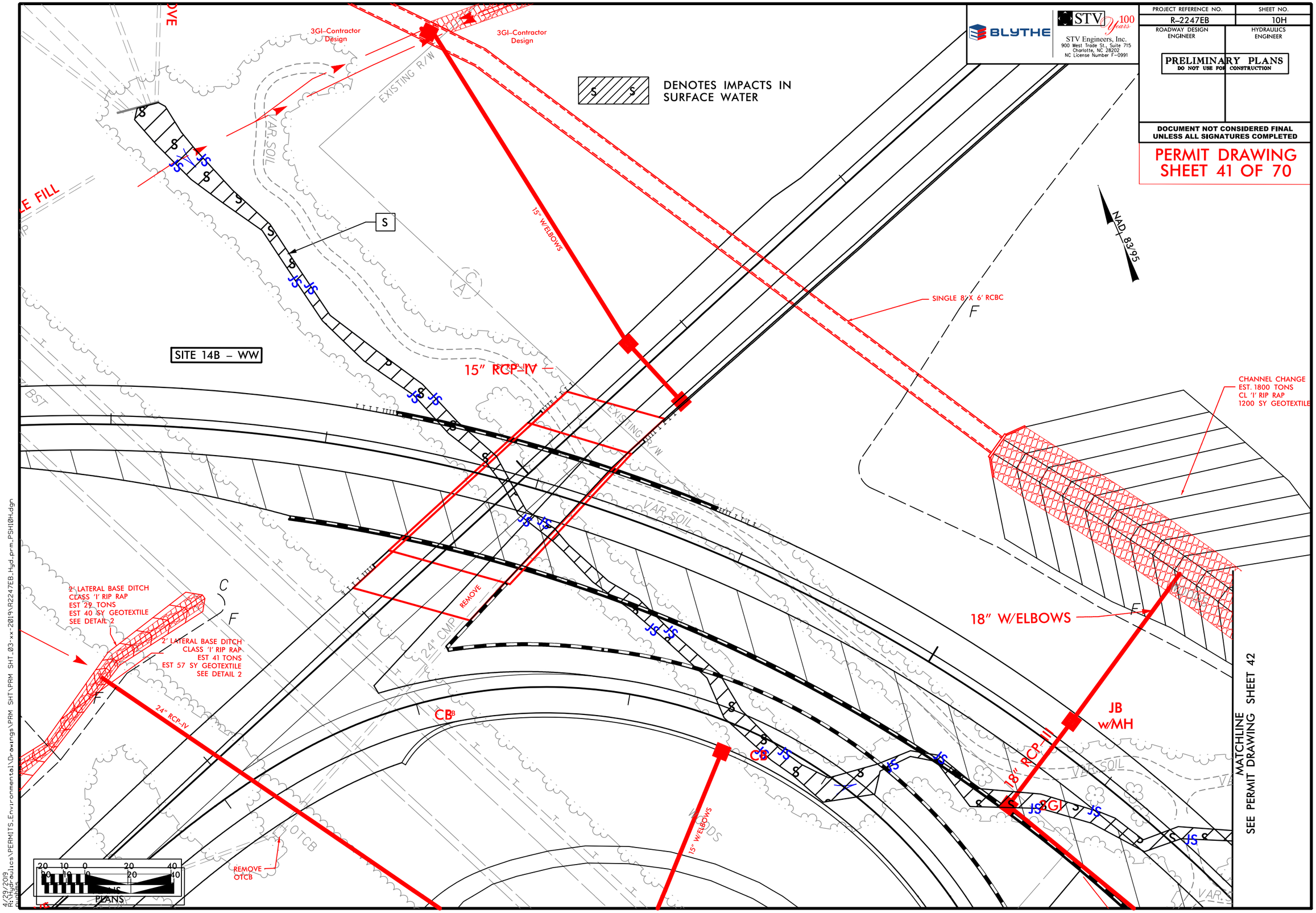
PERMIT DRAWING
SHEET 41 OF 70



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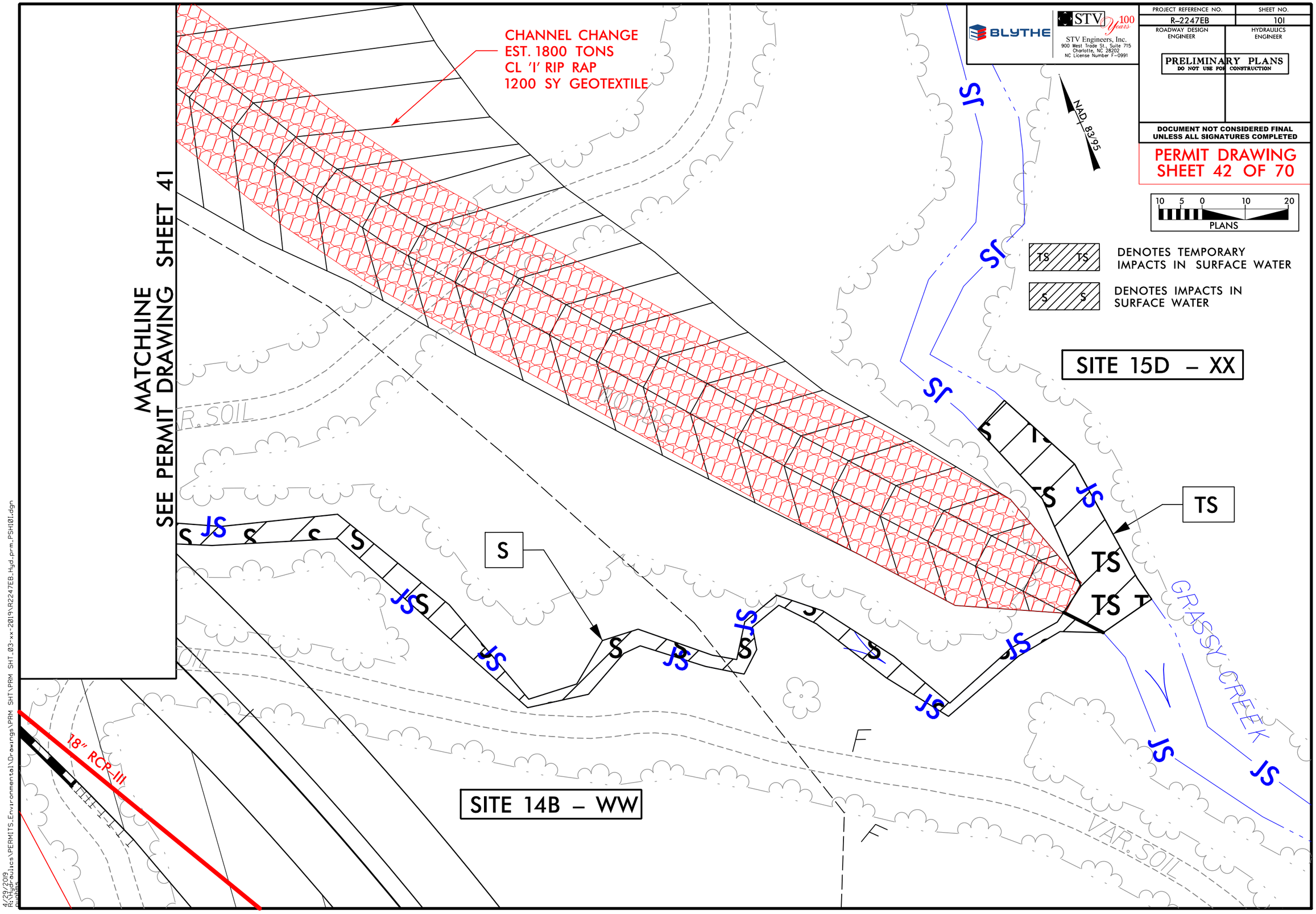

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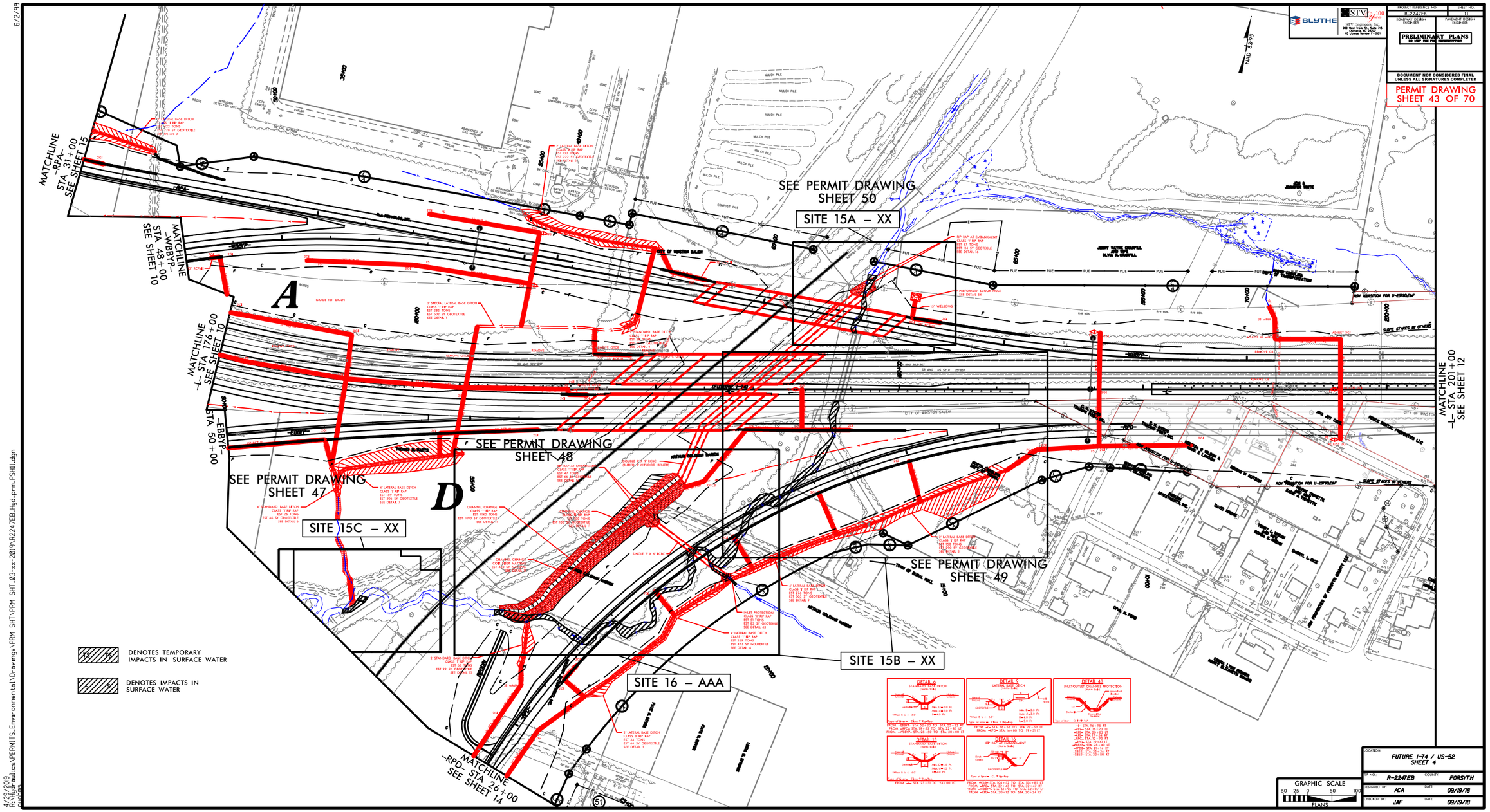
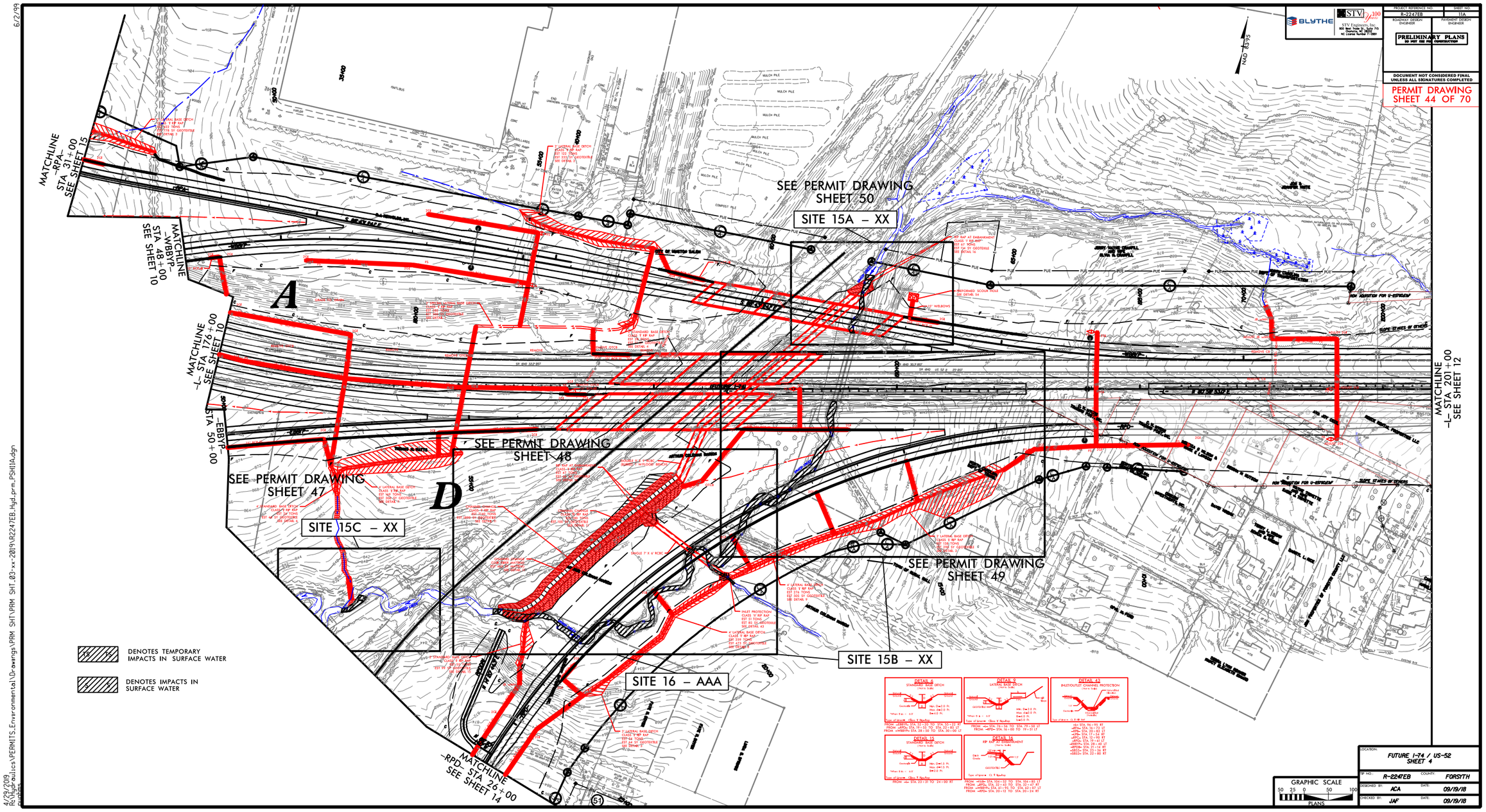


PRELIMINARY PLANS
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING
SHEET 43 OF 70
SEE PERMIT DRAWING
SHEET 50
SITE 15A – XX
SEE PERMIT DRAWING
SHEET 48
SEE PERMIT DRAWING
SHEET 47
SITE 15C – XX
SEE PERMIT DRAWING
SHEET 49
SITE 15B – XX
SITE 16 – AAA
MATCHLINE
-RPA-
STA 31+00
SEE SHEET 15
MATCHLINE
-WBBYP-
STA 48+00
SEE SHEET 10
MATCHLINE
-L- STA 176+00
SEE SHEET 10
-EBBYP-
STA 50+00
MATCHLINE
-RPD- STA 26+00
SEE SHEET 14
MATCHLINE
-L- STA 201+00
SEE SHEET 12
A
D
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER
GRAPHIC SCALE
PLANS
FUTURE I-74 / US-52
SHEET 4
R-2247EB
FORSYTH
ACA
09/19/18
JAF
09/19/18



6/2/99

4/29/2019
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PERMIT DRAWING
SHEET 45 OF 70

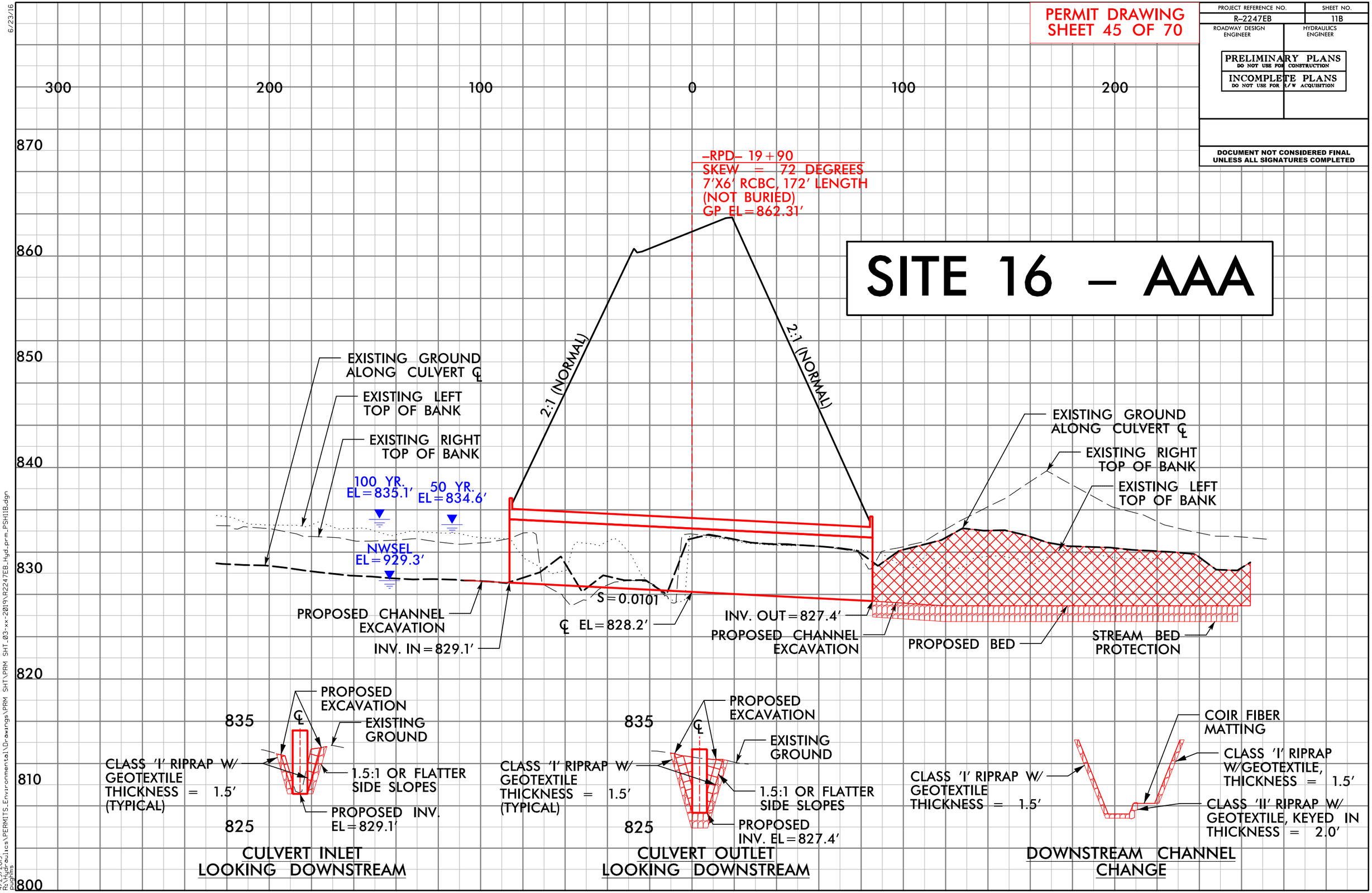
PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	11B
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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 16 – AAA



6/23/16

4/29/2019
R:\Roadways\Utilities\PERMITS_Environmental\Drawings\PRM SHT\PRM SHT_03-xx-2019\R2247EB_Hyd_prm_PSH11B.dgn
pughins

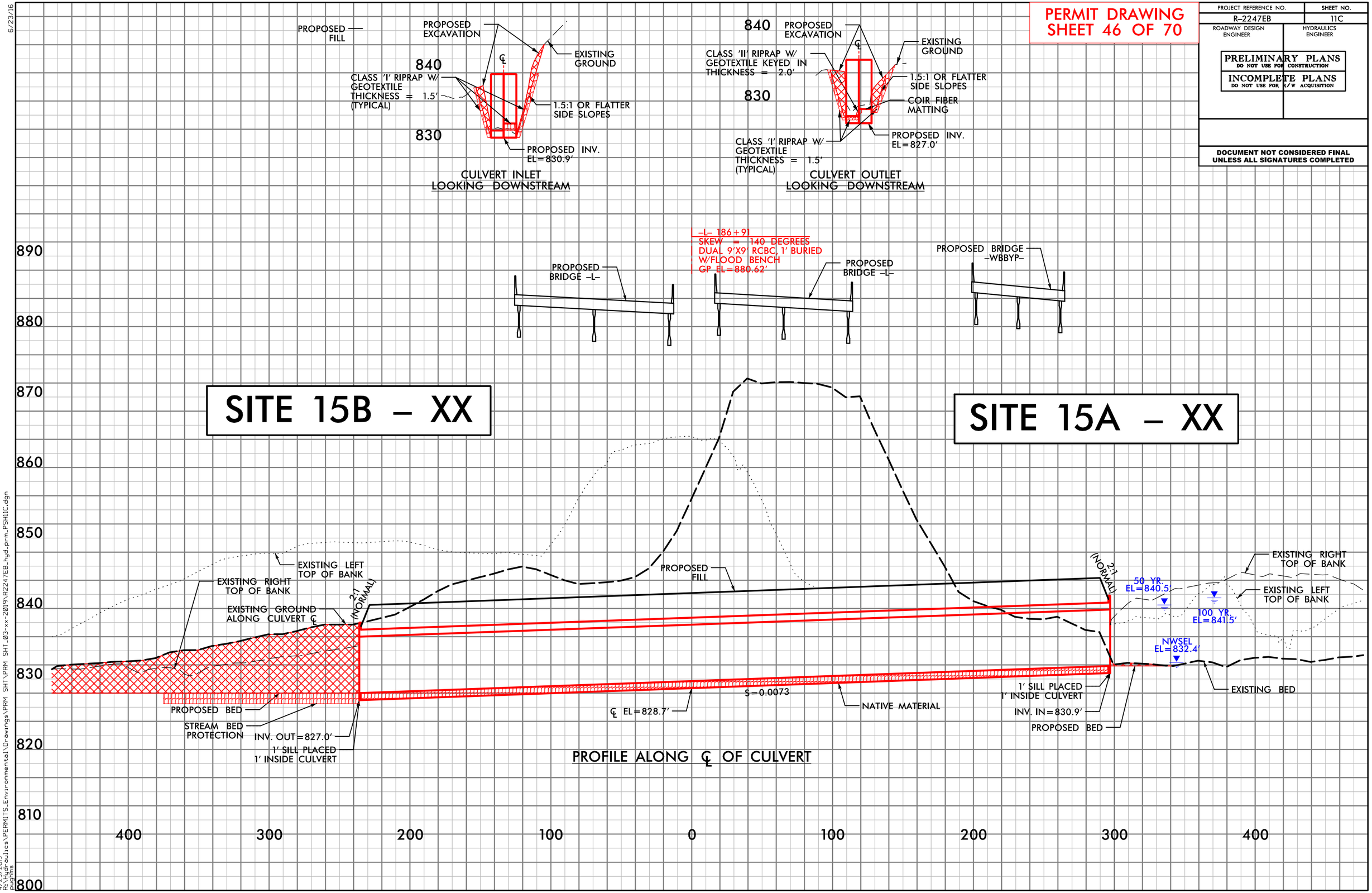
PERMIT DRAWING
SHEET 46 OF 70

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	11C
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

4/29/2019
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pughins

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	11D
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

BLYTHE

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

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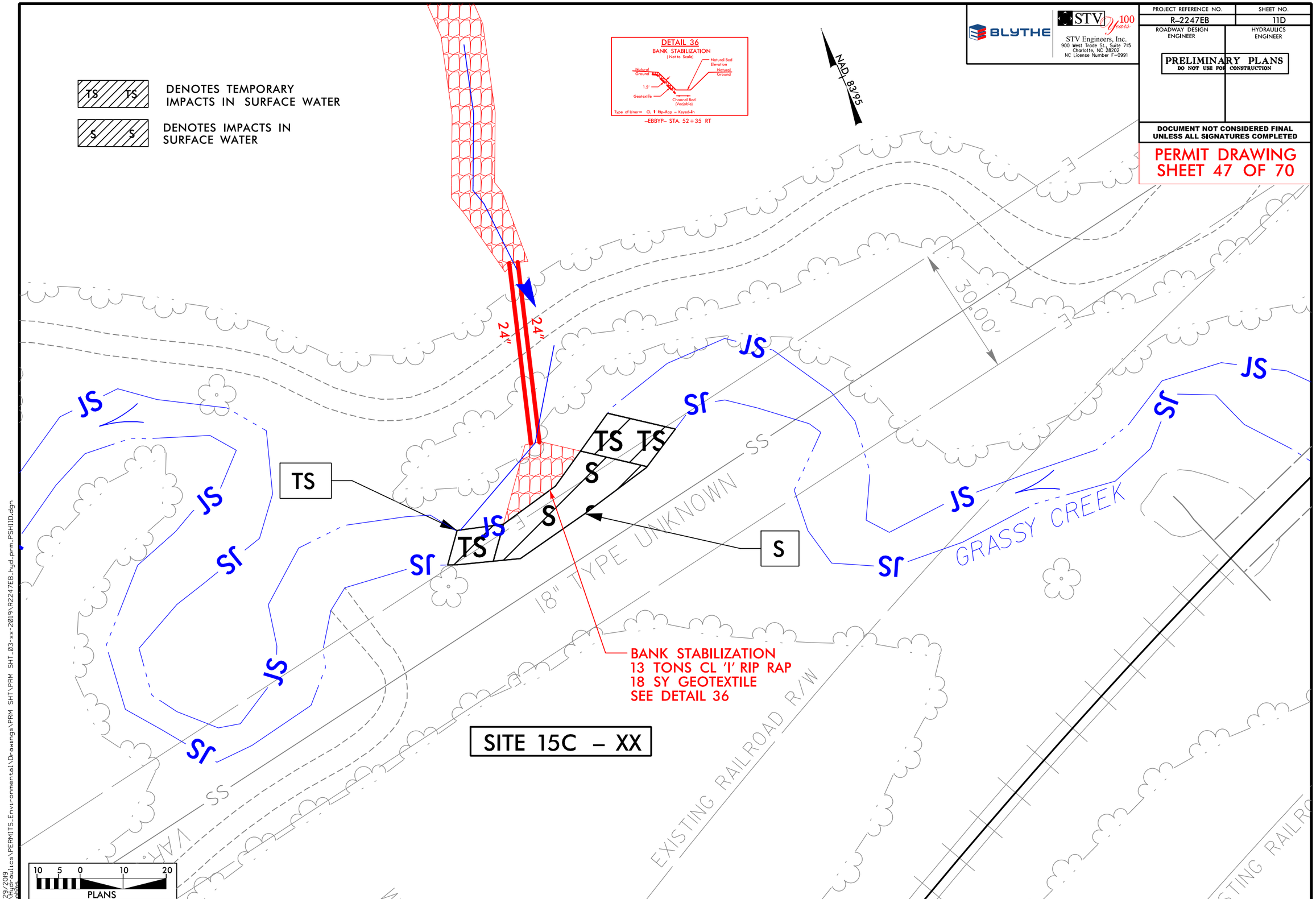
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 47 OF 70



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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	11E
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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

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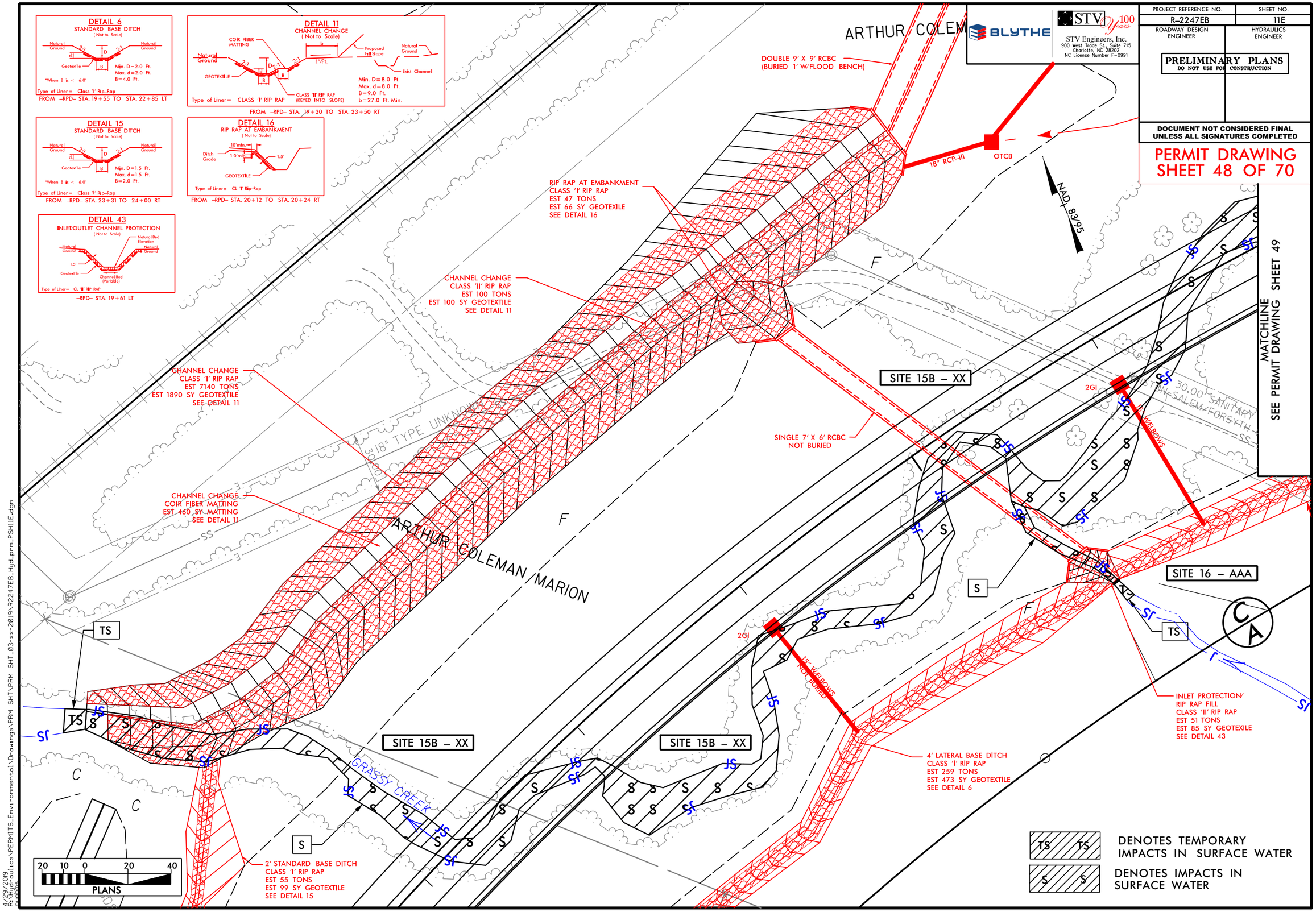
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 48 OF 70

MATCHLINE SEE PERMIT DRAWING SHEET 49



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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	11F
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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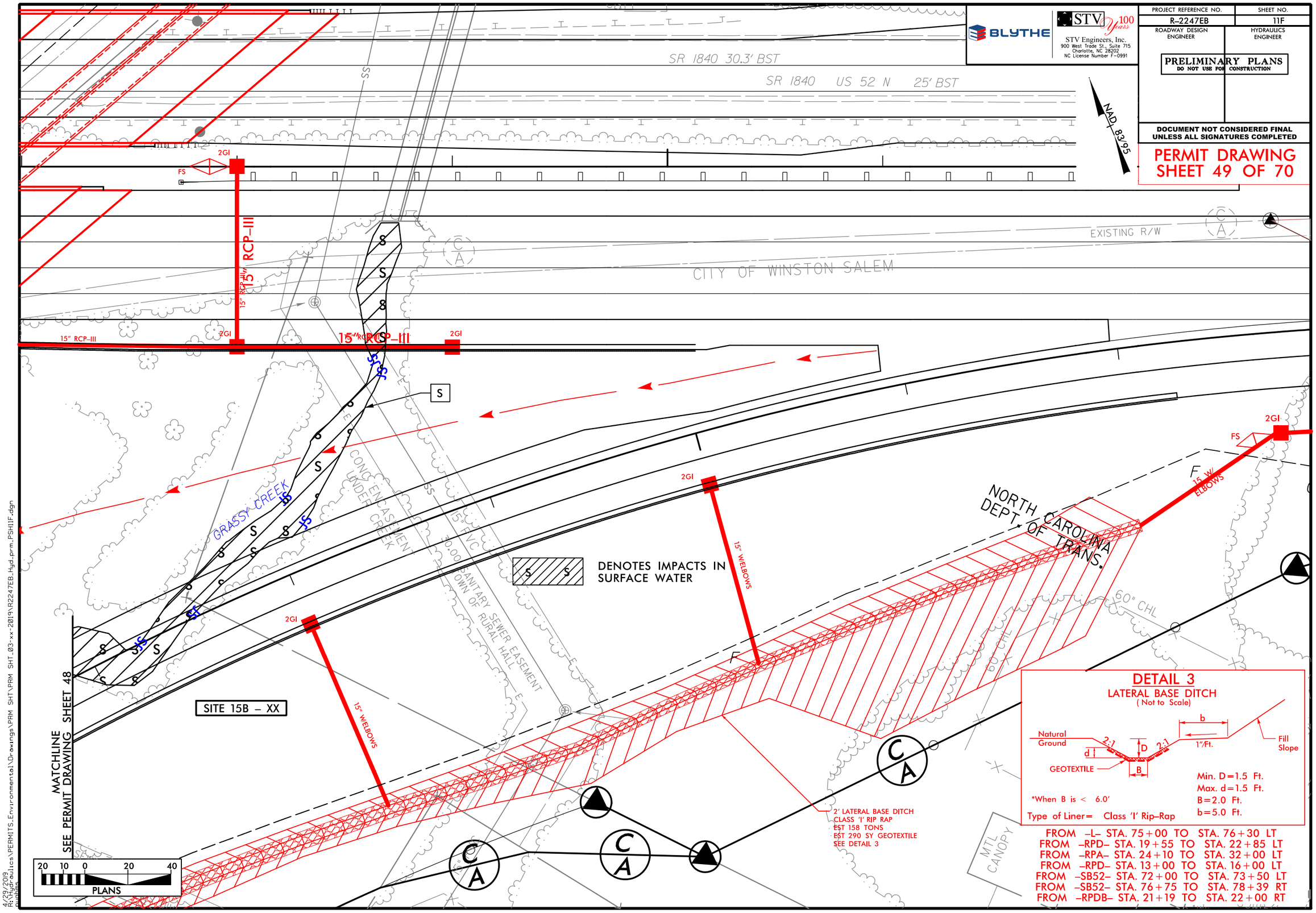
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number F-0991

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 49 OF 70



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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	11G
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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Charlotte, NC 28202
NC License Number F-0991

PRELIMINARY PLANS
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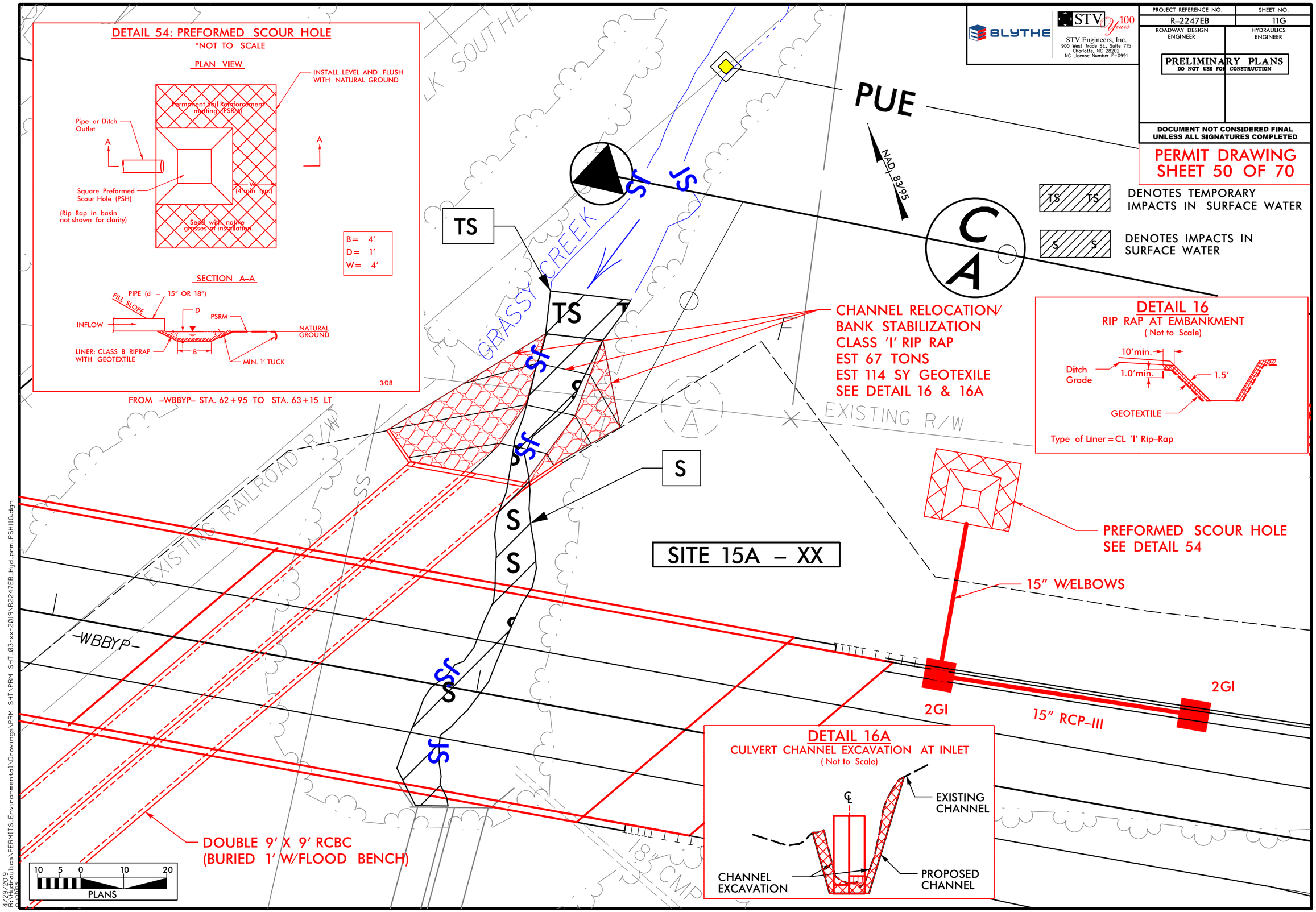
PERMIT DRAWING
SHEET 50 OF 70

DETAIL 54: PREFORMED SCOUR HOLE

*NOT TO SCALE

FROM –WBBYP– STA. 62+95 TO STA. 63+15 LT



TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S S DENOTES IMPACTS IN SURFACE WATER

DETAIL 16

RIP RAP AT EMBANKMENT
(Not to Scale)

Type of Liner = CL 'I' Rip-Rap

DETAIL 16A

CULVERT CHANNEL EXCAVATION AT INLET
(Not to Scale)

4/29/2019
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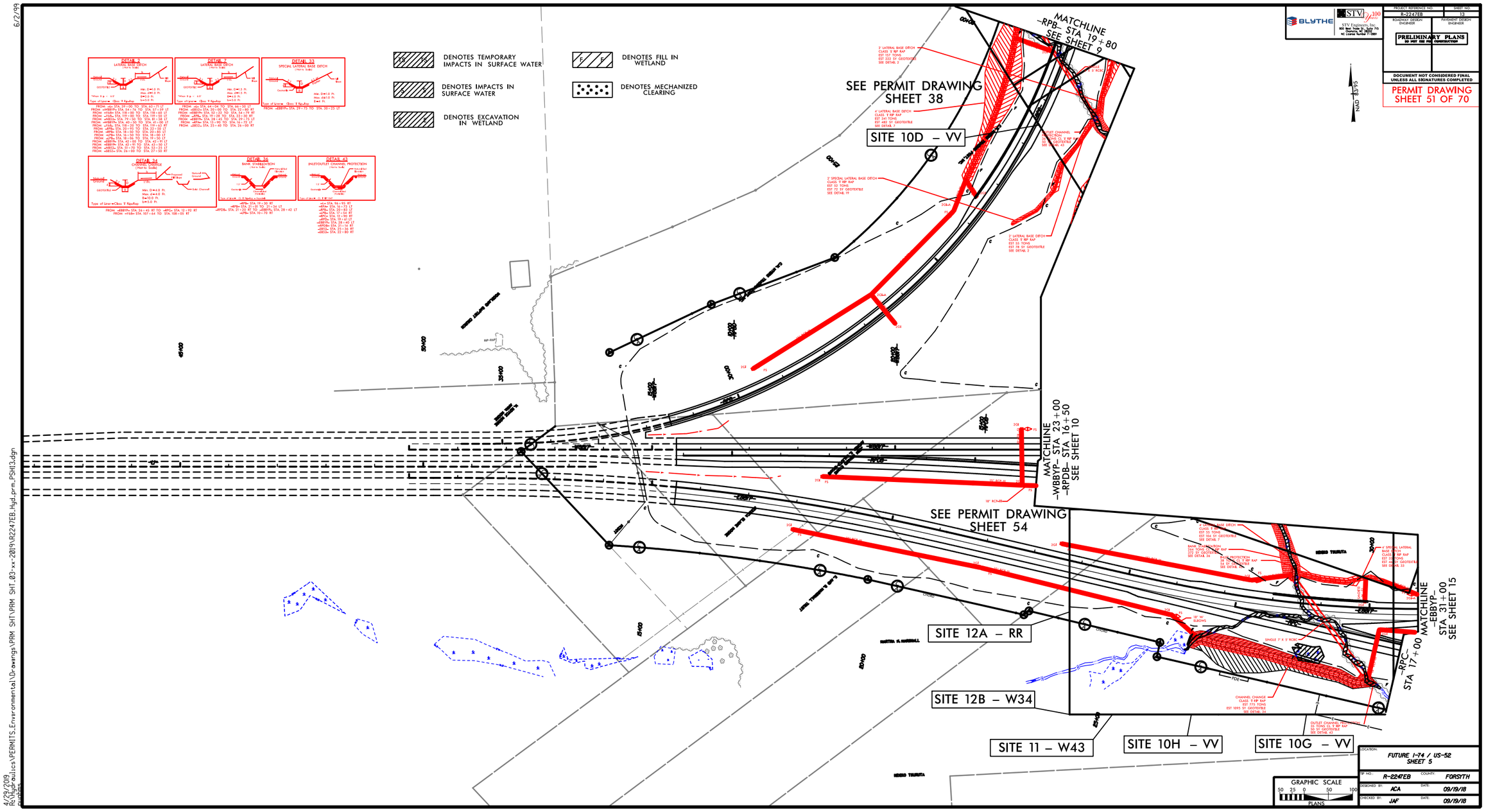


BLYTHE

STV Engineers, Inc.
100 West Tryon Ave., Suite 715
Charlotte, NC 28202
NC License Number F-1081

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	13
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

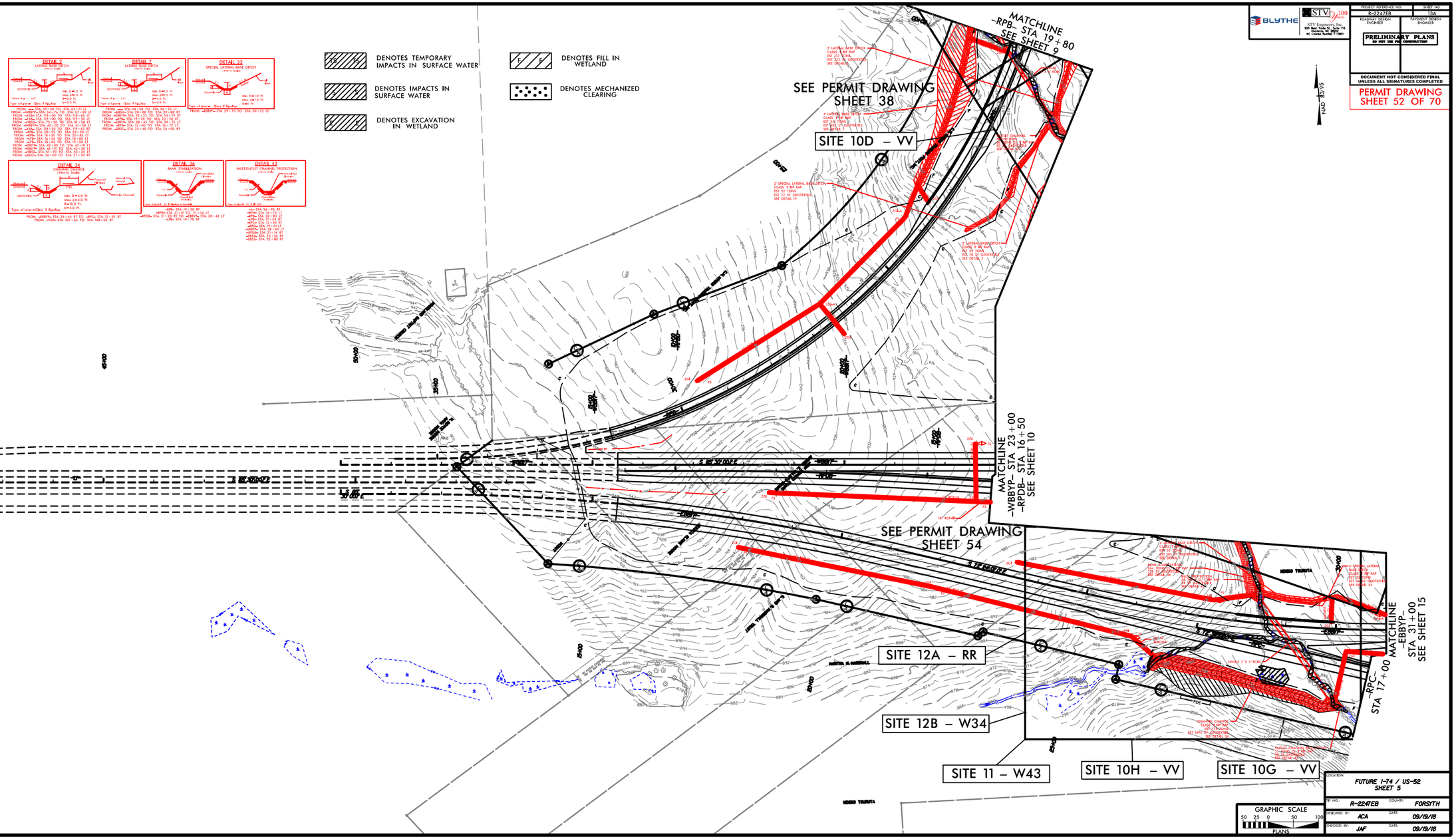
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 51 OF 70

LOCATION:	FUTURE I-74 / US-52 SHEET 5		
TIP NO.:	R-2247EB	COUNTY:	FORSYTH
DESIGNED BY:	ACA	DATE:	09/19/18
CHECKED BY:	JAF	DATE:	09/19/18

6/2/99

4/29/2019
R:\Hydraulics\PERMITS_Environmental\Drawings\PRM SHT\PRM SHT_03-xx-2019\R2247EB_Hyd_prm_PSH13.dgn



BLYTHE

STV Engineers, Inc.
500 East Stone Ave., Suite 715
Greenville, NC 28202
NC License Number F-1080

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	13A
ROADWAY DESIGN ENGINEER	PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 52 OF 70

LOCATION: FUTURE I-74 / US-52 SHEET 5

TIP NO.	COUNTY:
R-2247EB	FORSYTH
DESIGNED BY: ACA	DATE: 09/19/18
CHECKED BY: JAF	DATE: 09/19/18

6/2/99

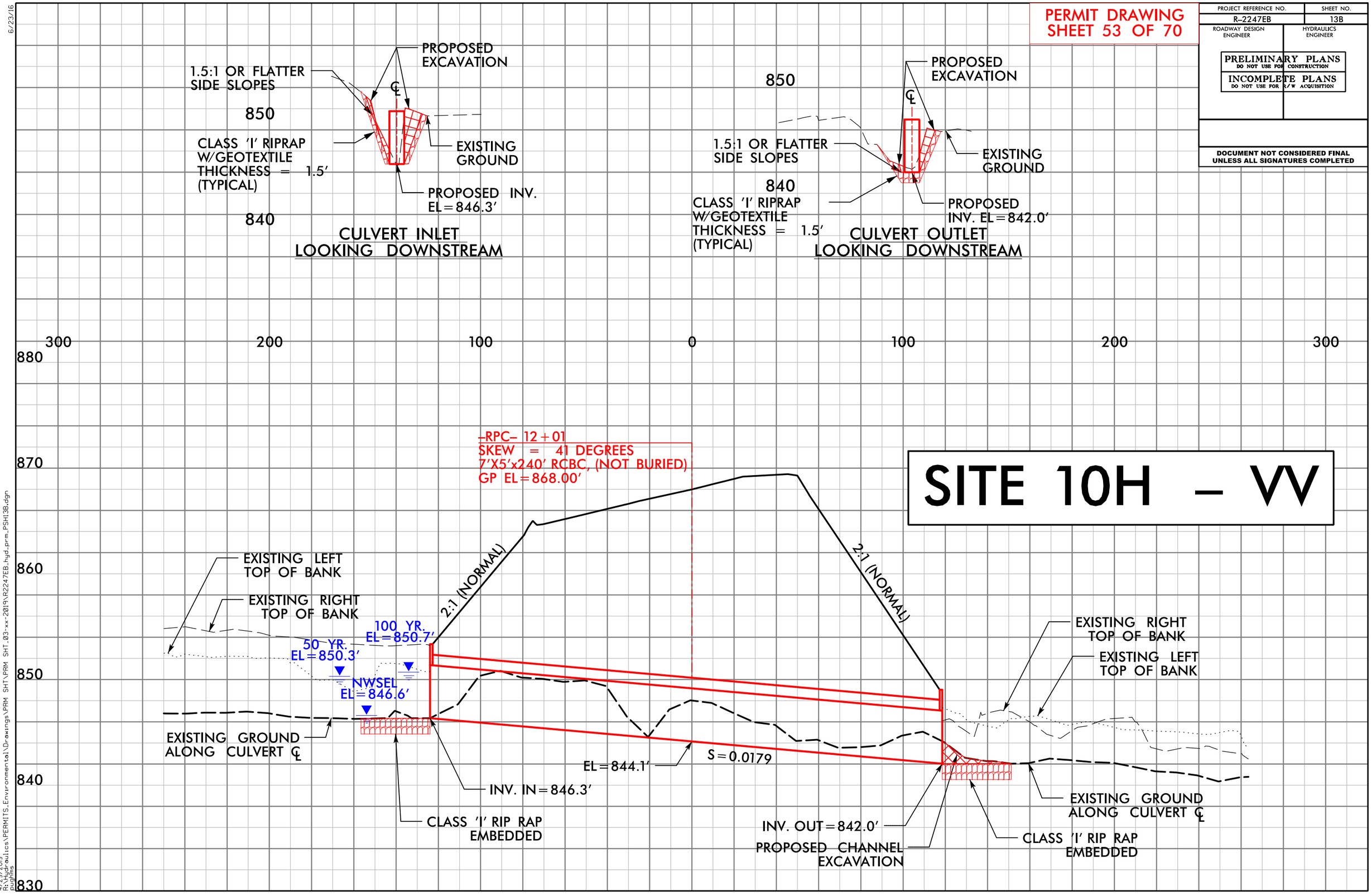
4/29/2019
R:\Hydraulics\PERMITS_Environmental\Drawings\PRM SHT\PRM SHT_03-xx-2019\R2247EB_Hyd_prm_PSH13A.dgn

PERMIT DRAWING
SHEET 53 OF 70

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	13B
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

4/29/2019
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pughms

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	13C
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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Charlotte, NC 28202
NC License Number F-0991

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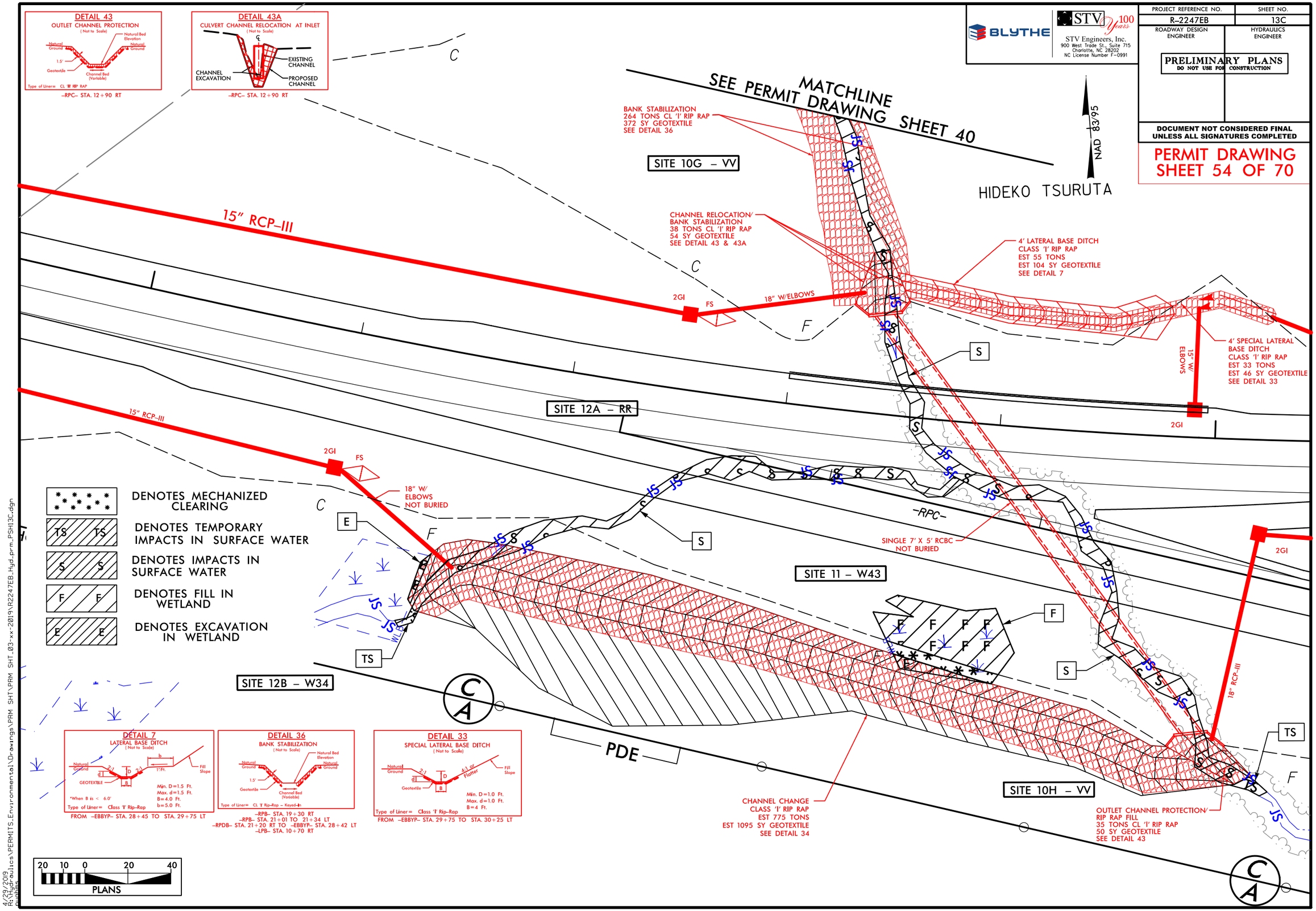
PERMIT DRAWING SHEET 54 OF 70



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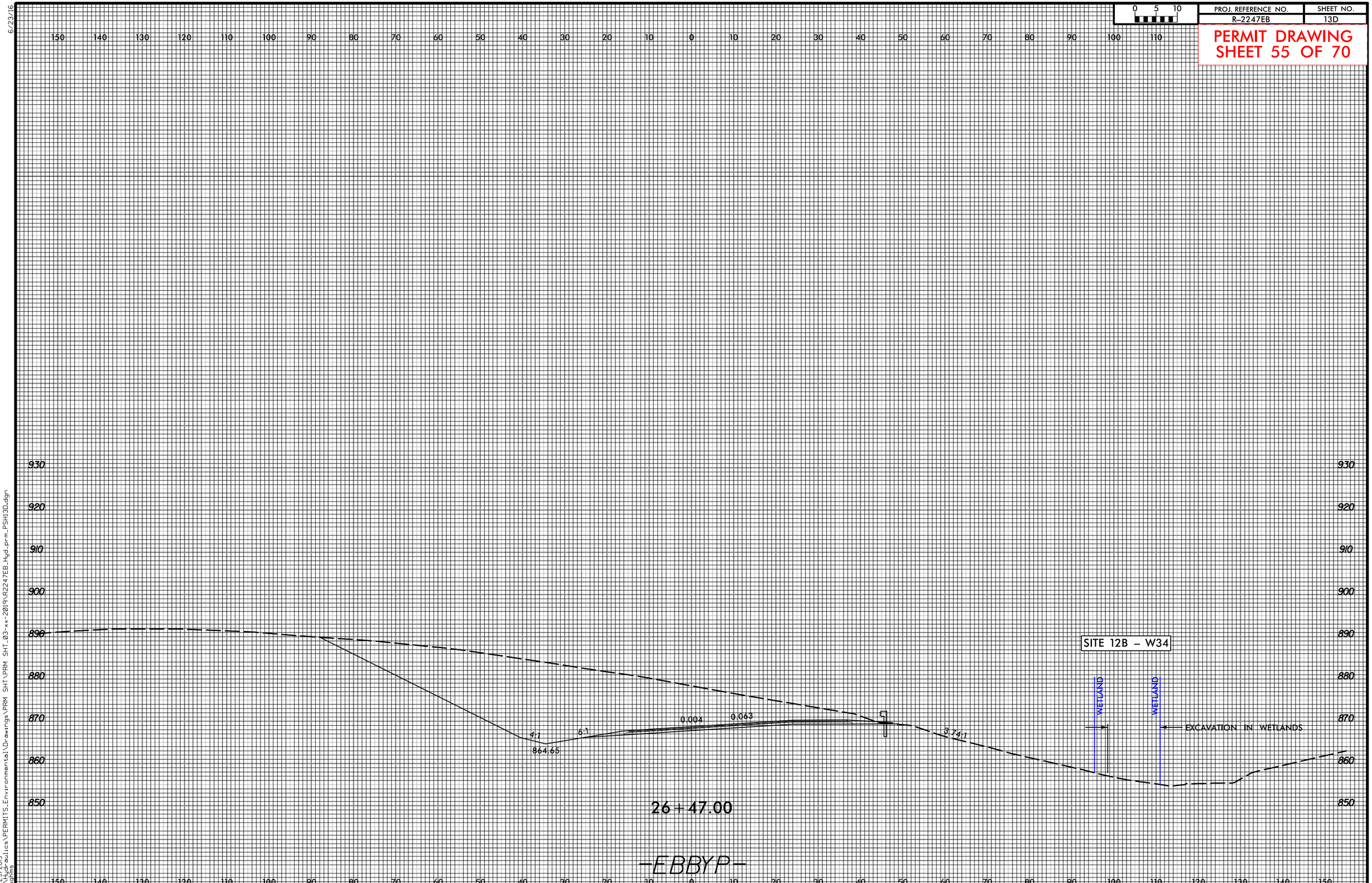
PROJ. REFERENCE NO.	SHEET NO.
R-2247EB	13D

PERMIT DRAWING
SHEET 55 OF 70



6/23/16

4/29/2019
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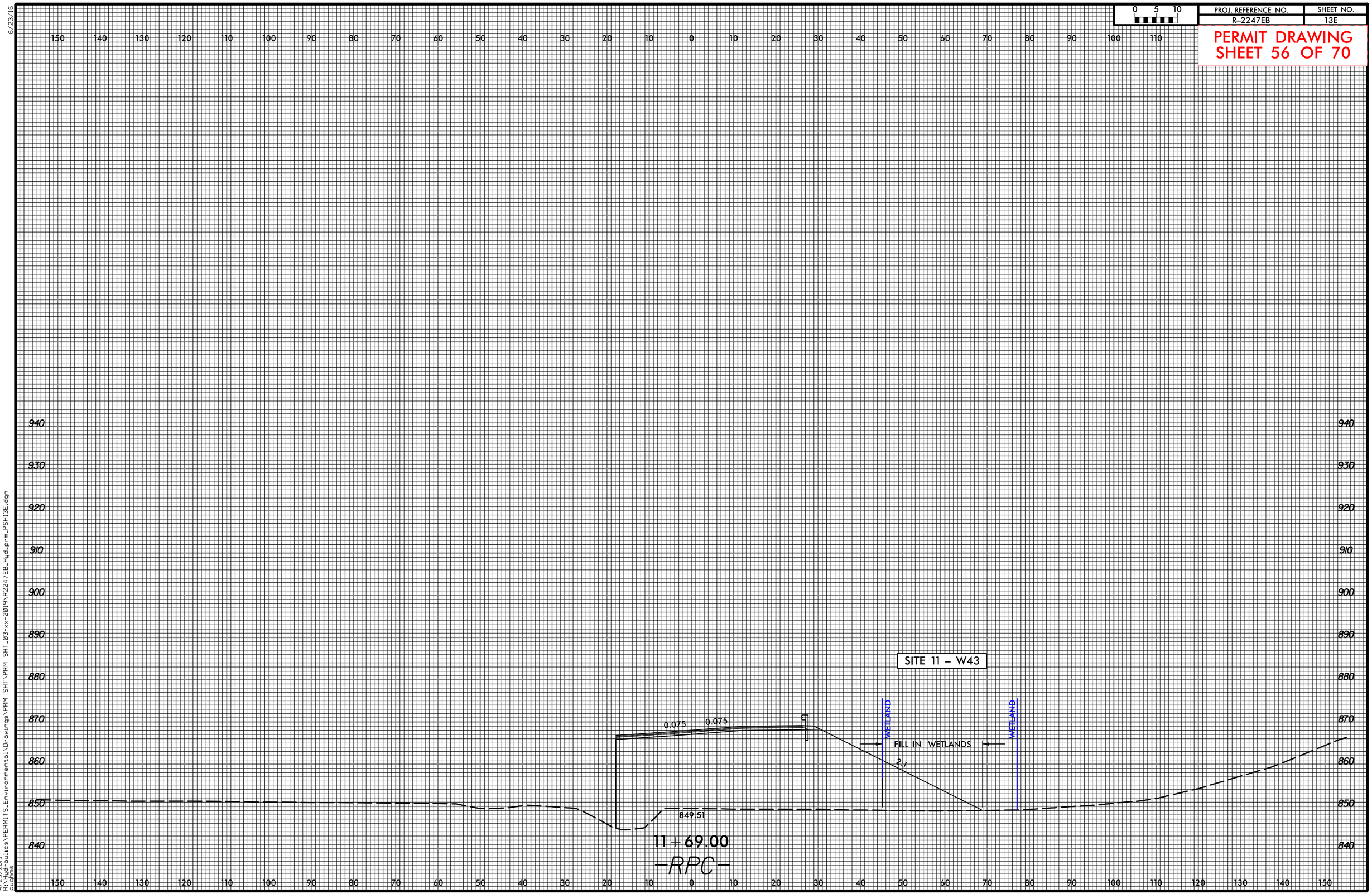
pughins

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

PERMIT DRAWING
SHEET 56 OF 70



6/23/16

4/29/2019
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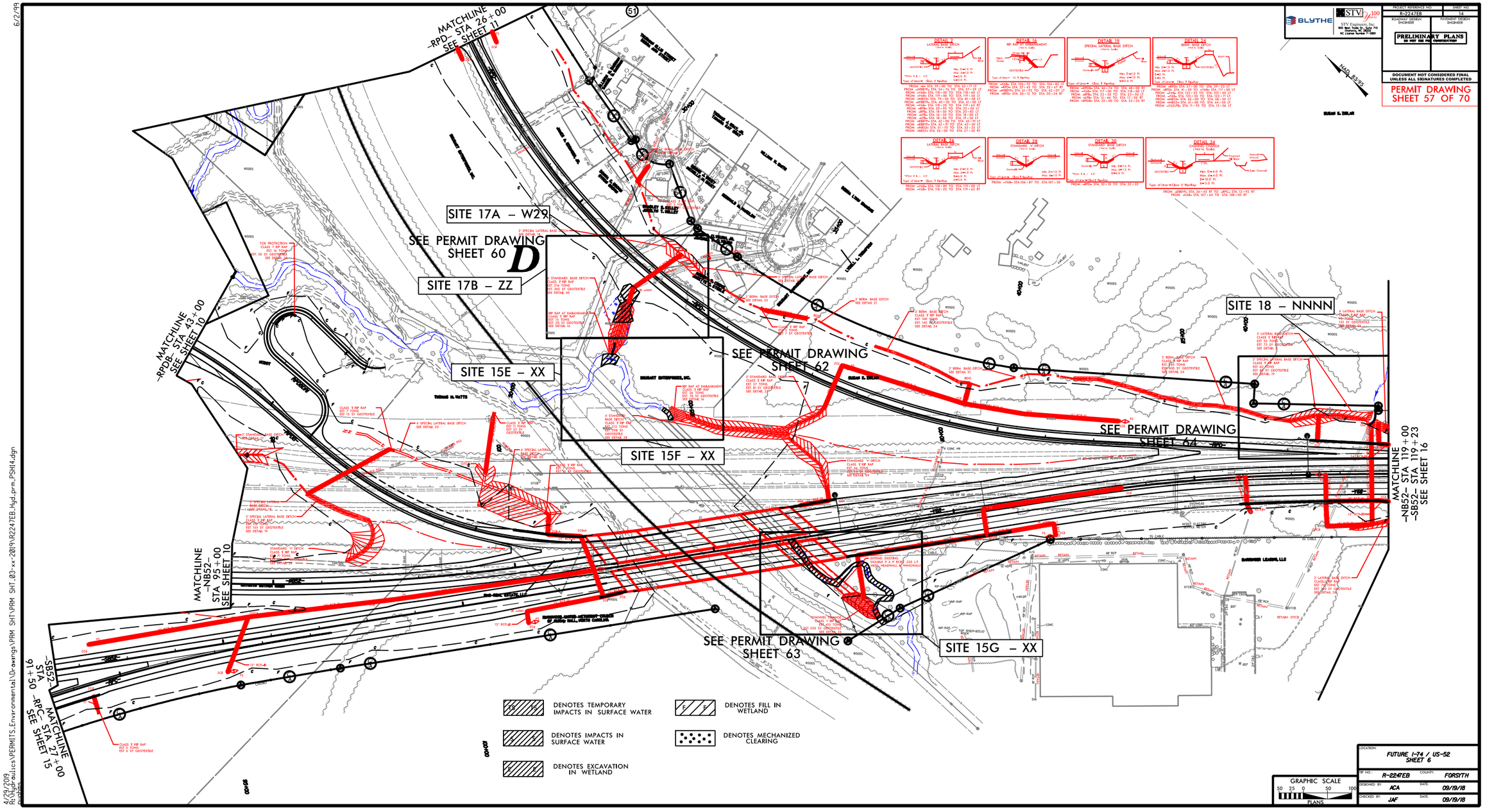

BLYTHE

STV Engineers, Inc.
100 Shoe Street, Suite 715
Sanford, NC 28202
NC License Number F-1081

PROJECT REFERENCE NO.: R-2247EB
SHEET NO.: 14
ROADWAY DESIGN ENGINEER
PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 57 OF 70

NAD 83/95

LOCATION: FUTURE I-74 / US-52 SHEET 6

TIP NO.:	R-2247EB	COUNTY:	FORSYTH
DESIGNED BY:	ACA	DATE:	09/19/18
CHECKED BY:	JAF	DATE:	09/19/18

6/2/99

4/29/2019
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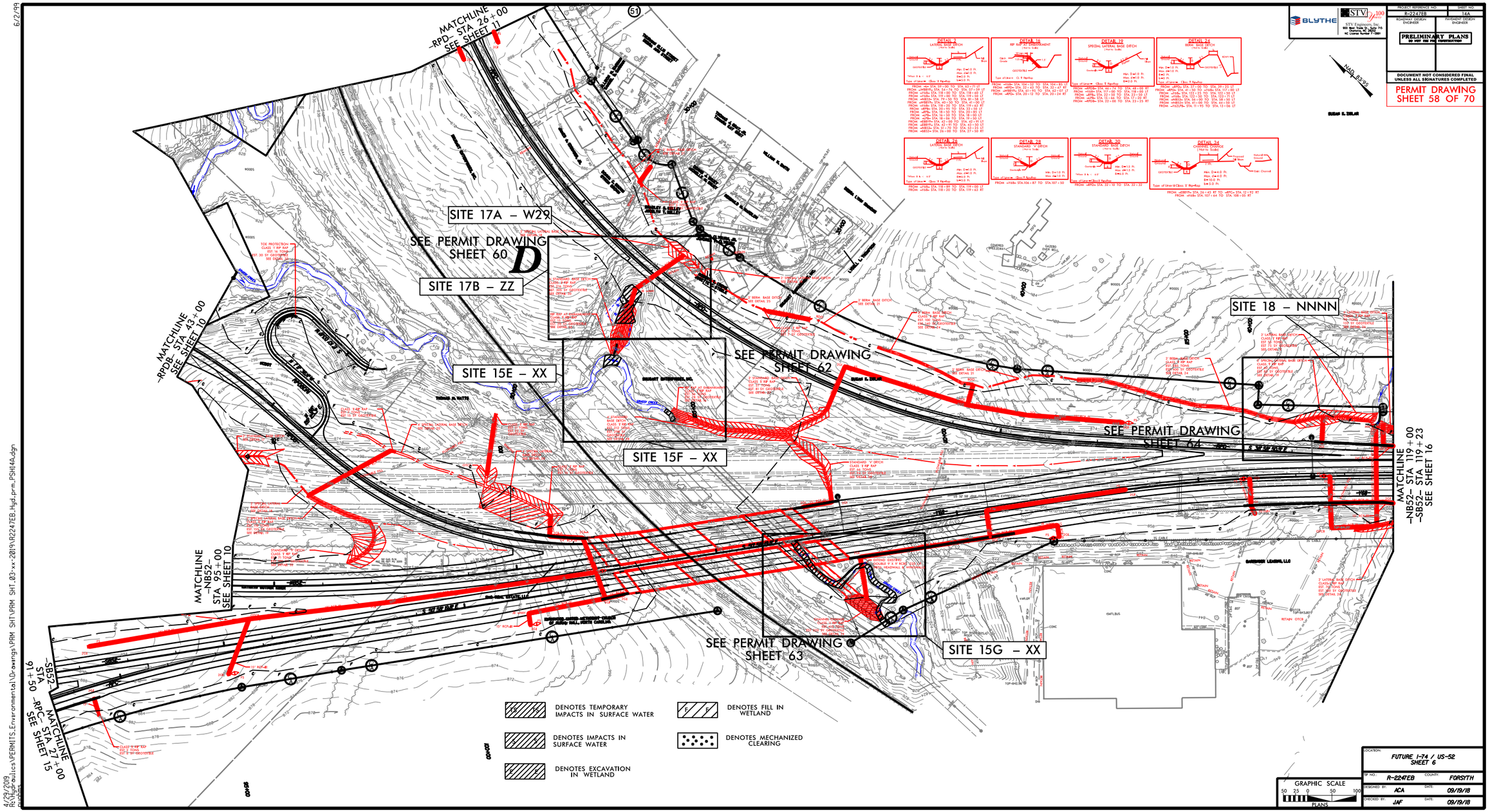

BLYTHE

STV Engineers, Inc.
900 Blue Ridge Rd., Suite 100
Raleigh, NC 27606
NC License Number F-1991

PROJECT REFERENCE NO.: R-2247EB
SHEET NO.: 14A
ROADWAY DESIGN ENGINEER
PAVEMENT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 58 OF 70

LOCATION: FUTURE I-74 / US-52 SHEET 6

TIP NO.:	R-2247EB	COUNTY:	FORSYTH
DESIGNED BY:	ACA	DATE:	09/19/18
CHECKED BY:	JAF	DATE:	09/19/18

6/2/99

4/29/2019
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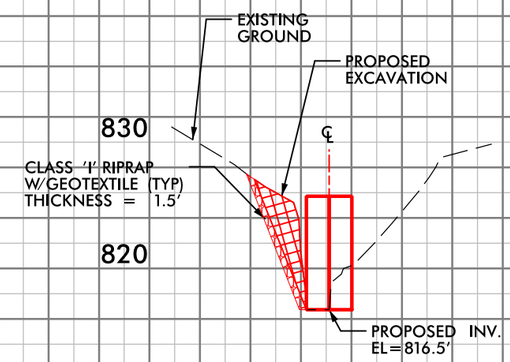
PERMIT DRAWING
SHEET 59 OF 70

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	14B
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

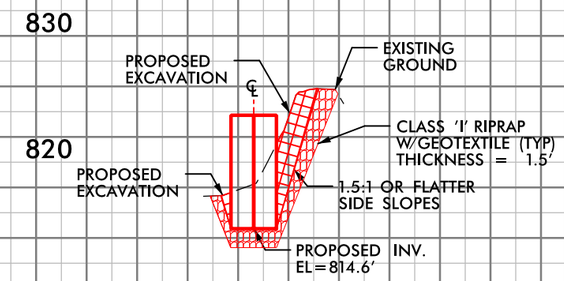
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

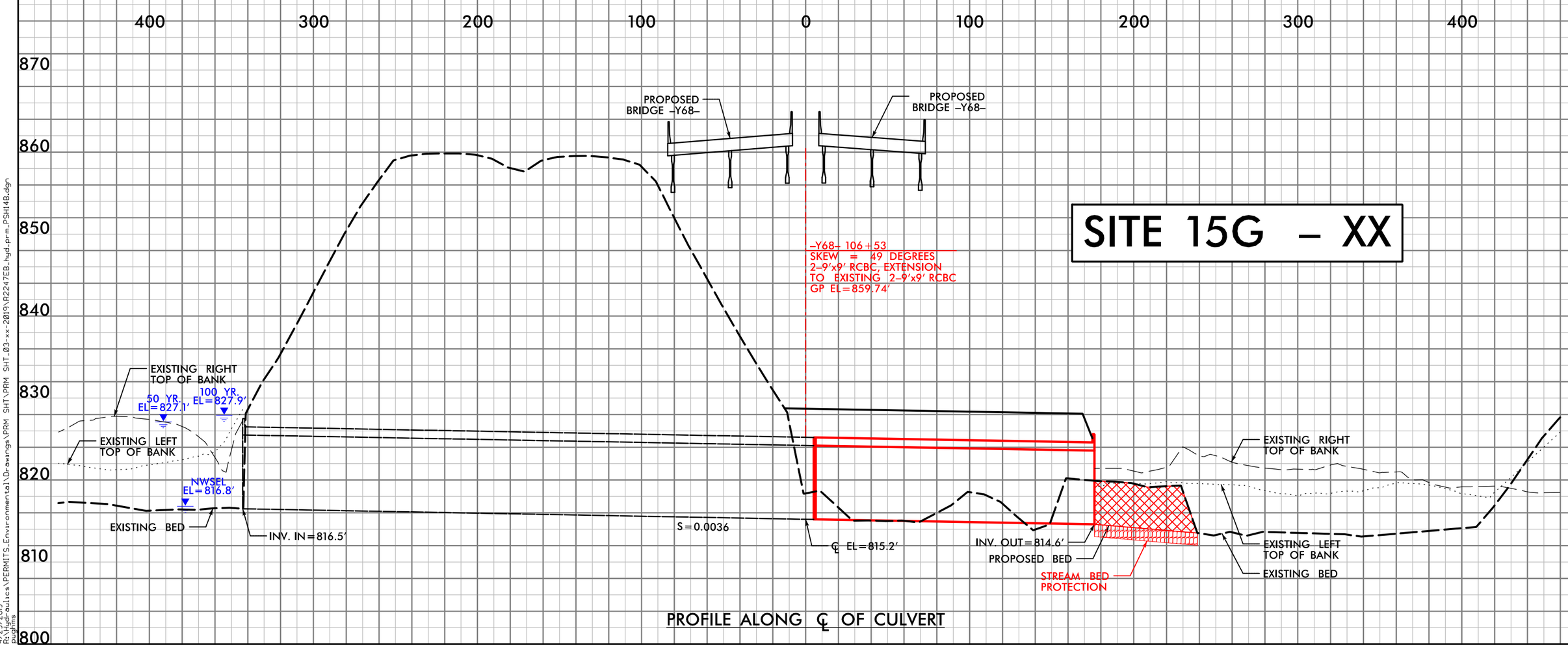
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



CULVERT INLET
LOOKING DOWNSTREAM



CULVERT OUTLET
LOOKING DOWNSTREAM

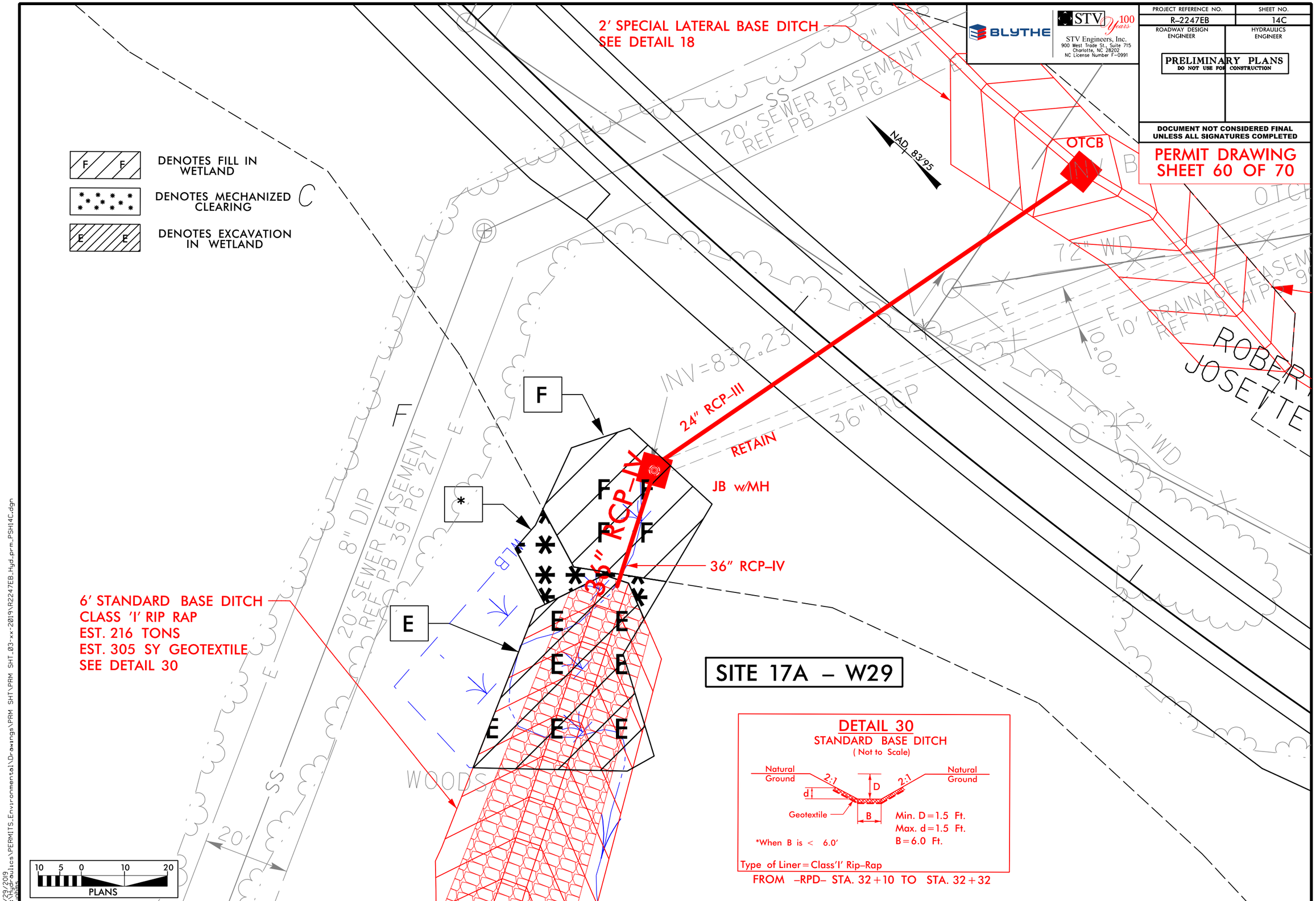


SITE 15G – XX

PROFILE ALONG ℄ OF CULVERT

6/23/16

4/29/2019
R:\Hydraulics\PERMITS_Environmental\Drawings\PRM SHT\PRM SHT_03-xx-2019\R2247EB_hyd_prm_PSH14B.dgn
pughes



BLYTHE
STV 100 Years
STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number F-0991
PROJECT REFERENCE NO.
R-2247EB
SHEET NO.
14C
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING
SHEET 60 OF 70
2' SPECIAL LATERAL BASE DITCH
SEE DETAIL 18
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES EXCAVATION IN WETLAND
NAD 83/95
OTCB
20' SEWER EASEMENT
REF PB 39 PG 27
8" VCP
72" WD
10' DRAINAGE EASEMENT
REF PB 41 PG 9
ROBERT JOSETTE
INV=832.23'
24" RCP-III
36" RCP
RETAIN
JB w/MH
36" RCP-IV
6' STANDARD BASE DITCH
CLASS 'I' RIP RAP
EST. 216 TONS
EST. 305 SY GEOTEXTILE
SEE DETAIL 30
SITE 17A – W29
WOODS
8" DIP
20' SEWER EASEMENT
REF PB 39 PG 27
DETAIL 30
STANDARD BASE DITCH
(Not to Scale)
Natural Ground
2:1
D
d
Geotextile
B
Min. D=1.5 Ft.
Max. d=1.5 Ft.
B=6.0 Ft.
*When B is < 6.0'
Type of Liner=Class'I' Rip-Rap
FROM -RPD- STA. 32+10 TO STA. 32+32
10 5 0 10 20
PLANS
4/29/2019
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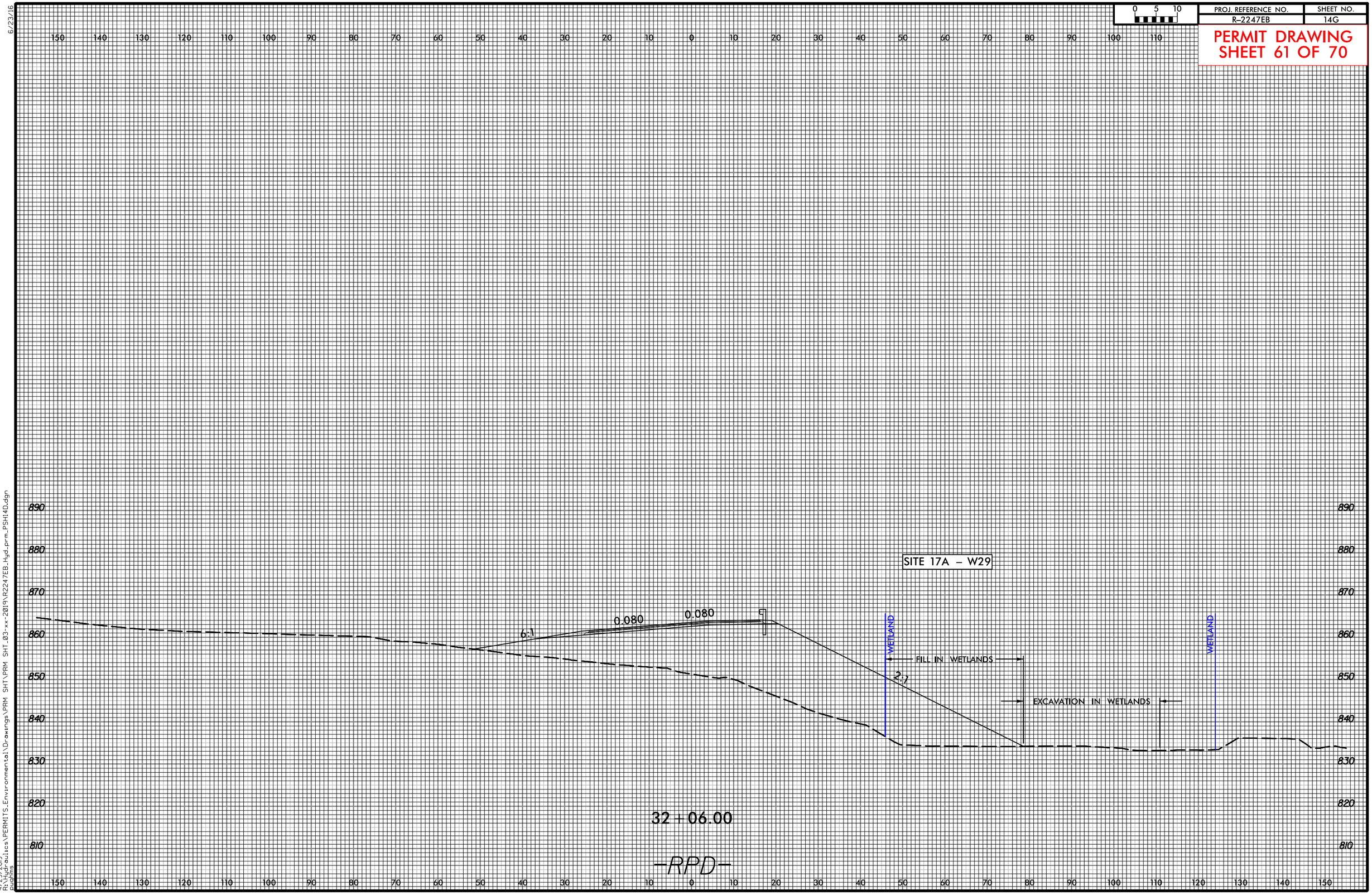

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Charlotte, NC 28202
NC License Number F-0991

PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	14E
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 62 OF 70

NAD 83/95

TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

SITE 17B – ZZ

SITE 15E – XX

SITE 15F – XX

TS

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

SHUGART ENTERPRISES, INC.

GRASSY CREEK

EXISTING R/W

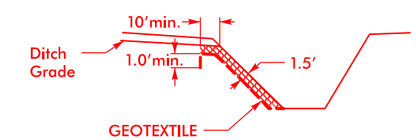
BANK STABILIZATION
CLASS 'I' RIP RAP
EST. 56 TONS
EST. 78 SY GEOTEXTILE
SEE DETAIL 16

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

54" TUNNEL UNDER

30.00'

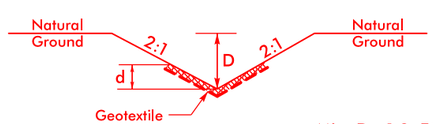
DETAIL 16
RIP RAP AT EMBANKMENT
(Not to Scale)



Type of Liner= CL 'I' Rip-Rap

FROM –Y68– STA. 104+52 TO STA. 104+85 LT
FROM –RPD– STA. 32+43 TO STA. 32+47 RT

DETAIL 28
STANDARD 'V' DITCH
(Not to Scale)



Min. D=1.0 Ft.
Max. d=1.0 Ft.

Type of Liner= Class'I' Rip-Rap

FROM –Y68– STA.106+87 TO STA.107+50

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PLANS

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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	14F
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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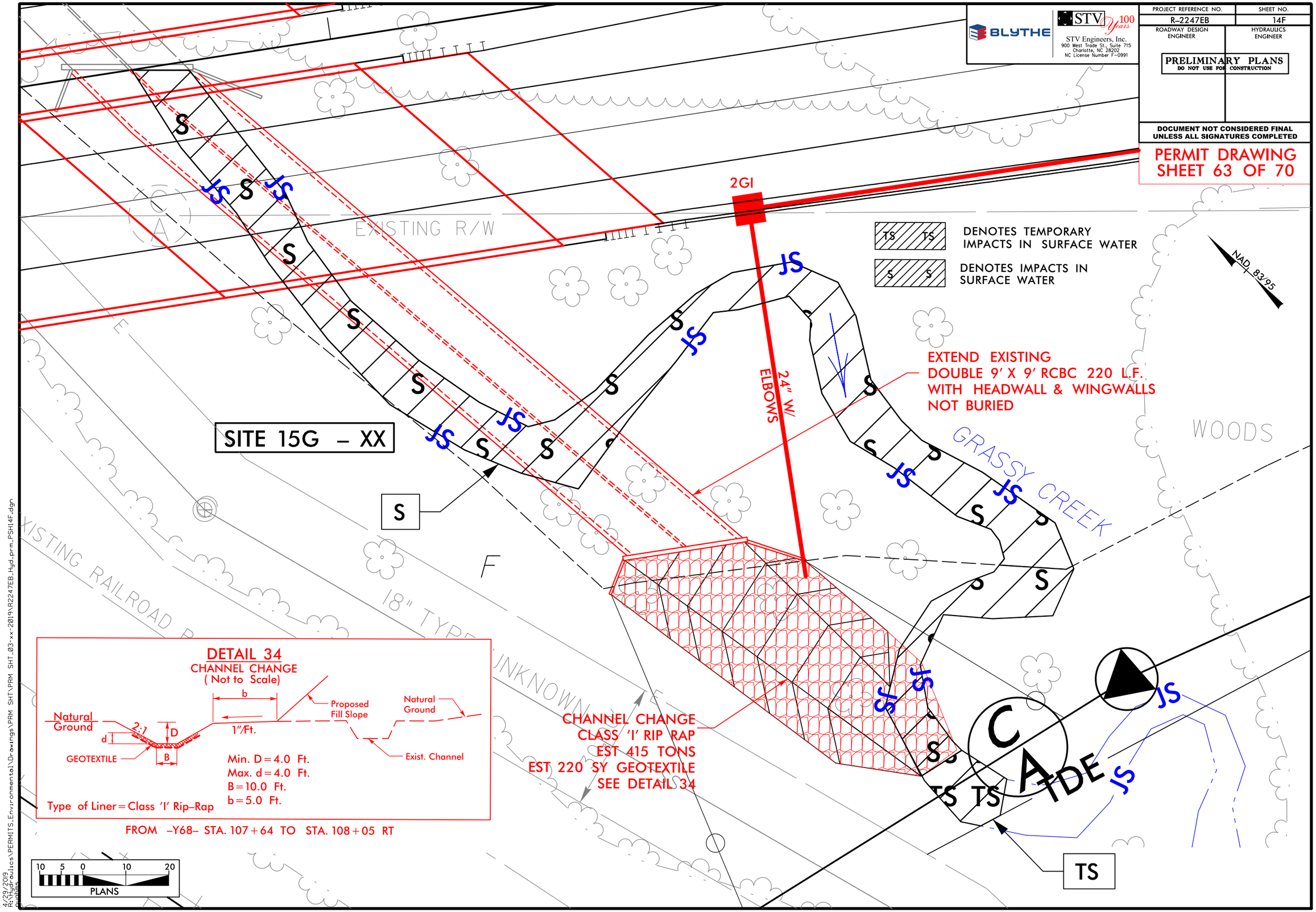
SHEET 63 OF 70



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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	14G
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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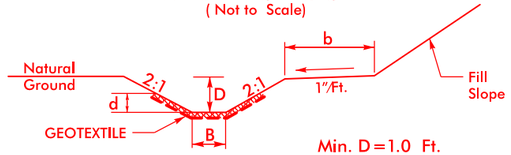
SHEET 64 OF 70

DETAIL 2
LATERAL BASE DITCH
(Not to Scale)



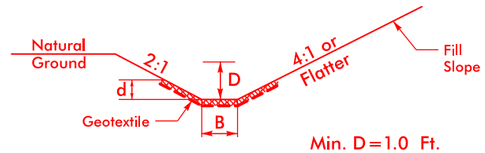
Min. D=1.0 Ft.
Max. d=1.0 Ft.
B=2.0 Ft.
b=5.0 Ft.

*When B is < 6.0'

Type of Liner= Class 'I' Rip-Rap

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

DETAIL 19
SPECIAL LATERAL BASE DITCH
(Not to Scale)

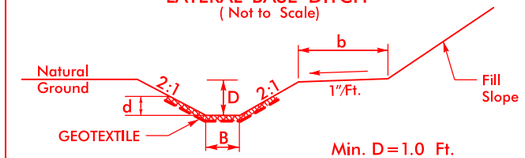


Min. D=1.0 Ft.
Max. d=1.0 Ft.
B=2.0 Ft.

Type of Liner= Class 'I' Rip-Rap

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

DETAIL 26
LATERAL BASE DITCH
(Not to Scale)



Min. D=1.0 Ft.
Max. d=1.0 Ft.
B=6.0 Ft.
b=5.0 Ft.

*When B is < 6.0'

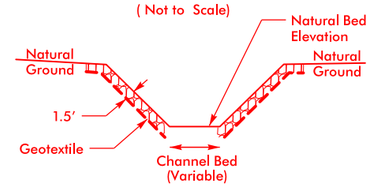
Type of Liner= Class 'I' Rip-Rap

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

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S S DENOTES IMPACTS IN SURFACE WATER

DETAIL 36
BANK STABILIZATION
(Not to Scale)



Type of Liner= CL 'I' Rip-Rap - Keyed-In

-Y68- STA. 118+65 LT

NAD 83/95

SITE 18 - NNNN

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

TS

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

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

S

HW

15" W/ ELBOWS

2GI

TRENCHLESS INSTALLATION
48" WELDED STEEL

24" W/ ELBOWS

2GI-A

24" RCP-III

-RPD-

10 5 0 10 20
PLANS

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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	15
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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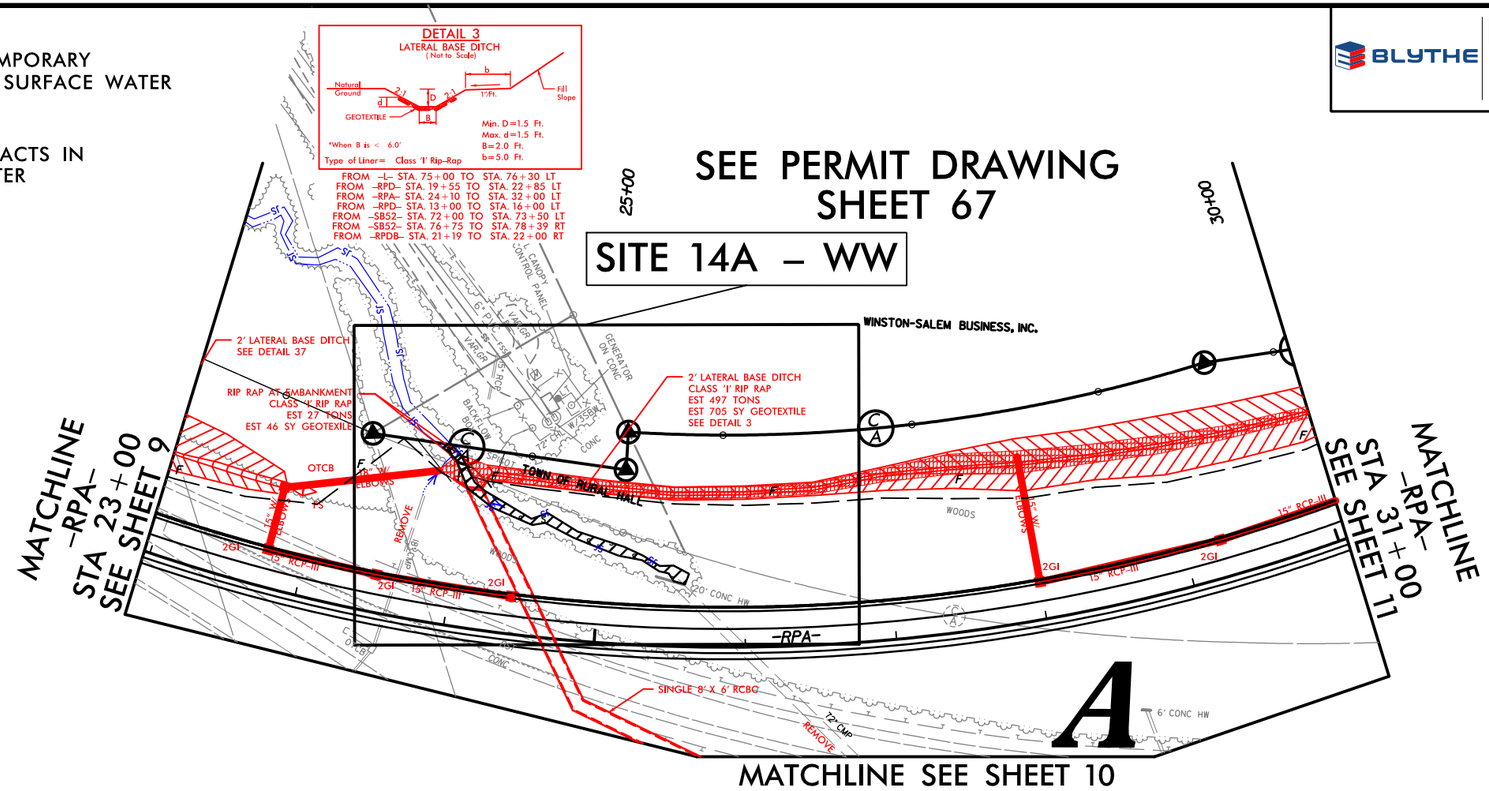
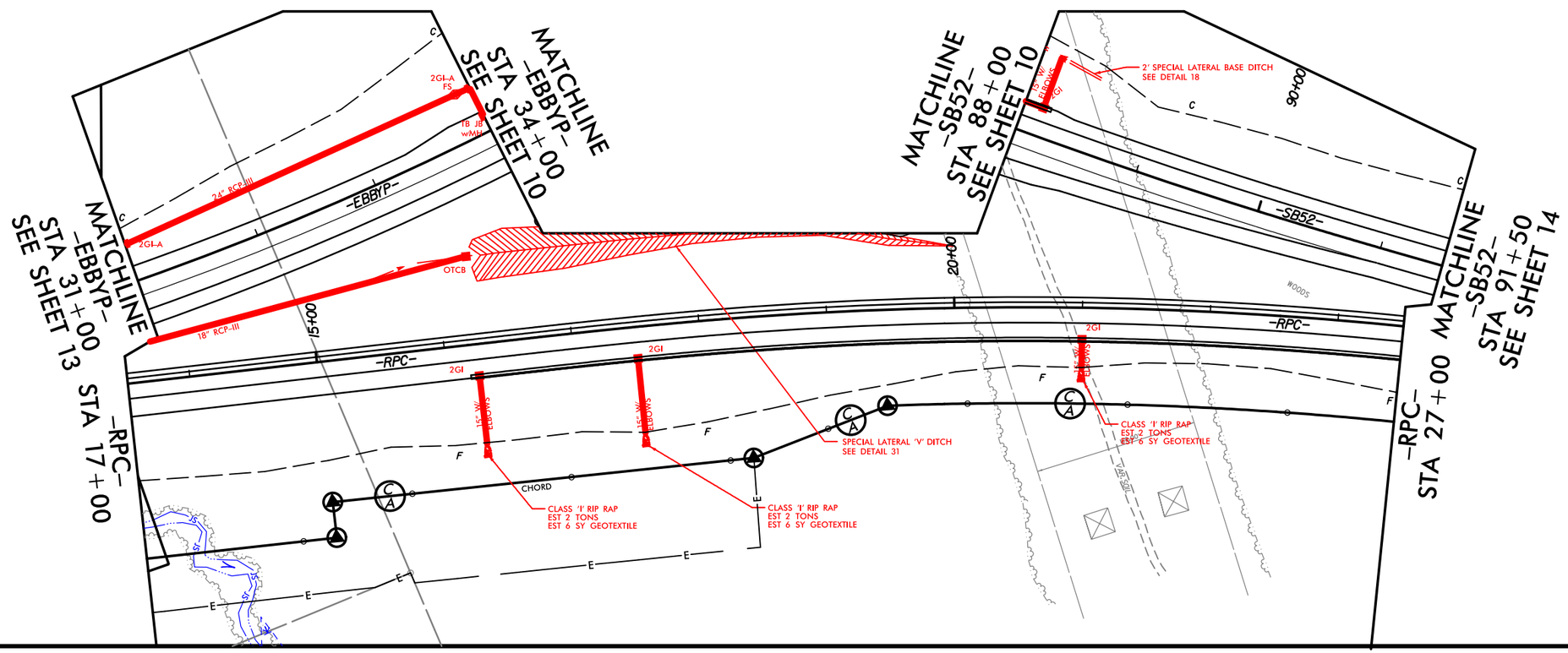
SHEET 65 OF 70

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S S DENOTES IMPACTS IN SURFACE WATER





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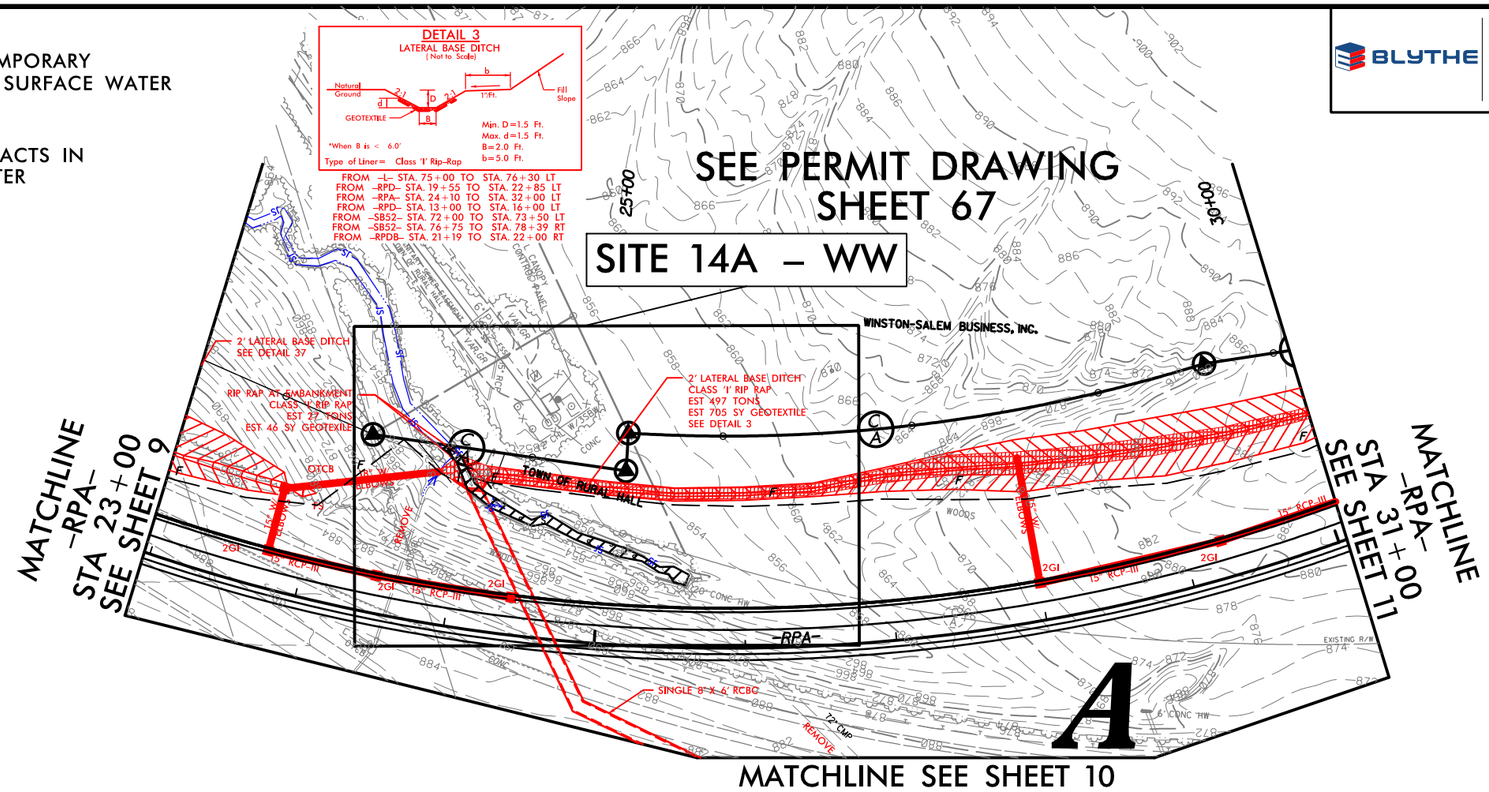
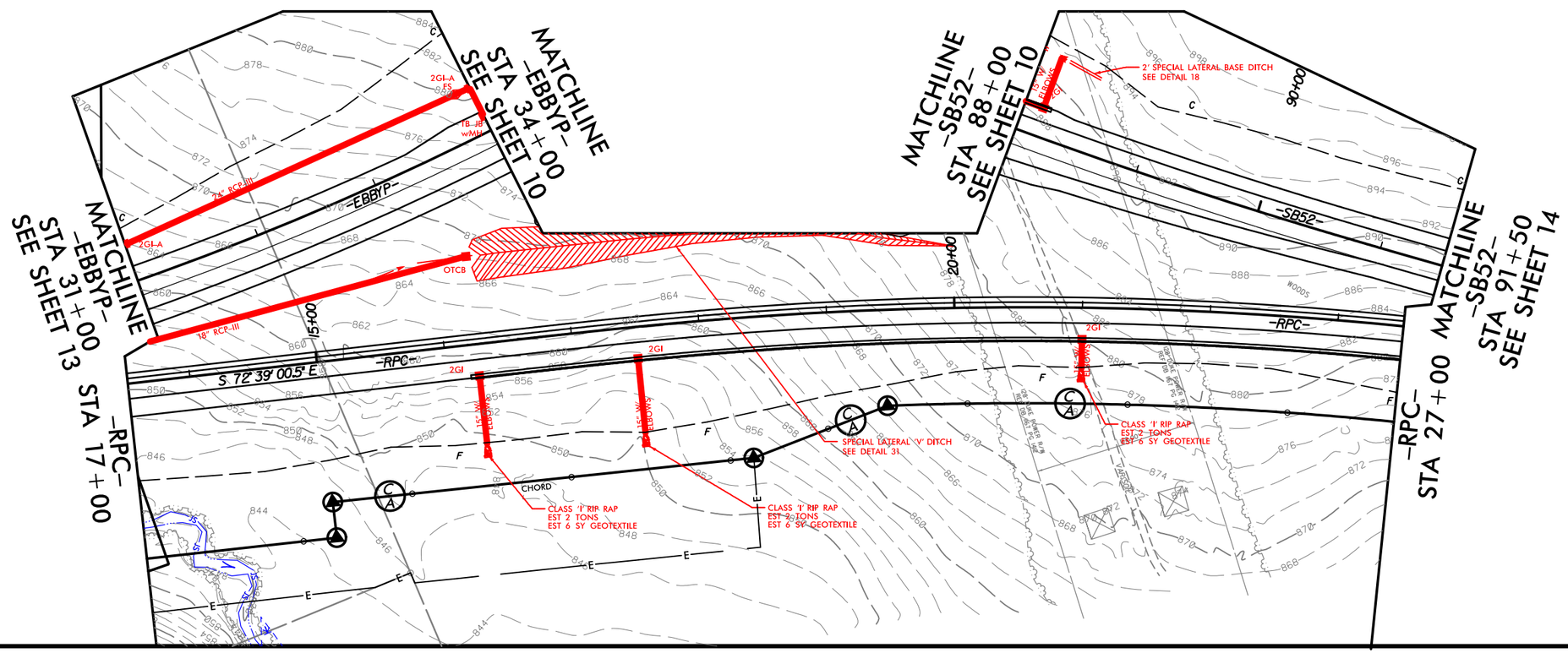
TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S S DENOTES IMPACTS IN SURFACE WATER





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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	15A
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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SHEET 66 OF 70

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PROJECT REFERENCE NO.	SHEET NO.
R-2247EB	15B
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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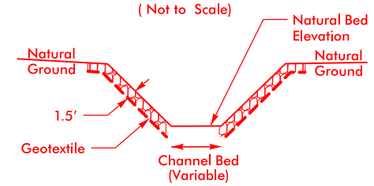
SHEET 67 OF 70

NAD 83/95

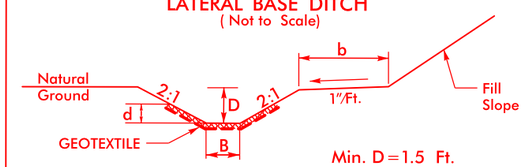
DETAIL 36
BANK STABILIZATION
(Not to Scale)



Type of Liner= CL 'I' Rip-Rap – Keyed-In

–RPA– STA. 24+05 LT

DETAIL 3
LATERAL BASE DITCH
(Not to Scale)



*When B is < 6.0'

Min. D=1.5 Ft.
Max. d=1.5 Ft.
B=2.0 Ft.
b=5.0 Ft.

Type of Liner= Class 'I' Rip-Rap

FROM –RPA– STA. 24+10 TO STA. 32+00 LT

TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

S DENOTES IMPACTS IN SURFACE WATER

CHANNEL RELOCATION
BANK STABILIZATION
CLASS 'I' RIP RAP
EST 27 TONS
EST 46 SY GEOTEXILE
SEE DETAIL 36 & 36A

2' LATERAL BASE DITCH
CLASS 'I' RIP RAP
EST 497 TONS
EST 705 SY GEOTEXTILE
SEE DETAIL 3

TOWN OF RURAL HALL

SITE 14A – WW

TS

S

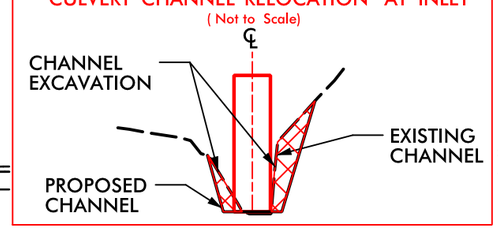
SINGLE 8' X 6' RCBC
NOT BURIED

2GI

15" RCP-III

–RPA–

DETAIL 36A
CULVERT CHANNEL RELOCATION AT INLET
(Not to Scale)



–RPA– STA. 24+05 LT

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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)
1	-L- 63+69 to 64+24 LT	2 @ 7' x 7' RCBC EXTENSION/CHANNEL RELOCATION						0.02	< 0.01	66	10	
2	-L- 64+21 to 65+97 LT	ROADWAY FILL						< 0.01		85		
3	-L- 76+12 to 76+55 LT	ROADWAY FILL/CULVERT EXTENSION						< 0.01		50		
4A	-L- 76+36 to 76+31 LT	UPSTREAM 8' x 7' RCBC EXTENSION/CHANNEL RELOCATION						0.01	< 0.01	69	10	
4B	-L- 77+51 to 77+72 RT	60" STEEL PIPE/RIP RAP FILL						0.01	< 0.01	40	10	
5	-L- 96+77 to 96+96 RT	30" ALTERNATE PIPE/OUTLET CHANNEL PROTECTION/RIP RAP FILL						< 0.01		40		
6A	-L- 108+27 to 108+77 RT	OUTLET CHANNEL PROTECTION/RIP RAP FILL						< 0.01	< 0.01	42	10	
6B	-SB52- 22+78 RT	ROADWAY FILL	< 0.01									
7	-L- 110+89 to 111+03 RT	66" RCP-III/OUTLET CHANNEL PROTECTION/RIP RAP FILL						< 0.01	< 0.01	28	10	
7	-L- 110+89 to 111+03 RT	ROADWAY FILL/CHANGE FROM EC TO EB						< 0.01		10		
8A	-Y62LPA- 12+87 RT	ROADWAY FILL	< 0.01			0.02						
8B	-SB52- 37+87 to 37+99 RT	ROADWAY FILL						< 0.01		33		
8C**	-Y62RPB- 16+75 RT	ROADWAY FILL	0.06									
8C***	-Y62RPB- 16+75 RT	ROADWAY FILL										
9A	-SB52- 56+93 to 61+16 RT	ROADWAY FILL						0.02	< 0.01	465	25	
9B	-SB52- 58+54 RT	ROADWAY FILL	0.12		0.06	0.04			< 0.01			
TOTALS*:			0.19		0.06	0.05		0.09	0.01	928	75	0

*Rounded totals are sum of actual impacts

NOTES:
**Wetland W26 is a total take
***Wetland W26 mechanized clearing mitigated through Project R-2247EC

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
5/01/2019
FORSYTH COUNTY
R-2247 EB
34409.3.17

Revised 2018 Feb

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)
10A	-SB52- 59+43 to 59+62 RT	RAP FILL						< 0.01	< 0.01	30	10	
10B	-SB52- 63+03 RT	BANK STABILIZATION ONLY							< 0.01		32	
10C	-SB52- 68+58 to 71+57 RT	4' x 5' RCBC/CHANNEL RELOCATION/RIP RAP FILL						0.04	< 0.01	344	10	
10D	-SB52- 71+57 to 72+19 RT	BANK STABILIZATION ONLY						< 0.01		47		
10E	-SB52- 72+19 to 75+11 RT	5' x 5' RCBC/CHANNEL RELOCATION/RIP RAP FILL						0.05	< 0.01	406	10	
10F	-SB52- 77+21 to 79+59 RT	6' x 5' RCBC/CHANNEL RELOCATION/RIP RAP FILL						0.04	< 0.01	294	10	
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/CHANNEL RELOCATION/RIP RAP FILL						0.05	< 0.01	336	12	
11	-RPC- 11+69 RT	ROADWAY FILL	0.03		< 0.01	< 0.01						
12A	-EBBYP- 26+40 to 28+84 RT	ROADWAY FILL/LOSS OF WATER DUE TO CHANNEL CHANGE						0.03	< 0.01	282	11	
12B	-EBBYP- 26+47 RT	DITCH EXCAVATION			< 0.01							
13A	-RPA- 16+18 to 16+89 LT	42" ALTERNATE/OUTLET CHANNEL PROTECTION/RIP RAP FILL						< 0.01	< 0.01	111	11	
13B	-RPA- 16+65 LT	ROADWAY FILL	< 0.01									
14A	-RPA- 23+82 to 25+59 LT	8' x 6' RCBC/CHANNEL RELOCATION						0.02	< 0.01	178	10	
14B	-NB52- 84+51 to 93+96 LT	8' x 6' RCBC/LOSS OF WATER DUE TO CHANNEL CHANGE						0.12		926		
TOTALS*:			0.04		< 0.01	< 0.01		0.39	0.01	3051	116	0

*Rounded totals are sum of actual impacts

NOTES:
**Wetland W26 is a total take
***Wetland W26 mechanized clearing mitigated through Project R-2247EC

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
5/01/2019
FORSYTH COUNTY
R-2247 EB
34409.3.17

Revised 2018 Feb

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)
15A	-L- 189+05 to 189+45 LT	2 @ 9' x 9' RCBC/CHANNEL RELOCATION/BANK STABILIZATION						0.02	< 0.01	119	10	
15B	-L- 181+77 to 188+71 RT	ROADWAY FILL/LOSS OF WATER DUE TO CHANNEL CHANGE						0.30	< 0.01	1092	56	
15C	EBBYP- 52+13 to 52+60 RT	BANK STABILIZATION ONLY						< 0.01	< 0.01	34	22	
15D	-RPDB- 42+56 to 43+02 LT	CHANNEL RELOCATION							0.02		45	
15E	-RPD- 32+41 to 32+64 RT	BANK STABILIZATION ONLY							0.02		32	
15F	-RPD- 33+82 to 34+06 RT	BANK STABILIZATION ONLY							< 0.01		28	
15G	-Y68- 106+60 to 108+27 RT	2 @ 9' x 9' RCBC EXTENSION/CHANNEL CHANGE/RIP RAP FILL						0.09	< 0.01	361	18	
16	-RPD- 19+51 to 19+71 LT	7' x 6' RCBC/INLET PROTECTION/RIP RAP FILL						< 0.01	< 0.01	60	10	
17A	-RPD- 32+06 RT	ROADWAY FILL	0.02		0.03	< 0.01						
17B	-RPD- 32+44RT	DITCH EXCAVATION						< 0.01		25		
18	-Y68118+61 to 118+74 LT	48" WELDED STEEL/BANK STABILIZATION						< 0.01	< 0.01	33	12	
TOTALS*:			0.24	0.00	0.10	0.07	0.00	0.89	0.08	5703	424	0

*Rounded totals are sum of actual impacts

NOTES:
**Wetland W26 is a total take
***Wetland W26 mechanized clearing mitigated through Project R-2247EC

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
5/01/2019
FORSYTH COUNTY
R-2247 EB
34409.3.17

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