STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

J. ERIC BOYETTE
SECRETARY

November 04, 2020

U.S. Army Corps of Engineers
Asheville Regulatory Field Office
151 Patton Avenue, Room 208
Asheville, NC 28801-5006

ATTN: Mr. Eric Alsmeyer
NCDOT Regulatory Coordinator

Subject: **Request for Modification to Individual Section 404 and Section 401Water Quality Certification** for the Winston-Salem Northern Beltway from US 52 to US 311 (New Walkertown Road), Forsyth County. Federal Aid Project No. NHP-0074(213), TIP Nos. U-2579D, E& F. Division 9.

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)

- Modification Application for U-2579D, E, F / U-2579C Phase 2, dated January 7, 2019.
- Modification Application for R-2247EB, dated June 26, 2019.
- Modification Application for U-2579D, E, F, dated October 17, 2019.

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)

- Permit Modification for U-2579D, E, F / U-2579C Phase 2, dated March 4, 2019.
- Permit Modification for R-2247EB, dated August 13, 2019.
- Permit Modification for U-2579D, E, F, dated January 29, 2020.

Section 401 Water Quality Certification issued November 14, 2017 (WQC004131); 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); Revision 1 dated November 27, 2017, Revision 2 dated December 21, 2017 , Revision 3 dated February 7, 2019, Revision 4 dated August 13, 2019, Revision 5 dated November 14, 2019.

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
DIVISION 9
375 SILAS CREEK PARKWAY
WINSTON SALEM, NC 27127

Telephone: (336) 896-2330
Customer Service: 1-877-368-4968
Website: www.ncdot.gov

Location:
375 SILAS CREEK PARKWAY
WINSTON SALEM, NC 27127

Dear Sir:

The North Carolina Department of Transportation (NCDOT) requests modification to the existing Section 404 Individual Permit and Section 401 Water Quality Certification for the proposed Winston Salem Northern Beltway from US 52 to US 311 (TIP U-2759 D, E, and F) in Forsyth County. This project is currently under construction.

This modification will result in no changes to wetland impacts previous documented. It will result in 31 linear feet of additional permanent stream fill impacts and 20 linear feet of additional temporary stream impacts. The total project impacts for U-2579D, E, and F include 12,111 linear feet of permanent stream impacts of which 405 linear feet is bank stabilization, 615 linear feet of temporary stream impacts, 1.66 acres of permanent wetland impacts, no temporary wetland impacts, and no hand clearing in wetlands.

Please see the enclosed revised permit drawings and updated impact summary sheets which reflect the changes in impacts.

Permit Impact Site Modification

Site 18A (Roadway Plan Sheet 20): Site 18A impacts changed as a result of the decision to remove a 24" reinforced concrete pipe (RCP) located to the south of the Winston Salem Northern Beltway roadway alignment and to the west of Phelps Drive (Y6C). The parcels (5 total) where Stream ES-S68 (UT to Mill Creek) and the existing 24" RCP are located were obtained by NCDOT during the right of way process. Access to the parcel is being removed along with the homes and sheds that occurred on the parcel(s). This site was reviewed for onsite mitigation potential; however, due to a number of constraints, it was determined that the best solution was to remove the 24" RCP and replace it with a standard base ditch with embedded rip rap. The main constraint and reason to use the standard base ditch is due to the steep slope of the channel. There will be 20 linear feet of temporary impacts at this location in order to dewater the existing stream around during construction. Removal of the 24" RCP will result in 141 linear feet of channel being daylighted. There will be 7 linear feet of permanent bank stabilization impacts to the channel beyond the pipe to tie the channel in at the inlet location and 24 linear feet of permanent impact to correct the existing scour and tie at the pipe outlet. No additional impacts will occur at this site.

Site 26 (Roadway Plan Sheets 24/25): Site 26 impacts have not changed from the modification dated January 2020; however, the design has changed due to the noise walls. A ditch is required along the toe of fill that will tie to the existing bank stabilization at the inlet of ES-S24. The updated plan sheets are attached.

Compensatory Mitigation

At site 18A, compensatory mitigation is proposed for the 24' of new linear feet of permanent impacts to correct the existing scour and tie at the pipe outlet. No compensatory mitigation is proposed for the 7' of permanent bank stabilization impacts. Table 1 below illustrates the current summary of stream impacts requiring mitigation which has changed since the last permit modification request dated October 17, 2019.

Table 1. 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	4345[+*]	- 698
U-2579E	Permitted	4,864	4,817	- 47
U-2579F	Permitted	2,544	2,502	- 42
R-2247EA	Preliminary	0	774 [+]	774 [+]
R-2247EB	Final	5,819 [+]	5,323 [+]	- 496
	Totals	36,474 [+]	35,710 [2]	- 764

1 Final impacts for each section in the preliminary design stage will be updated with future modifications.
2 Assumes the preliminary impacts for future sections.
+ Revised, per Permit Modification for R-2247EB [NCDOT's R-2247EB Modification application, dated June 26, 2019; USACE's R-2247EB Phased Modification (Action ID SAW-2017-02112), dated August 13, 2019] and Permit Modification for U-2579DEF [NCDOT's U-2579DEF Modification application, dated October 17, 2019; USACE'sU-2579DEF Modification (Action ID SAW-2017-02112), dated January 29, 2020].
*Revised, per the current permit modification for U-2579DEF, dated November 4, 2020.

Thank you for your assistance with this project. If you have any questions or need additional information, please contact me at either aeuliss@ncdot.gov or (336) 747-7800.

Sincerely,

Amy Euliss

Amy Euliss
NCDOT Division 9 Environmental Officer

cc:
Bill Barrett, Environmental Analysis Unit
Michael Shumsky, PE, Project Manager, NCDOT Design Build Unit
Marcus Kiser, PE, NCDOT Division 9 Resident Engineer
Phil Suggs, NCDOT Division 9 and 10 Roadside Environmental Filed Operations Engineer
Beth Harmon, Division of Mitigation Services
Amy Chapman, NCDENR-DWR
Dave Wanucha, NCDENR-DWR

North Carolina Department of Transportation
Environmental Analysis Unit (EAU)
Raleigh, North Carolina

UT to Mill Creek and Mill Creek
On-site Stream Mitigation Feasibility Report for
Winston-Salem Northern Beltway
Forsyth County, North Carolina

T.I.P. Number U-2579 D, E, and F
WBS No. 34839.3.GV7

May 22, 2020

1.0 BASELINE INFORMATION

The project is located within USGS Hydrologic Cataloging Unit 03040101, and NC Division of Water Resources (NCDWR) sub-basin 03-07-04 of the Yadkin Pee-Dee River Basin, and is part of the of the South Atlantic-Gulf region. The potential mitigation site is located along and to the west of Phelps Drive approximately 0.35 mile east of Baux Mountain Road in Forsyth County on the north side of Winston-Salem, on land that was purchased by the North Carolina Department of Transportation (NCDOT). The project is within the Piedmont physiographic province, specifically near the line between the Northern Inner Piedmont and the Southern Outer Piedmont Ecoregions. Land use within the watershed is primarily residential development, forested areas, and agricultural. The existing stream length, drainage area, and jurisdictional status are summarized in Table 1.

Table 1. Summary of Existing Stream Length and Drainage Area.

Stream Reach	Existing Length (LF)	Drainage Area	Intermittent/Perennial Status
UT to Mill Creek	419	17.7 ac	Stream reach considered intermittent by agencies during impact assessments. Status = Intermittent
Mill Creek	285	3.45 sq. mi.	Stream reach considered perennial by agencies during impact assessments. Status = Perennial

The project includes analyzing the feasibility of restoration, enhancement, and preservation of an unnamed tributary (UT) to Mill Creek as well as enhancement and restoration to areas along Mill Creek. Mill Creek has been assigned Stream Index Number12-94-7 (NCDWR 2020) and is designated a warm water stream with a classification of C. Class C waters are protected for secondary recreation, fishing, and aquatic life.

Most of the native plant communities have been removed from the site as the area has been mowed and maintained for the nearby residence and outbuildings which have now been removed through NCDOTs acquisition of the property.

NCDOT is analyzing the potential for on-site mitigation for jurisdictional stream impacts associated with Transportation Improvement Program (TIP) U-2579DEF as part of the construction of the Winston-Salem Northern Beltway. The project would serve as on-site mitigation through the restoration, enhancement, and preservation of 705 linear feet of streams if deemed feasible.

2.0 SITE SELECTION

TIP U-2579 DEF involves construction of the Winston-Salem Northern Beltway from US 52 to US 311 (New Walkertown Road). The stream restoration, enhancement and preservation site was selected due to its location within the U-2579DEF corridor and NCDOTs purchase of the property related to the project. The potential mitigation area includes approximately 1.5 acres within a Right of Way held by NCDOT. Within this area, the NCDOT reviewed the potential for restoration of the UT to Mill Creek, restoration of Mill Creek at the crossing of Phelps Dr, and enhancement along Mill Creek. These options are referred to as options 1, 2 and 3, respectfully. These options are summarized in table 2.

3.0 OPTIONS REVIEWED

Option 1: Restoration of Unnamed Tributary to Mill Creek

The existing UT to Mill Creek begins immediately downstream of a 24" pipe within the footprint of the U-2579DEF road construction project. The UT extends over 600 lf from this point to where it ties to Mill Creek. The far upstream extent of the UT is marked by severe channel and floodplain incision immediately downstream of the 24" pipe where the channel begins. From this point, moving downstream, the floodplain begins to widen allowing the channel some meander pattern progressing south toward Mill Creek. Around the midway point along the UT, the channel proceeds through another 24" reinforced concrete pipe for 141 lf.

Approximately 180 lf of the upper portion of the UT will be filled in by the new roadway facility (permit site 18). Extensive Class I Rip Rap outlet protection is called for in the construction plans to address stability concerns due to a 42" cross pipe and 18" pipe system outlet at this location. This mitigation feasibility analysis reviewed restoring the UT to a natural channel design from the terminus of the existing impact at permit site 18 to the tie in with Mill Creek.

The feasibility analysis reviewed three options for the Unnamed Tributary to Mill Creek. These are referred to as Options 1a, 1b, and 1c below.

- Option 1a proposes to remove 141 ft of existing 24" pipe and Provide full restoration of the UT to Mill Creek by grading a new floodplain, installing a number of grade control structures and steps to stabilize the channel, and plantings. See Figures 1 thru 3.

- Option 1b incorporates restoration, enhancement, and preservation of UT to Mill Creek. This option attempts to strike a balance between the costs of full restoration and obtaining mitigation credits. See Figures 4 thru 6.
- Option 1c, is based on removing 141 linear feet of existing 24" pipe and replacing it with a standard base ditch with embedded riprap for stability. This option does not propose mitigation credits for this work. Instead, it avoids a potential issue with the existing pipe in the future by removing it prior to access being removed or restricted. See Figures 7 and 8.

Issues Discovered with Options 1a and 1b

The feasibility analysis has several constraints which would make options 1a and 1b appear cost prohibitive on the UT to Mill Creek. These challenges include long term stability, grade control, cost associated with necessary cut to achieve adequate floodplain, and buffer limitations due to utility easements.

Stability and Grade Control Concerns: First and foremost was the channel slope which is 3.8% or more specifically the UT to Mill Creek drops 19 feet in elevation over 500 feet in length. In order to address that slope and provide full restoration on the UT to Mill Creek would take significant grading and a significant number of structures in order to stabilize the channel. Because of the slope of the channel, there is also a high potential for head cutting if any proposed structures were to fail within the restored channel. There is an approximately 8 foot drop to get from the UT elevation in the floodplain to the elevation of Mill Creek which poses a challenge for stability and would require a substantial structure and some grading if you left the channel at existing grade and simply tried to tie it in at Mill Creek. Even by doing that there is still a steep grade on the channel which would require a number of structures to stabilize the channel.

The existing 24" pipe to be removed has a slope of 2.5%. As shown in the profile drawing (Figure 6), there is notable drop-down in channel elevation as water enters the inlet side of the pipe. At the outlet end there is a 2' drop from pipe outlet to channel bottom. This outlet drop is stabilized by a small concrete pad.

Grade control structures would be needed for stability of the channel and prevention of potential head-cutting in the channel. In addition, the new channel will need to be steeper than existing pipe to avoid drastic elevation changes at the upstream and downstream ends. As seen in profile drawings for Options 1a and 1b (Figures 3 and 6) the longitudinal slopes would need to be 3.5-4% to better tie with the channel upstream and limit amount of grade change at the downstream end. Grade control needs to be achieved through the use of rock cross vanes. These have been shown on the mitigation plan drawings for Options 1a and 1b (Figures 1 and 4).

With the amount of grade change in this section, as well as the overall site, trying to achieve any riffle-pool sequence would be problematic as the riffle sections would need to be very short in

length and severely steep. Therefore a typical section resembling that of a constructed riffle with adequately sized stone to be embedded to channel depth would be required.

At the locations noted on Figures 4 and 7, the existing channel braids with some channel flow accessing the floodplain of Mill Creek. If we were to take this channel offline we would face challenges with grade change and tying a new channel into Mill Creek in a stable fashion.

Floodplain Concerns: In addition to the slope and stability issues noted above, another item that is of concern creating and maintaining the floodplain.

In the full restoration option (Option 1a) floodplain would need to be created due to channel elevations and topography. For studying the feasibility of this option we set the longitudinal grade by mirroring the existing channel grade for the UT and then stepping the proposed channel down after reaching the top of bank for Mill Creek (See Figure 3, profile). Proceeding in this fashion kept the longitudinal grade as low as possible (aided by drop structures near pipe removal) and limited the amount of floodplain excavation needed. Even still, we estimated approximately 1060 CY of grading.

Another concern is with potential backwater impacts to the channel that could occur due to high flows in Mill Creek. As mentioned above about stepping a new channel down to tie back in with Mill Creek, we would need to accomplish this with grade controls structures. There would be potential for these to degrade or fail due to effects of higher flows in Mill Creek.

Other unanticipated impacts that could occur include potentially impacting wetlands that exist in the floodplain of Mill Creek that were not previously mapped as jurisdictional to the west of the existing tributary.

Option 2: Restoration to Mill Creek at Phelps Drive

The two options reviewed at the crossing of Phelps Drive included restoration using natural channel design (option 2a) and stabilizing with conventional means as approved in the permit application (option 2b).

Option 2a: Option 2a includes restoration along Mill Creek where the existing culvert will be removed using natural channel design methods. The intent would be to lay back the slopes and remove the existing roadbed/fill to accomplish this. The slopes would be matted and planted with livestakes. The existing scour hole would be filled in and banks repaired to tie in with the new opening from removal of the culvert and the existing channel downstream. The goal would be to install a minimum of two structures to assist in stabilizing the channel grade where the culvert is removed and scour hole is repaired. There would not be any relocation of the channel with this option.

Option 2b: Option 2b includes removal of the existing culvert and stabilizing the area with riprap as detailed and illustrated in the permitted plans.

Issues Discovered with Options 2a

The main issue discovered when analyzing the options of restoration along Mill Creek include the potential to increase instability along the reach and the existing utility easement along the left bank of the channel. There is a potential to impact the utility easement by laying back the channel to a stable slope depending on the final designed slope. In addition, when laying back the slopes in just a short section of the channel there would be additional stress added to those banks when the flow necks back down to the existing channel and could create a potential area of erosion or scour. The channel has a large drainage area and storms or other events could significantly impact the stability of the reach during the time it takes to stabilize the plantings. This could lead to future maintenance issues and/or additional sedimentation into Mill Creek in the interim.

Option 3: Enhancements Along Mill Creek

Option 3 includes enhancing the riparian buffer along Mill Creek. This option includes planting of native bareroot tree and shrub species. The goal would be to plant a minimum 50-foot buffer if possible; however, there is an existing utility easement that would not allow that width to the south or along the left bank of Mill Creek. The minimum width of buffer along Mill Creek would be 35 feet along the utility easement.

Table 2. Summary of Restoration and/or Enhancement Options 1, 2 and 3 and Proposed Mitigation Amounts.

Mitigation Area	Option	Existing Length	Potential Credits	Restoration Approach
UT to Mill Creek	1a	420 LF	420 (1:1)	Restoration of entire UT to Mill Creek using natural channel design.
UT to Mill Creek	1b	87 LF	22 (4:1 ratio)	Preservation will consist of maintaining the stream reach and existing stream riparian buffer as it currently is in the upper section of UT.
UT to Mill Creek	1b	156 LF	156 (1:1 ratio)	Restoration will consist of removing the existing 24" RCP and replacing it with a stable 3' wide base channel and building a 10' wide floodplain bench on each side.
UT to Mill Creek	1b	177 LF	44 (4:1 ratio)	Enhancement will consist removing the existing trees which are growing in portions of the channel and planting a native riparian species typical of a bottomland hardwood forest. Any invasive tree/shrub species noted will be cut and treated with herbicide.
Mill Creek	2a	89 LF	89 (1:1 ratio)	Restoration of the channel in the area of an existing culvert and repair of adjacent scour hole utilizing natural channel design.

Mill Creek	2b	89 LF	0	Removal of existing culvert and install rip rap channel per permitted plans.
Mill Creek	3	196 LF	49 (4:1 ratio)	Enhancement will consist of planting a native riparian buffer with species typical of a bottomland hardwood forest. Any invasive tree/shrub species noted will be cut and treated with herbicide. Full 50 ft wide buffer is not possible due to existing utility easement.

4.0 PROJECT COST ESTIMATES FOR UT TO MILL CREEK

Three cost estimates are provided below based on the three options that have been reviewed for the potential mitigation site (Table 3). The first cost estimate provided is based on providing a full restoration of the UT to Mill Creek by grading a new floodplain, installing a number of grade control structures and steps to stabilize the channel, and plantings. In the table below this is Option 1a.

Option 1b below is based on the proposed plan detailed in the previous sections of this document which incorporate restoration, enhancement, and preservation of UT to Mill Creek. This option attempts to strike a balance between the costs of full restoration and obtaining mitigation credits. The Table below illustrates the cost estimate for Option 2.

The final option, Option 1c, is based on removing 141 linear feet of existing 24" pipe and replacing it with a standard base ditch. This option does not propose mitigation credits for this work. Instead, it avoids a potential issue with the existing pipe in the future by removing it prior to access being removed or restricted.

Table 3. Cost Estimates of Potential Options for UT to Mill Creek.

Option	**Description**	**Potential Mitigation Credits**	**Estimated Cost of Construction [1]**
Option 1a	Full Restoration of UT to Mill Creek	420	$180,000
Option 1b	Combination of Restoration, Enhancement, and Preservation to UT to Mill Creek	222	$111,000
Option 1c	No Restoration – Pipe Removal on UT to Mill Creek	0	$41,000 [2]
Option 2a	Full Restoration – Mill Creek	89	$110,500
Option 2b	No Restoration – Pipe Removal on Mill Creek	0	Included in the cost of the D-B contract

Option 3	Enhancement – Mill Creek	49	$7,700

[1] Please note: This is a preliminary Rough Oder of Magnitude Price only and final pricing would need to be submitted following issuance of RFC plans for the selected option.

[2] Assumes work would be completed by the D-B contractor rather than an approved mitigation contractor.

Recommendations

Based on the above description of options regarding mitigation at the UT to Mill Creek and Mill Creek at Phelps Drive, NCDOT has determined the best path forward as Option 1c which is to remove the pipe on the UT to Mill Creek and stabilize the area and 2b which is removing the pipe on Mill Creek and proceeding with the permitted plans for stabilizing the channel. The decision to move in this direction was based on a number of factors such as cost of construction when weighed against the potential mitigation credits, long term monitoring and maintenance of the site, and utility encroachments. The overall benefit of doing full restoration would not provide significant ecological uplift on either reach and could introduce instability of either reach following construction.

Figure 1

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

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

PROJECT REFERENCE NO.	SHEET NO.
U-2579D, E & F	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

FLATIRON

Blythe

GRAPHIC SCALE
25 0 50
PLANS

-L- POC Sta. 277+41.55 =
-Y6C- POC Sta. 18492.14
△ = 123°13' 25.04"

OUTLET CHANNEL PROTECTION
CLASS 'I' RIP RAP
EST 82 TONS
139 SY GEOTEXTILE
SEE DETAIL 20-10

REMOVE 24" RCP

BUILDINGS HAVE BEEN REMOVED

BUILDING AND METAL CANOPIES HAVE BEEN REMOVED

PROPOSED CHANNEL RESTORATION
SEE DETAIL 20-12

PROPOSED ROCK CROSS VANE (TYP.)

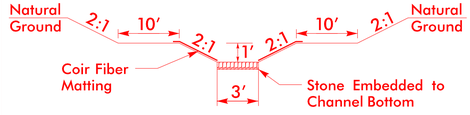
FLOODPLAIN EXCAVATION
SEE DETAIL 20-11

PIPE REMOVAL AND CHANNEL RESTORATION PER CONSTRUCTION PLANS

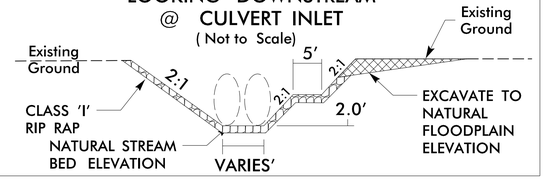
-Y6C- PC Sta. 23+86.07

REMOVE
2 x 72" CMP

DETAIL 20-12
PROPOSED CHANNEL RESTORATION
(Not to Scale)



DETAIL 20-11
FLOODPLAIN EXCAVATION\
PIPE REMOVAL
LOOKING DOWNSTREAM
@ CULVERT INLET
(Not to Scale)



STA. 24+34 -Y6C- LT

REVISIONS

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Figure 2

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St. Suite 900 Raleigh, N.C. 27601
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900 West Trade St., Suite 715
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-L- POC Sta. 277+41.55 =
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47" WW FENCE

OUTLET CHANNEL PROTECTION
CLASS 'I' RIP RAP
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PROPOSED ROCK CROSS VANE (TYP.)

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PIPE REMOVAL AND CHANNEL RESTORATION PER CONSTRUCTION PLANS

REMOVE
2 x 72" CMP

24" W/ELBOWS

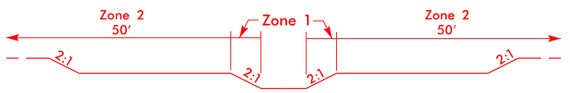
18" W/ELBOWS

24" RCP

NAD 83/95

S 45° 45' 22.6" E

PROPOSED CHANNEL RESTORATION
PLANTING PLAN
(Not to Scale)



*Provide Zone 2 Plantings in Floodplain of Mill Creek as Shown

PLANTING SPECIES LIST

ZONE 1 – LIVE STAKES	ZONE 2 – BARE ROOT
Black willow (Salix nigra)	Wild cherry (Prunus serotina)
Silky dogwood (Cornus amonum)	Sycamore (Platanus occidentalis)
Silky willow (Salix sericea)	Willow oak (Quercus phellos)
Nine bark (Physocarpus opulifolius)	River birch (Betula nigra)
Elderberry (Sambucus canadensis)	Persimmon (Diospyros virginiana)
Buttonbush (Cephalanthus occidentalis)	Sugarberry (Celtis laevigata)

*Substitutions due to lack of availability may occur with engineer approval.

LEGEND
ZONE 1
ZONE 2

REVISIONS

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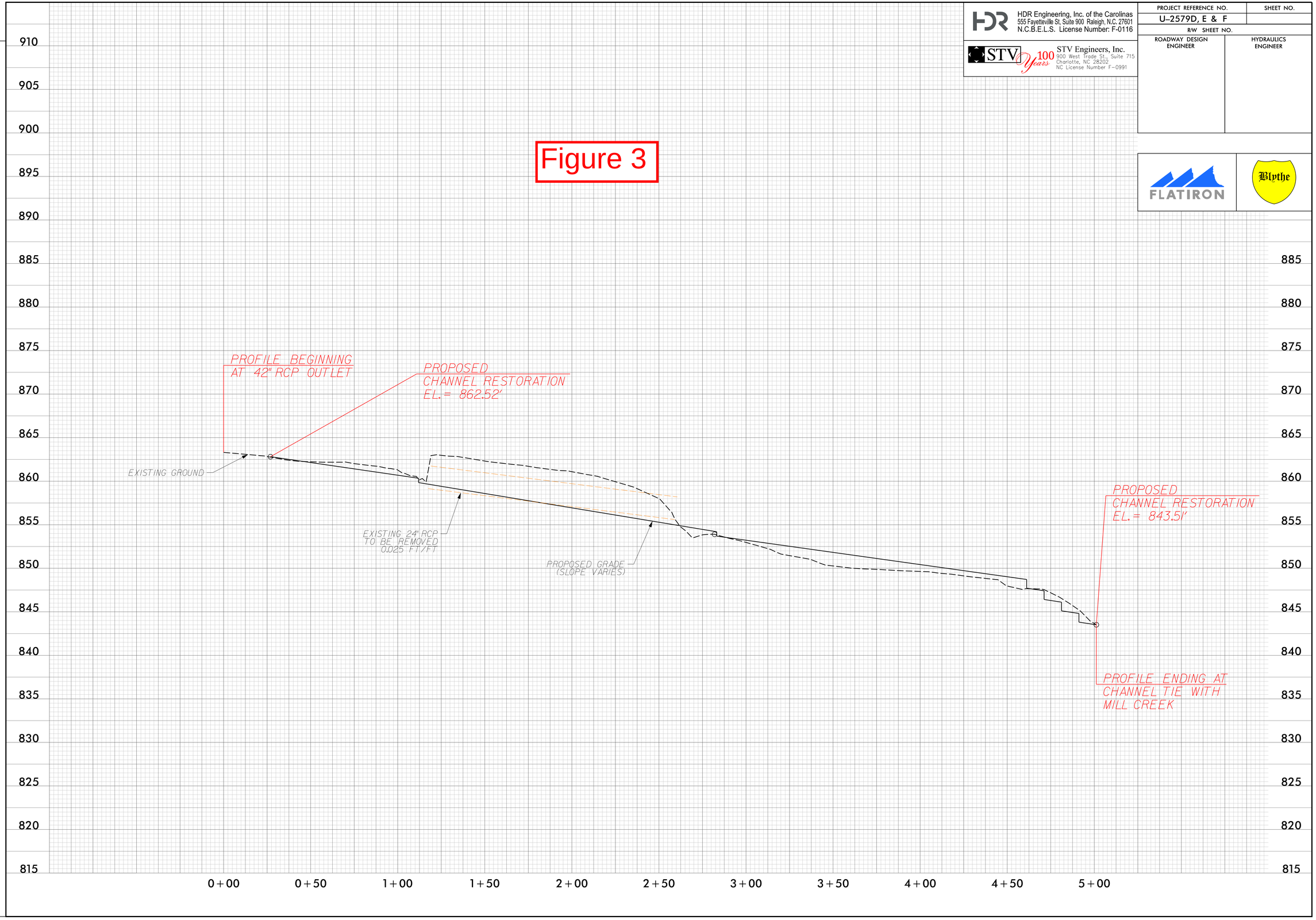
FLATIRON

Blythe

Figure 3



REVISIONS

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Figure 4

HDR Engineering, Inc. of the Carolinas
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Charlotte, NC 28202
NC License Number F-0991

PROJECT REFERENCE NO.	SHEET NO.
U-2579D, E & F	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

FLATIRON

Blythe

GRAPHIC SCALE
25 0 50
PLANS

OUTLET PROTECTION PER CONSTRUCTION PLANS

-L- POC Sta. 277+41.55 =
-Y6C- POC Sta. 18+92.14
△ = 123°13' 25.04"

OUTLET CHANNEL PROTECTION
CLASS 'I' RIP RAP
EST 82 TONS
139 SY GEOTEXTILE
SEE DETAIL 20-10

RETAIN EXISTING CHANNEL AND FLOODPLAIN

REMOVE 24" RCP

BUILDINGS HAVE BEEN REMOVED

ROCK CROSS VANE GRADE CONTROL

BUILDING AND METAL CANOPIES HAVE BEEN REMOVED

PROPOSED CHANNEL RESTORATION

ROCK CROSS VANE GRADE CONTROL

TRIM HARDWOOD VEGETATION IN CHANNEL TO GROUND LEVEL

RETAIN EXISTING CHANNEL

EXISTING CHANNEL BRAIDING AT THIS LOCATION

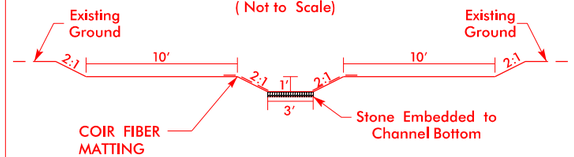
FLOODPLAIN EXCAVATION SEE DETAIL 20-11

PIPE REMOVAL AND CHANNEL RESTORATION PER CONSTRUCTION PLANS

-Y6C- PC Sta. 23+86.07

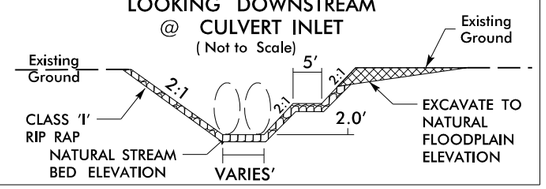
REMOVE 2 x 72" CMP

PROPOSED CHANNEL RESTORATION
TYPICAL SECTION
LOOKING DOWNSTREAM
(Not to Scale)



EMBEDDED STONE – TYPE TBD

DETAIL 20-11
FLOODPLAIN EXCAVATION\
PIPE REMOVAL
LOOKING DOWNSTREAM
@ CULVERT INLET
(Not to Scale)



STA. 24+34 -Y6C- LT

REVISIONS

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USER: WYELVERT
FILE: Flatiron_Construction_Corp.\Flatiron-U-2579_D_E_F_WS\6.0_CAD_BIM\6.2_WIP\U-2579DEF_STREAM_PSH_20.dgn
DATE: 2/20/2020
TIME: 10:03:17 AM
PENTABLE: NCDOT_EC_Stream Restoration_DRW.tbl

Figure 5

HDR Engineering, Inc. of the Carolinas
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N.C.B.E.L.S. License Number: F-0116

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

PROJECT REFERENCE NO.	SHEET NO.
U-2579D, E & F	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

FLATIRON

Blythe

GRAPHIC SCALE
25 0 50
PLANS

-L- POC Sta. 277+41.55 =
-Y6C- POC Sta. 18+92.14
△ = 123°13' 25.04"

OUTLET PROTECTION PER CONSTRUCTION PLANS

OUTLET CHANNEL PROTECTION
CLASS 'I' RIP RAP
EST 82 TONS
139 SY GEOTEXTILE
SEE DETAIL 20-10

ROCK CROSS VANE GRADE CONTROL

BUILDING AND METAL CANOPIES HAVE BEEN REMOVED

RETAIN EXISTING CHANNEL AND FLOODPLAIN

REMOVE 24" RCP

PROPOSED CHANNEL RESTORATION

BUILDINGS HAVE BEEN REMOVED

ROCK CROSS VANE GRADE CONTROL

TRIM HARDWOOD VEGETATION IN CHANNEL TO GROUND LEVEL

RETAIN EXISTING CHANNEL

EXISTING CHANNEL BRAIDING AT LOCATION

FLOODPLAIN EXCAVATION SEE DETAIL 20-11

PIPE REMOVAL AND CHANNEL RESTORATION PER CONSTRUCTION PLANS

-Y6C- PC Sta. 23+86.07

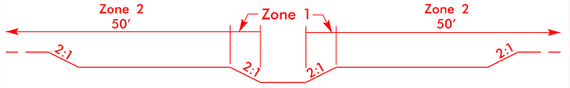
REMOVE 2 x 72" CMP

+69.47 END C/A FENCE

+96.84 BEGIN C FENCE

S 1° 45' 22.6" E

PROPOSED CHANNEL RESTORATION
PLANTING PLAN
(Not to Scale)



*Provide Zone 2 Plantings in Floodplain of Mill Creek as Shown

PLANTING SPECIES LIST

ZONE 1 – LIVE STAKES	ZONE 2 – BARE ROOT
Black willow (Salix nigra)	Wild cherry (Prunus serotina)
Silky dogwood (Cornus amonum)	Sycamore (Platanus occidentalis)
Silky willow (Salix sericea)	Willow oak (Quercus phellos)
Nine bark (Physocarpus opulifolius)	River birch (Betula nigra)
Elderberry (Sambucus canadensis)	Persimmon (Diospyros virginiana)
Buttonbush (Cephalanthus occidentalis)	Sugarberry (Celtis laevigata)

*Substitutions due to lack of availability may occur with engineer approval.

LEGEND
ZONE 1
ZONE 2

REVISIONS

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USER: WYELVERT
DATE: 2/20/2020
TIME: 10:01:13 AM
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FILE: Flatiron_Construction_Corp.\Flatiron-U-2579_D_E_F_WS\6.0_CAD_BIM\6.2_WIP\U-2579DEF\Hydraulics\CADD\Stream

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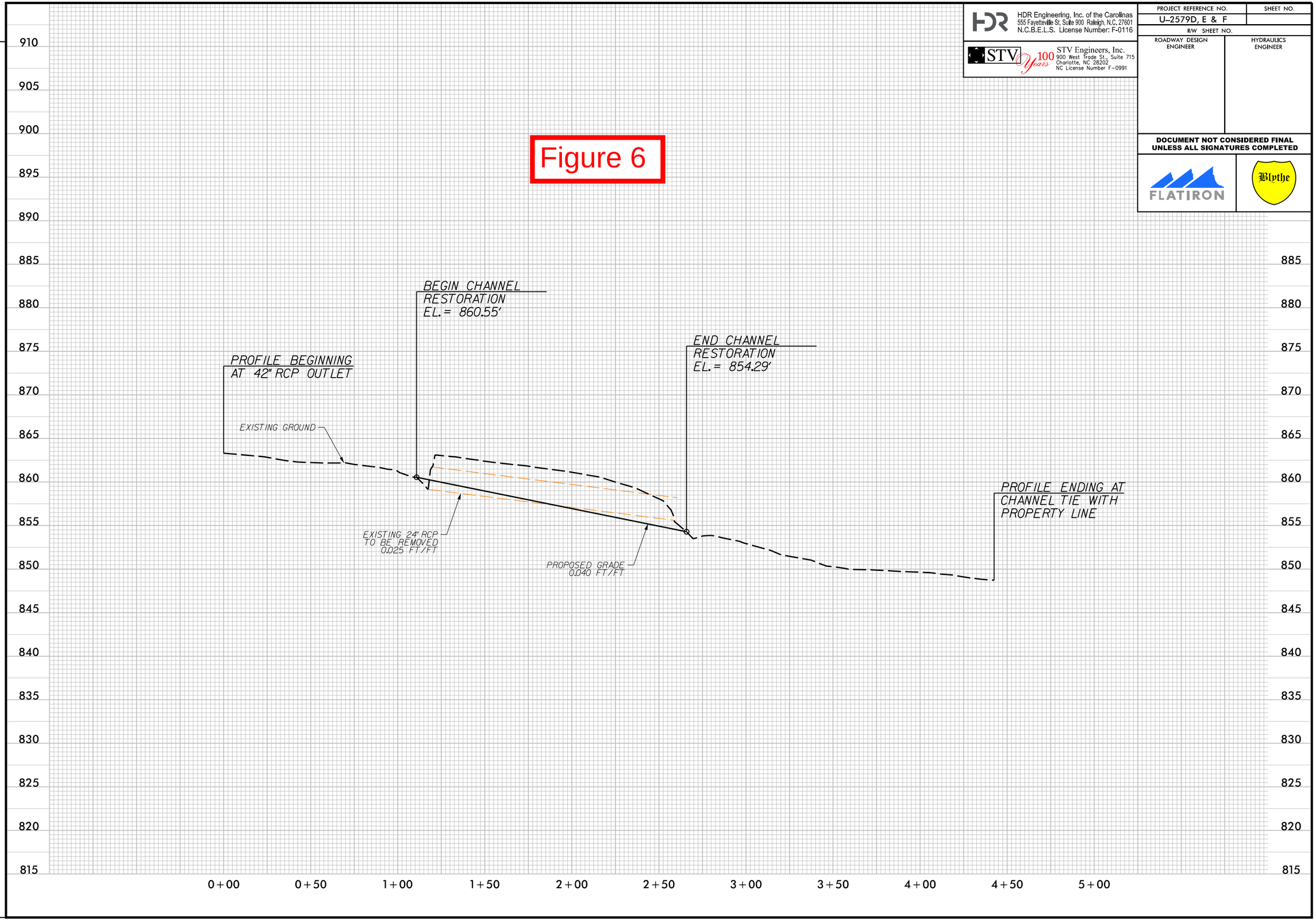
PROJECT REFERENCE NO.	SHEET NO.
U-2579D, E & F	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

FLATIRON

Blythe

Figure 6



REVISIONS

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FILE: U2579DEF_STREAM_PFL.dgn

DATE: 2/20/2020
TIME: 10:07:51 AM
PENTABLE: NCDOT_PFL_XSC.tbl

Figure 7

OUTLET PROTECTION PER CONSTRUCTION PLANS

OUTLET CHANNEL PROTECTION
CLASS 'I' RIP RAP
EST 82 TONS
139 SY GEOTEXTILE
SEE DETAIL 20–10

RETAIN EXISTING CHANNEL AND FLOODPLAIN

REMOVE 24" RCP

BUILDINGS HAVE BEEN REMOVED

BUILDING AND METAL CANOPIES HAVE BEEN REMOVED

STANDARD BASE DITCH
CLASS 'I' RIPRAP
EST 115 TONS
345 SY GEO–TEXTILE
SEE DETAIL 20–12

EXISTING CHANNEL BRAIDING AT THIS LOCATION

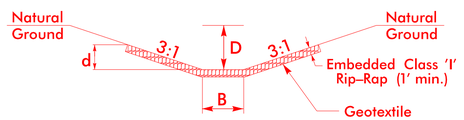
RETAIN EXISTING CHANNEL

FLOODPLAIN EXCAVATION
SEE DETAIL 20–11

PIPE REMOVAL AND CHANNEL RESTORATION PER CONSTRUCTION PLANS

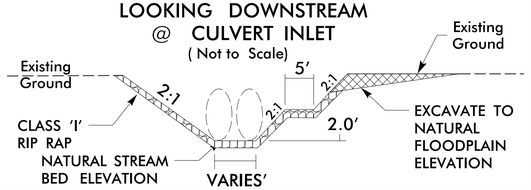
REMOVE
2 x 72" CMP

DETAIL 20–12
STANDARD BASE DITCH
(Not to Scale)



Min. D = 2Ft.
Max. d = 1.5Ft.
B = 3Ft.

DETAIL 20–11
FLOODPLAIN EXCAVATION\
PIPE REMOVAL
LOOKING DOWNSTREAM
@ CULVERT INLET
(Not to Scale)



STA. 24+34 –Y6C– LT

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NC License Number F-0991

PROJECT REFERENCE NO.	SHEET NO.
U–2579D, E & F	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

FLATIRON

Blythe

GRAPHIC SCALE
25 0 50
PLANS

REVISIONS

PLOT DRIVER: NCDOT.pdf_color-eng_100.pit
USER: DWAGNER
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DATE: 3/23/2020
TIME: 12:17:07 PM
PENTABLE: NCDOT_EC_Stream Restoration.DRW.tbl

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N.C.B.E.L.S. License Number: F-0116

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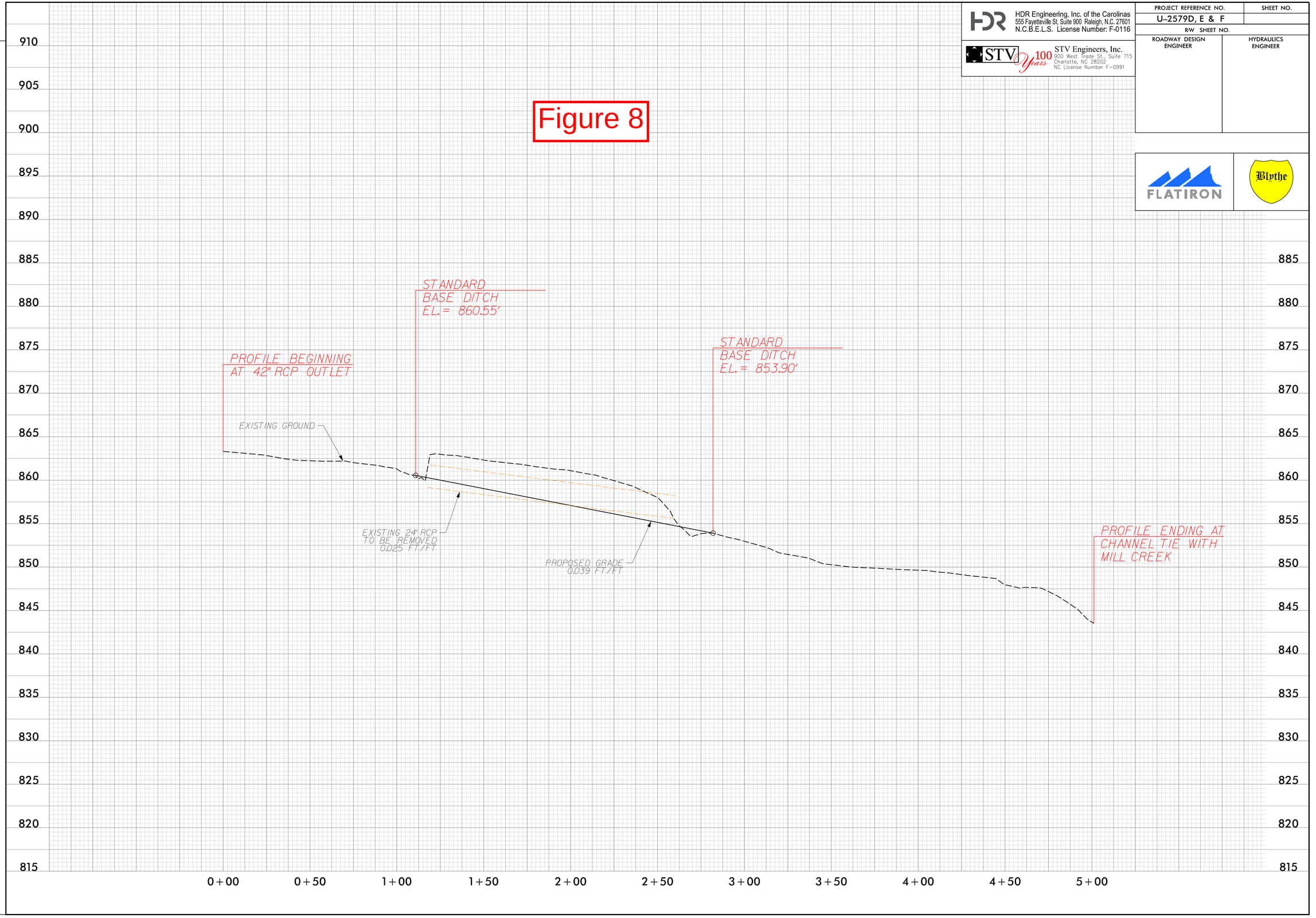
PROJECT REFERENCE NO.	SHEET NO.
U-2579D, E & F	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

FLATIRON

Blythe

Figure 8



REVISIONS

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NC License Number F-0991

PROJECT REFERENCE NO.	SHEET NO.
U-2579D, E & F	20
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

FLATIRON

Blythe

MATCHLINE -Y6A- STA 13+00 SEE SHEET 51

MATCHLINE -Y6C- STA 14+20 SEE SHEET 51

MATCHLINE -L- STA 269+00 SEE SHEET 19

MATCHLINE -L- STA 281+50 SEE SHEET 21

MATCHLINE -Y6C- STA 24+60 SEE SHEET 51

NAD 83/95

SITE 19

ES-S19

SITE 18

ES-S68

SITE 18A

SEE SHEET 20A

SITE 20

MILL CREEK (ES-S20)

MILL CREEK (ES-S20)

BEGIN JS

NW16

CHORD

605 182 181 604 183 184 604 185 606 655 186 187 188 180

15" RCP-III

18" RCP-III

24" RCP-III

42" RCP-IV

5'-X-7' RCBC (1' BURIED)

24" W/ELBOWS

15" RCP-III W/FG

18" W/ELBOWS

2GI

2GI W/FG

2GI-A W/FG

2GI-A50 W/FG

FS

CLASS 'B' RIP RAP
EST 2 TONS
7 SY GEOTEXTILE

2' BERM
BASE DITCH
SEE DETAIL 20-1

LATERAL 'V' DITCH
CLASS 'B' RIPRAP
EST 69 TONS
152 SY GEO-TEXTILE
SEE DETAIL 20-9
DDE = 106 CY

CLASS 'I' RIP RAP
EST 25 TONS
42 SY GEOTEXTILE

GRADE TO DRAIN

LATERAL 'V' DITCH
SEE DETAIL 20-3
DDE = 130 CY

BANK STABILIZATION
CLASS 'I' RIP RAP
EST 62 TONS
90 SY GEOTEXTILE
SEE DETAIL 20-8

CLASS 'B' RIP RAP
EST. 5 TONS
14 SY GEO-TEXTILE

OUTLET PROTECTION PER CONSTRUCTION PLANS

NO RIP RAP IN BED FIRST 7 FT OF DITCH

OUTLET CHANNEL PROTECTION
CLASS 'I' RIP RAP
EST 82 TONS
139 SY GEOTEXTILE
SEE DETAIL 20-10

6' LATERAL BASE DITCH
CLASS 'I' RIPRAP
EST 118 TONS
210 SY GEO-TEXTILE
SEE DETAIL 20-4
DDE = 572 CY

RETAIN EXISTING CHANNEL AND FLOODPLAIN

BUILDING AND METAL CANOPIES HAVE BEEN REMOVED

5' STANDARD BASE DITCH
CLASS 'I' RIPRAP
EST 209 TONS
205 SY GEOTEXTILE
SEE DETAIL 20-2

REMOVE 24" RCP

BUILDINGS HAVE BEEN REMOVED

OUTLET CHANNEL PROTECTION
CLASS 'I' RIP RAP
EST 40 TONS
86 SY GEOTEXTILE
SEE DETAIL 20-10

STANDARD BASE DITCH
CLASS 'I' RIPRAP
EST 115 TONS
345 SY GEO-TEXTILE
SEE DETAIL 20-12

PIPE REMOVAL
SEE DETAIL 20-11

FLOODPLAIN EXCAVATION
SEE DETAIL 20-11

PIPE REMOVAL AND CHANNEL RESTORATION PER CONSTRUCTION PLANS

EXISTING CHANNEL BRAIDING AT THIS LOCATION

RETAIN EXISTING CHANNEL

REMOVE 2 X 72" CMP

47" WW FENCE

N 50° 55' 10.0" W

S 53° 29' 21.0" W

S 9° 03' 51.0" W

270+00

275+00

280+00

20+00

DETAIL 20-12
STANDARD BASE DITCH
(Not to Scale)

Min. D=2Ft.
Max. d=1.5Ft.
B=3Ft.

DETAIL 20-8
BANK STABILIZATION AT JURISDICTIONAL STREAM
(Not to Scale)

Type of Liner= CL I Rip-Rap

STA. 279+50 -L- LT

DETAIL 20-10
OUTLET CHANNEL PROTECTION
(Not to Scale)

Type of Liner= CL 'I' RIP RAP

STA. 271+50 -L- RT
STA. 280+78 -L- RT

DETAIL 20-11
FLOODPLAIN EXCAVATION\ PIPE REMOVAL LOOKING DOWNSTREAM @ CULVERT INLET
(Not to Scale)

STA. 24+34 -Y6C- LT

DETAIL 20-2
STANDARD BASE DITCH
(Not to Scale)

Min. D= 3.0Ft.
Max. d= 3.0Ft.
B= 5.0Ft.
*When B is < 6.0'

Type of Liner= Class 'I' Rip-Rap

FROM -L- STA. 280+78 TO STA. 281+50 RT

DETAIL 20-3
LATERAL 'V' DITCH
(Not to Scale)

Min. D= 1.5Ft.
b= 5.0Ft.

FROM -L- STA. 269+00 TO STA. 276+50 LT
FROM -L- STA. 279+50 TO STA. 281+50 LT

DETAIL 20-4
LATERAL BASE DITCH
(Not to Scale)

Min. D= 1.5Ft.
Max. d= 1.5Ft.
B= 6.0Ft.
b= 5.0Ft.
*When B is < 6.0'

Type of Liner= Class 'I' Rip-Rap

FROM -L- STA. 279+00 TO STA. 280+80 RT

LEGEND:

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

25 12.5 0 25 50
GRAPHIC SCALE

PERMIT DRAWING
SHEET 60 OF 97

REVISIONS

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USER: CMYERS
FILE: Flatiron_Construction_Corp\Flatiron-U-2579_D_E_F_WS\6.0_CAD_BIM\6.2_WIP\U-2579DEF\Hydraulics\PERMITS_Environmental\Drawings\U2579DEF_PRM_4C_PSH.dgn
PENTABLE: NCDOT_permits_NOCON.tbl
DATE: 11/4/2020
TIME: 1:12:49 PM

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Charlotte, NC 28202
NC License Number F-0991

PROJECT REFERENCE NO.	SHEET NO.
U-2579D, E & F	20
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

FLATIRON

Blythe

MATCHLINE -Y6A- STA 13+00 SEE SHEET 51

MATCHLINE -Y6C- STA 14+20 SEE SHEET 51

MATCHLINE -L- STA 269+00 SEE SHEET 19

MATCHLINE -L- STA 281+50 SEE SHEET 21

MATCHLINE -Y6C- STA 24+50 SEE SHEET 51

SITE 19

SITE 18

SITE 18A

SITE 20

ES-S19

ES-S68

MILL CREEK (ES-S20)

NW16

BEGIN JS

SEE SHEET 20A

NAD 83/95

S 55°29'29" W

S 90°03'50" W

N 50°55'10.0" W

CHORD

47" WW FENCE

15" RCP-III

18" RCP-III

24" RCP-III

42" RCP-IV

24" W/ELBOWS

18" W/ELBOWS

2GI

2GI W/FG

FS

HW

BDO

CLASS 'B' RIP RAP
EST. 2 TONS
7 SY GEOTEXTILE

2' BERM
BASE DITCH
SEE DETAIL 20-1

LATERAL 'V' DITCH
CLASS 'B' RIPRAP
EST 69 TONS
152 SY GEO-TEXTILE
SEE DETAIL 20-9
DDE = 106 CY

CLASS 'I' RIP RAP
EST 25 TONS
42 SY GEOTEXTILE

GRADE TO DRAIN

LATERAL 'V' DITCH
SEE DETAIL 20-3
DDE = 130 CY

BANK STABILIZATION
CLASS 'I' RIP RAP
EST 62 TONS
90 SY GEOTEXTILE
SEE DETAIL 20-8

5'-1.7" RCBC (1' BURIED)

OUTLET PROTECTION PER CONSTRUCTION PLANS

CLASS 'B' RIP RAP
EST. 5 TONS
14 SY GEO-TEXTILE

NO RIP RAP IN BED
FIRST 7 FT OF DITCH

OUTLET CHANNEL PROTECTION
CLASS 'I' RIP RAP
EST 82 TONS
139 SY GEOTEXTILE
SEE DETAIL 20-10

6' LATERAL BASE DITCH
CLASS 'I' RIPRAP
EST 118 TONS
210 SY GEO-TEXTILE
SEE DETAIL 20-4
DDE = 572 CY

RETAIN EXISTING CHANNEL AND FLOODPLAIN

BUILDING AND METAL CANOPIES HAVE BEEN REMOVED

REMOVE 24" RCP

BUILDINGS HAVE BEEN REMOVED

5' STANDARD BASE DITCH
CLASS 'I' RIPRAP
EST 209 TONS
205 SY GEOTEXTILE
SEE DETAIL 20-2

OUTLET CHANNEL PROTECTION
CLASS 'I' RIP RAP
EST 40 TONS
SEE DETAIL 20-10

STANDARD BASE DITCH 86 SY GEOTEXTILE
CLASS 'I' RIPRAP
EST 115 TONS
345 SY GEO-TEXTILE
SEE DETAIL 20-12

PIPE REMOVAL
SEE DETAIL 20-11

FLOODPLAIN EXCAVATION
SEE DETAIL 20-11

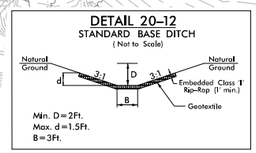
PIPE REMOVAL AND CHANNEL RESTORATION PER CONSTRUCTION PLANS

EXISTING CHANNEL BRAIDING AT THIS LOCATION

RETAIN EXISTING CHANNEL

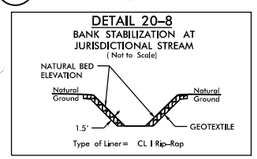
5'-0" x 7'-0" RCBC
2 x 72" CMP

DETAIL 20-12
STANDARD BASE DITCH
(Not to Scale)



Min. D = 2Ft.
Max. d = 1.5Ft.
B = 3Ft.

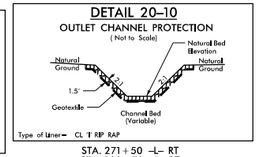
DETAIL 20-8
BANK STABILIZATION AT JURISDICTIONAL STREAM
(Not to Scale)



Type of Liner = CL I Rip-Rap

STA. 279+50 -L- LT

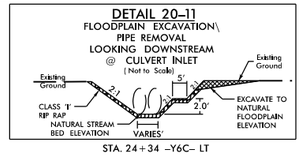
DETAIL 20-10
OUTLET CHANNEL PROTECTION
(Not to Scale)



Type of Liner = CL 'I' RIP RAP

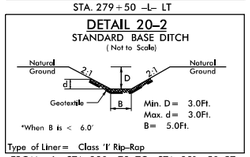
STA. 271+50 -L- RT
STA. 280+78 -L- RT

DETAIL 20-11
FLOODPLAIN EXCAVATION\ PIPE REMOVAL
LOOKING DOWNSTREAM
@ CULVERT INLET
(Not to Scale)



STA. 24+34 -Y6C- LT

DETAIL 20-2
STANDARD BASE DITCH
(Not to Scale)



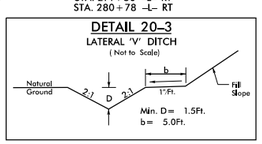
Min. D = 3.0Ft.
Max. d = 3.0Ft.
B = 5.0Ft.

*When B is < 6.0'

Type of Liner = Class 'I' Rip-Rap

FROM -L- STA. 280+78 TO STA. 281+50 RT

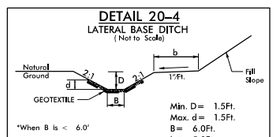
DETAIL 20-3
LATERAL 'V' DITCH
(Not to Scale)



Min. D = 1.5Ft.
b = 5.0Ft.

FROM -L- STA. 269+00 TO STA. 276+50 LT
FROM -L- STA. 279+50 TO STA. 281+50 LT

DETAIL 20-4
LATERAL BASE DITCH
(Not to Scale)



Min. D = 1.5Ft.
Max. d = 1.5Ft.
B = 6.0Ft.
b = 5.0Ft.

*When B is < 6.0'

Type of Liner = Class 'I' Rip-Rap

FROM -L- STA. 279+00 TO STA. 280+80 RT

LEGEND:

S S — DENOTES IMPACTS IN SURFACE WATER

TS TS — DENOTES TEMPORARY IMPACTS IN SURFACE WATER

25 12.5 0 25 50
GRAPHIC SCALE

PERMIT DRAWING
SHEET 61 OF 97

REVISIONS

PLOT DRIVER: NCDOT_pdf_color_eng_100.plt PENTABLE: NCDOT_permits_CON.tbl
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PENTABLE: NCDOT_permits_NOCON.tbl
DATE: 10/19/2020
TIME: 11:30:43 AM

REVISIONS

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

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

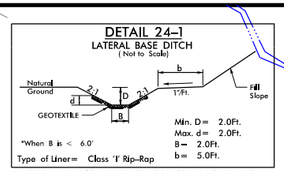
PROJECT REFERENCE NO.	SHEET NO.
U-2579D, E & F	24
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

FLATIRON | Blythe

GRAPHIC SCALE 25 12.5 0 25 50

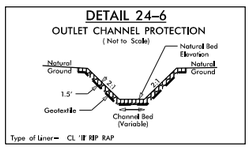
DETAIL 24–1
LATERAL BASE DITCH
(Not to Scale)



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

FROM –L– STA. 335+73 TO STA. 337+50 LT

DETAIL 24–6
OUTLET CHANNEL PROTECTION
(Not to Scale)



Type of Liner= CL 'II' RIP RAP

STA. 335+81 –L– LT

LEGEND:
- SS — DENOTES IMPACTS IN SURFACE WATER
- TS TS — DENOTES TEMPORARY IMPACTS IN SURFACE WATER

NAD 83/95

MATCHLINE –L– STA 323+50 SEE SHEET 23

MATCHLINE –L– STA 337+50 SEE SHEET 25

SITE 25

SITE 26

ES–S23

ES–S49

ES–S50

ES–S24

ES–W23

WINSTON-SALEM CITY LIMITS

47" WW FENCE

CHORD

BEGIN JS

S 29°00'58.0" E

N 21°24'18.8" W

2' LATERAL BASE DITCH
CLASS 'I' RIPRAP
EST 159 TONS
270 SY GEOTEXTILE
SEE DETAIL 24-1
DDE = 393 CY

CL 'I' RIP RAP
EST 7 TONS
15 SY GEOTEXTILE

OUTLET CHANNEL PROTECTION
CLASS "II' RIP RAP
EST 59 TONS
101 SY GEOTEXTILE
SEE DETAIL 24-6

24" RCP-III
18" RCP-III
15" RCP-III
12" RCP
6' X 6' RCBC NOT BURIED
24" W ELBOWS
18" W ELBOWS
15" W ELBOWS
JB w/MH
2GI
2GI-A
2GI W/FG
FS
BDO

BERM DITCH
CLASS 'I' RIPRAP
EST 157 TONS
266 SY GEOTEXTILE
SEE DETAIL 24-2

2' BERM DITCH
CLASS 'I' RIPRAP
EST 454 TONS
768 SY GEOTEXTILE
SEE DETAIL 24-5

BERM DITCH
SEE DETAIL 24-3

SPECIAL BERM DITCH
SEE PROFILE FOR DETAILS
SEE DETAIL 24-9

SPECIAL 2' BERM DITCH
SEE PROFILE FOR DETAILS
SEE DETAIL 24-10

BERM DITCH
CLASS 'I' RIPRAP
EST 116 TONS
196 SY GEOTEXTILE
SEE DETAIL 24-2

BERM DITCH
SEE DETAIL 24-9

2' BERM DITCH
SEE DETAIL 24-10

BERM DITCH
CLASS 'B' RIPRAP
EST 64 TONS
107 SY GEOTEXTILE
SEE DETAIL 24-11

2' BERM DITCH
CLASS 'B' RIPRAP
EST 58 TONS
100 SY GEOTEXTILE
SEE DETAIL 24-12

2' LATERAL BASE DITCH
CLASS 'I' RIPRAP
EST 60 TONS
101 SY GEOTEXTILE
SEE DETAIL 24-1
DDE = 206 CY

EXISTING R/W
PROP. LINE
EYG
INV=962.0'
INV=961.2'
60' CHL
60' WW
WW & RAIL
WD
DK
CONC
GR
RUINS
ELECTRIC METER
POOL
SOU
SOU

PERMIT DRAWING
SHEET 72 OF 97

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R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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FLATIRON | Blythe

GRAPHIC SCALE 25 12.5 0 25 50

DETAIL 24-1
LATERAL BASE DITCH
(Not to Scale)

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

FROM -L- STA. 335+73 TO STA. 337+50 LT

DETAIL 24-6
OUTLET CHANNEL PROTECTION
(Not to Scale)

Type of Liner= CL 'II' RIP RAP

STA. 335+81 -L- LT

LEGEND:
- S S — DENOTES IMPACTS IN SURFACE WATER
- TS TS — DENOTES TEMPORARY IMPACTS IN SURFACE WATER

MATCHLINE -L- STA 323+50 SEE SHEET 23

MATCHLINE -L- STA 337+50 SEE SHEET 25

SITE 25

SITE 26

ES-S23

ES-S49

ES-S50

ES-W23

ES-S24

325+00

330+00

335+00

NAD 83/95

WINSTON-SALEM CITY LIMITS

47" WW FENCE

CHORD

24" W ELBOWS

24" RCP-III

18" RCP-III

15" RCP-III

15" W ELBOWS

18" W ELBOWS

2GI

2GI-A

2GI W/FG

FS

JB w/MH

6'X 6' RCBC NOT BURIED

S 29° 00' 58.0" E

BEGIN JS

BERM DITCH CLASS 'I' RIPRAP EST 157 TONS 266 SY GEOTEXTILE SEE DETAIL 24-2

2' BERM DITCH CLASS 'I' RIPRAP EST 454 TONS 768 SY GEOTEXTILE SEE DETAIL 24-5

BDO

BERM DITCH SEE DETAIL 24-3

CL 'I' RIP RAP EST 7 TONS 15 SY GEOTEXTILE

OUTLET CHANNEL PROTECTION CLASS "II' RIP RAP EST 59 TONS 101 SY GEOTEXTILE SEE DETAIL 24-6

2' LATERAL BASE DITCH CLASS 'I' RIPRAP EST 159 TONS 270 SY GEOTEXTILE SEE DETAIL 24-1 DDE = 393 CY

BERM DITCH CLASS 'I' RIPRAP EST 116 TONS 196 SY GEOTEXTILE SEE DETAIL 24-2

BERM DITCH SEE DETAIL 24-9

2' BERM DITCH SEE DETAIL 24-10

SPECIAL 2' BERM DITCH SEE PROFILE FOR DETAILS SEE DETAIL 24-10

SPECIAL BERM DITCH SEE PROFILE FOR DETAILS SEE DETAIL 24-9

BERM DITCH CLASS 'B' RIPRAP EST 64 TONS 107 SY GEOTEXTILE SEE DETAIL 24-11

2' BERM DITCH CLASS 'B' RIPRAP EST 58 TONS 100 SY GEOTEXTILE SEE DETAIL 24-12

2' LATERAL BASE DITCH CLASS 'I' RIPRAP EST 60 TONS 101 SY GEOTEXTILE SEE DETAIL 24-1 DDE = 206 CY

60' CHL

EXISTING R/W=PROP.LINE

N 21° 24' 18.8" W

PUE

EXISTING R/W

12" RCP

WD BK

WW & WD RAIL

RUINS

ELECTRIC METER

POOL

704 189 190 191 191A 192

PERMIT DRAWING
SHEET 73 OF 97

REVISIONS

PLOT DRIVER: NCDOT_pdf_color-eng.100.plt
USER: CMYERS
FILE: Flatiron_Construction_Corp.\Flatiron-U-2579_D_E_F_WS\6.0_CAD_BIM\6.2_WIP\U-2579DEF\Hydraulics\PERMITS_Environmental\Drawings\U2579DEF_PRM_4C_PSH.dgn
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PROJECT REFERENCE NO.	SHEET NO.
U-2579D, E & F	25
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

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FLATIRON

Blythe

25 12.5 0 25 50
GRAPHIC SCALE

NAD 83/95

-L- STA 337+50
SEE SHEET 24

-L- STA 351+50
SEE SHEET 26

-Y7- STA 23+00
SEE SHEET 52

SITE 26

ES-S24

ES-S51

BEGIN JS

BEGIN JS

2' LATERAL BASE DITCH
CLASS 'I' RIPRAP
EST 180 TONS
305 SY GEOTEXTILE
SEE DETAIL 25-3
DDE = 3002 CY

2' BERM DITCH
SEE DETAIL 25-10

BERM DITCH
SEE DETAIL 25-9

GRADE TO DRAIN

GRADE TO DRAIN

2' LATERAL BASE DITCH
CLASS 'I' RIPRAP
EST 69 TONS
117 SY GEOTEXTILE
SEE DETAIL 25-3
DDE = 304 CY

BANK STABILIZATION
CLASS I RIP RAP
EST 25 TONS
47 SY GEOTEXTILE
SEE DETAIL 25-8

6' X 6' RCBC
NOT BURIED

TOE PROTECTION
SEE DETAIL 25-7

47" WW FENCE

NW19-1B

NWJB

18" RCP-III

15" RCP-III

15" ELBOWS

2GI

2GI-A

2GI W/FG

FS

BDG

PUE

N 85° 28' 58.6" W

S 32° 34' 27.5" W

N 82° 27' 23.1" W

S 41° 31' 01.4" W

S 41° 36' 36.2" W

345+00

340+00

350+00

15+00

20+00

10+00

TDE
-L- +17.06
175.00' RT

TDE
-L- +71.59
214.35' RT

LATERAL 'V' DITCH
SEE DETAIL 25-2
DDE = 47 CY

LATERAL 'V' DITCH
SEE DETAIL 25-2
DDE = 9 CY

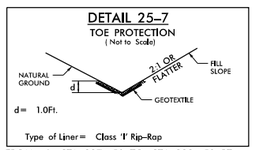
LATERAL 'V' DITCH
SEE DETAIL 25-2
DDE = 92 CY

BERM DITCH
SEE DETAIL 25-1

BERM DITCH
SEE DETAIL 25-1

192 661 677 610 611 198 199 673 608 190 190A 602 193 612 232

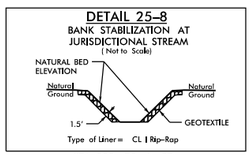
DETAIL 25-7
TOE PROTECTION
(Not to Scale)



d= 1.0Ft.

Type of Liner= Class 'I' Rip-Rap

DETAIL 25-8
BANK STABILIZATION AT JURISDICTIONAL STREAM
(Not to Scale)



Type of Liner= CL I Rip-Rap

STA. 338+75 -L- RT

FROM -L- STA. 337+50 TO STA. 338+52 RT
FROM -L- STA. 338+53 TO STA. 340+50 RT

LEGEND:

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

PERMIT DRAWING
SHEET 74 OF 97

REVISIONS

PLOT DRIVER: NCDOT_pdf_color_eng_100.plt
USER: CMYERS
DATE: 10/19/2020
TIME: 11:27:40 AM
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STV 100 Years
STV Engineers, Inc.
900 West Trade St., Suite 715
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PROJECT REFERENCE NO.	SHEET NO.
U-2579D, E & F	25
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

FLATIRON

Blythe

25 12.5 0 25 50
GRAPHIC SCALE

NAD 83/95

-L- STA 337+50
MATCHLINE
SEE SHEET 24

-L- STA 351+50
MATCHLINE
SEE SHEET 26

-Y7- STA 23+00
MATCHLINE
SEE SHEET 52

SITE 26

ES-S24

ES-S51

BEGIN JS

BEGIN JS

2' LATERAL BASE DITCH
CLASS 'I' RIPRAP
EST 180 TONS
305 SY GEOTEXTILE
SEE DETAIL 25-3
DDE = 3002 CY

2' BERM DITCH
SEE DETAIL 25-10

BERM DITCH
SEE DETAIL 25-9

GRADE TO DRAIN

GRADE TO DRAIN

2' LATERAL BASE DITCH
CLASS 'I' RIPRAP
EST 69 TONS
117 SY GEOTEXTILE
SEE DETAIL 25-3
DDE = 304 CY

BANK STABILIZATION
CLASS 'I' RIP RAP
EST 25 TONS
47 SY GEOTEXTILE
SEE DETAIL 25-8

6' X 6' RCBC
NOT BURIED

TOE PROTECTION
SEE DETAIL 25-7

18" RCP-III

15" RCP-III

15" ELBOWS

2GI

2GI-A

FS

OTCB

NW19-1B

NW19-1B

47" WW FENCE

S 4°31'01.4" W

N 85°28'58.6" W

S 32°34'27.5" W

N 82°27'23.1" W

S 41°36'36.2" W

345+00

340+00

350+00

15+00

20+00

10+00

192 661 677 610 232 611 198 199 673 608 193 602 190 190A 612

PUE

BERM DITCH
SEE DETAIL 25-1

LATERAL 'V' DITCH
SEE DETAIL 25-2
DDE = 92 CY

LATERAL 'V' DITCH
SEE DETAIL 25-2
DDE = 47 CY

LATERAL 'V' DITCH
SEE DETAIL 25-2
DDE = 9 CY

-L- +17.06
175.00' RT

-L- +71.59
214.35' RT

TDE

BDO

47" WW FENCE

DETAIL 25-7
TOE PROTECTION
(Not to Scale)

NATURAL GROUND
d
2:1 OR FLATTER
FILL SLOPE
GEOTEXTILE
d= 1.0Ft.
Type of Liner= Class 'I' Rip-Rap

FROM -L- STA. 337+50 TO STA. 338+52 RT
FROM -L- STA. 338+53 TO STA. 340+50 RT

DETAIL 25-8
BANK STABILIZATION AT JURISDICTIONAL STREAM
(Not to Scale)

NATURAL BED ELEVATION
Natural Ground
Natural Ground
1.5'
GEOTEXTILE
Type of Liner= CL I Rip-Rap

STA. 338+75 -L- RT

LEGEND:

DENOTES IMPACTS IN SURFACE WATER

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

PERMIT DRAWING
SHEET 75 OF 97

REVISIONS

PLOT DRIVER: NCDOT_pdf_color_eng_100.plt
USER: CMYERS
DATE: 10/19/2020
PENTABLE: NCDOT_permits_CON.tbl
TIME: 11:26:29 AM
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WETLAND PERMIT IMPACT 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)
11	173+80 -L-	48" RCP						0.04		615		
11A**	174+23 -L- RT	48" RCP	0.08									
12	203+75 - 207+10 -L- RT	ROADWAY FILL						0.02	< 0.01	410	10	
12A	205+69 -L- RT	FILL IN WETLAND	0.08									
13	207+24 -L-	5x6 CULVERT						0.03	< 0.01	337	22	
13A	209+14 -L- LT	4' BASE DITCH				< 0.01						
14	222+50 - 223+56 -L- RT	48" RCP						0.01	< 0.01	220	11	
14A	222+65 -L- LT	POND						3.06				
15	242+86/244+20 -L-	5'x6' RCBC						0.05	< 0.01	520	15	
15A	243+60/244+00 -L-	5'x6' RCBC	0.04									
16	253+92/255+58 -L-	42" RCP AND DITCH						0.05	< 0.01	513	20	
17	261+02/262+96 -L-	6'x6' RCBC						0.08	< 0.01	928	23	
18	275+75/276+78 -L-	42" RCP						0.03	< 0.01	161	11	
18A	277+00 RT -L-	PIPE REMOVAL AND DITCH						< 0.01	< 0.01	24	20	
18A	277+00 RT -L-	BANK STABILIZATION						< 0.01		7		
19	279+30/280+86 -L-	5'x7' RCBC						0.04	< 0.01	250	11	
19	280+86/281+71 -L-	5' STANDARD BASE DITCH						< 0.01	< 0.01	91	15	
20	280+61/281+66 -L-	REMOVE 2 - 72" CMP						0.02	< 0.01	35	31	
20A	285+56/285+81 -L-	BANK STABILIZATION						< 0.01	< 0.01	16	21	
20B	285+56/285+81 -L-	BANK STABILIZATION						< 0.01	< 0.01	20	21	
20C	284+44/285+33 -L-	TEMPORARY WORK PAD							0.06		165	
21	285+19/285+65 -L-	CHANNEL CHANGE						< 0.01		133		
21	285+19 -L-	BANK STABILIZATION						< 0.01	< 0.01	10	10	
22	303+57/304+09 -L-	30" RCP/ 36" RCP						< 0.01	< 0.01	97	7	
TOTALS SHEET 2*:			0.20			< 0.01		3.47	0.09	4387	413	0

*Rounded totals are sum of actual impacts

NOTES:
-**Wetland ES-W33 is total take
-Site 24 is a Channel Relocation

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
11/03/2020
FORSYTH
U-2579D, E & F
34839.3.GV7
SHEET OF

Revised 2013 10 24

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND 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)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
23	316+25/317+41 -L-	6'x6' RCBC						0.04		363		
23	317+40/317+49 -L-	BANK STABILIZATION						< 0.01	< 0.01	28	10	
24	316+84/317+01 -L-	CHANNEL CHANGE						< 0.01	< 0.01	120	10	
25	323+23/325+22 -L-	24" RCP						0.02	< 0.01	294	10	
26	335+66/338+74 -L-	6'x6' RCBC						0.05	< 0.01	523	10	
26	338+82 -L-	BANK STABILIZATION						< 0.01	< 0.01	29	8	
27	356+07/357+64 -L-	7'x7' RCBC						0.05		328		
27	356+07 -L- LT	BANK STABILIZATION						< 0.01	< 0.01	35	8	
27	357+63 -L- RT	BANK STABILIZATION						< 0.01	< 0.01	37	12	
28**	397+37/400+85 -L-	ROADWAY FILL	0.26									
29**	398+61/405+73 -L-	ROADWAY FILL / 5' BASE DITCH						0.06		906		
29**	398+61/405+73 -L-	BANK STABILIZATION						< 0.01	< 0.01	40	10	
29A**	401+96 -L-	ROADWAY FILL	< 0.01									
29B**	402+33/405+59 -L-	ROADWAY FILL / 5' BASE DITCH	0.26		0.03	0.01						
30***	409+52/411+61 -L-	54" RCP						0.05	< 0.01	563	14	
30***	409+53 -L-	BANK STABILIZATION						< 0.01	< 0.01	15	10	
31	49+59 - 50+28 -Y3- LT	2' BASE DITCH						< 0.01		57		
32	35+68/37+32 -Y6-	BANK STABILIZATION						0.03	< 0.01	172	19	
33	173+50 -L- LT	CHANNEL IMPROVEMENT TIE-IN						< 0.01	< 0.01	20	21	
34	357+38/357+49 -L-	BANK STABILIZATION						< 0.01	< 0.01	24	11	
		TOTAL SHEET 1	0.87		< 0.01	0.01		0.49	< 0.01	5694	49	
		TOTAL SHEET 2	0.20			< 0.01		3.47	0.09	4387	413	
		TOTAL SHEET 3	0.53		0.03	0.01		0.34	0.02	3554	153	
TOTALS ALL SHEETS*:			1.60	0.00	0.03	0.03	0.00	4.31	0.11	13635	615	

*Rounded totals are sum of actual impacts

** SITE 28, 29, 29A, AND 29B - SITE 1 IN U-2579C PHASE 2 PERMIT

*** SITE 30 - SITE 2 IN U-2579C PHASE 2 PERMIT

NOTES
- ISOLATED WETLANDS SITE
- SITE 24 IS A CHANNEL RELOCATION

Revised 2013 10 24

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
11/03/2020
FORSYTH
U-2579D, E & F
34839.3.GV7
SHEET 97 OF 97