SITE ID: 095-01-b9ecb

SITE ADDRESS: 928 JAMES HAYES RD.,
DEEP GAP, NC 28618

North Carolina Emergency Management – Private Roads and Bridges

Site Information Form

Site Number: 095-01-b9ecb

Site Address: 928 James Hayes Road, Deep Gap, NC 28618

GPS Coordinates: 36.19958, -81.57724

County: Watauga

Bridge Type: Steel I-beam with Timber Decking or Modular Steel Bridge

Span Length: 30 ft Standard Bridge or 40 ft Modular Bridge. Refer to BSR for required waterway opening.

Bridge Width: 12'-0" Clear Width

Substructure Type: Concrete Cap on Drilled-in Piles

Geotechnical Information: See Standard Bridge Plans or the Modular Bridge Substructure Plans for Notes

Additional Notes:

Timber bridge railing not required for Steel I-beam with timber decking option.

Modular Steel Bridge option shall include guardrail as part of the system.

Wingwalls are not required.

The existing bridge is in place and must be removed by the Contractor prior to the start of construction.

No known debris or obstructions in the stream requiring removal.

BRIDGE SURVEY & HYDRAULIC DESIGN REPORT

NC DEPARTMENT OF EMERGENCY MANAGEMENT
PRIVATE ROADS AND BRIDGES PROGRAM

Site Number 095-01-b9ecb Latitude 36.19958 Longitude -81.57724

County Watauga Address near 928 James Hayes Road

City Deep Gap, NC Zip Code 28618

Recommended Structure 1 @ 30' Steel Girder Bridge with timber deck

Recommended Width of Roadway ..... Skew .....

Recommended Location is (At, Upstream, Downstream) of Existing Crossing .....

Temporary Crossing .....

I hereby certify that that I have reviewed the existing hydraulic conveyance at this site which was approximately a 25 ft timber bridge with the proposed conveyance provided by the proposed 30.0 ft. span bridge.

The proposed bridge low chord for the bridge shall be set in accordance with the the FEMA Disaster Specific Guidance for the Replacement of Private Roads and Bridges issued on 14 February 2025, "to provide bridge/culvert design plans certified (sealed, signed, and dated) by a Professional Engineer licensed in the State of North Carolina demonstrating that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing".

This certification demonstrates that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing. This is based on the best available data provided from post storm evaluations. Portions of the existing structures may have been destroyed, removed, modified or shifted from their original location or elevation.

Designed by .....

Assisted by .....

Date .....

NORTH CAROLINA PROFESSIONAL SEAL 20646 ENGINEER MATTHEW D. FOSTER

Signed by: Matthew D Foster 7/27/2026 | 12:28:00 PM EDT
7B1932BFAFC8472...

Reviewed by ..... Date .....

REV 7/27/2026 Initial MDF

Johnson, Mirmiran, & Thompson Inc.
108 Asheville Commerce Parkway
Candler, NC, 28715
License No: C-3097

SITE DATA

Drainage Area ..... Source .....

River Basin Yadkin - PeeDee Character .....

Stream Classification (e.g., Trout, High Quality Water) B; Tr, ORW

Debris Potential: Low ☐ Moderate ☒ High ☐

Existing Structure - Source of Available Data NCEM Private Roads and Bridges Inspection Team

Existing Structure - Description 1 @ 25 ft. +/- timber bridge

Estimated Waterway Opening 86.8 ft²

Design Control Elev ..... ft Source .....

Gage Station No ..... Period of Records .....

Max Discharge ..... cfs Date ..... Frequency .....

Historical Flood Information:

Date ..... Elev ..... ft Est Freq ..... yr Source ..... Period of Knowledge ..... yrs

Historical Scour Info: General ..... ft Contraction ..... ft Local ..... ft

Channel Slope ..... ft/ft Source ..... Normal Water Surface Elev ..... ft

Manning's n: Left OB ..... Channel ..... Right OB ..... Source .....

Flood Study / Status N/A, Trout Creek is a Tributary to Elk Creek, LDS

Flood Study 100-yr Discharge ..... cfs WS Elev: With Floodway ..... ft Without Floodway ..... ft River Station .....

DESIGN DATA

Hydrological Method .....

Hydraulic Design Method Disaster Specific Guidance for the Replacement of Private Roads and Bridges 2/14/2025

Floods Evaluated	Frequency (year)	Discharge (cfs)	Elevation (ft)	Backwater (ft)	Bridge Opening Velocity (fps)

Waterway Opening Provided Below: Design WS Elev ..... sf 100-yr WS Elev ..... sf Total 95.3 sf

Average Channel Velocity (Design) ..... fps Average Overbank Velocity (Design) ..... fps

Computed Scour: General ..... ft Contraction ..... ft Local ..... ft

INFORMATION TO BE SHOWN ON PLANS

HYDRAULIC DATA

DESIGN DISCHARGE	= 260	C.F.S.
FREQUENCY OF DESIGN FLOOD	= 25	YRS.
DESIGN HIGH WATER ELEVATION	= ____	
DRAINAGE AREA	= 0.94	SQ. MI.
BASIC DISCHARGE (Q100)	= 420	C.F.S.
BASIC HIGH WATER ELEVATION	= ____	

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= ____	C.F.S.
FREQUENCY OF OVERRTOPPING FLOOD	= ____	YRS.
OVERTOPPING FLOOD ELEVATION	= ____*	

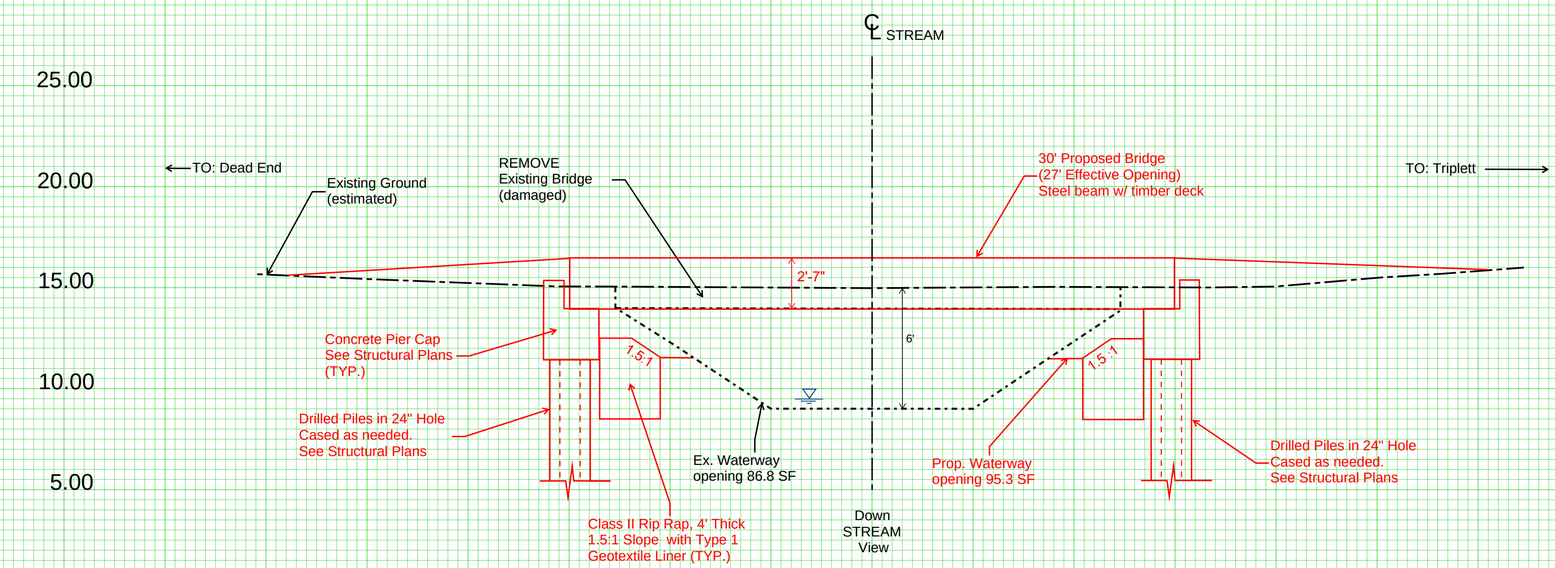
** NOTE LOCATION OF OVERTOPPING*

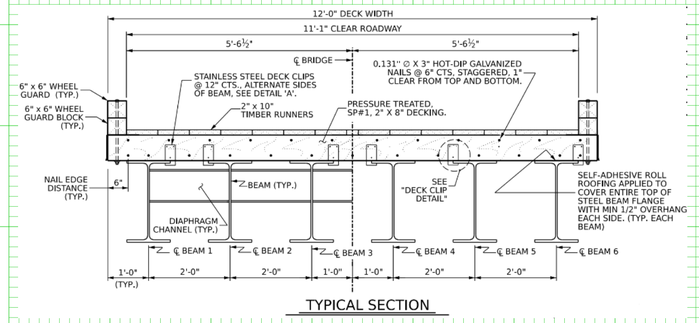
WS EL. Taken @ River Station ?

ADDITIONAL INFORMATION AND COMPUTATIONS

Number of Homes Confirmed	Yes
Number of Homes	5
Churches Confirmed	Yes
Number of Churches	0
Schools Confirmed	Yes
Number of Schools	0
Recreational/Business Areas Confirmed	Yes
Number of Recreational/Business Areas	0
General Description	Note same road has site 095-01-9347b farther down for 3 of the same houses. Ridge needs new upstream support beam and bridge is warping.
Overall Condition	Intact
Condition Other	
Site Repair Status	No Repair
Condition Description	Needs repair for cracked support beams. Still holding due to rock under beam.
Expected Level of Effort	Repair
Other Level of Effort	
Horizontal Curve	No
Number of Travel Lanes (LOS)	1
Inclination	No
Roadway Divider	No
Road/Bridge Width (ft)	12.00
Span/Gap Estimate (ft)	25.00
Surface to Water (ft)	6.00
Utility/Mechanical	No
Utility Types	
Pipe Needs Sizing	No
Depth of Pipe	
Geotechnical	Erosion/scour
Other Geotechnical	

21" W21X48 beam
+ 8" Deck
+ 2" Runner
=31" (2'-7") ft structure depth)





TYPICAL SECTION

Stationing and elevations shown are relative to the site.
Based on an assumed datum.
No survey grade field work was performed.

BSR based on STANDARD BRIDGE PLANS

BRIDGE SURVEY & HYDRAULIC DESIGN REPORT

NC DEPARTMENT OF EMERGENCY MANAGEMENT
PRIVATE ROADS AND BRIDGES PROGRAM

Site Number 095-01-b9ecb Latitude 36.19958 Longitude -81.57724

County Watauga Address near 928 James Hayes Road

City Deep Gap, NC Zip Code 28618

Recommended Structure 1 @ 40' Steel Modular Bridge (30' effective flow length)

Recommended Width of Roadway ____ Skew ____

Recommended Location is (At, Upstream, Downstream) of Existing Crossing ____

Temporary Crossing ____

I hereby certify that that I have reviewed the existing hydraulic conveyance at this site which was approximately a 25 ft timber bridge with the proposed conveyance provided by the proposed 40 ft. span bridge.

The proposed bridge low chord for the bridge shall be set in accordance with the the FEMA Disaster Specific Guidance for the Replacement of Private Roads and Bridges issued on 14 February 2025, "to provide bridge/culvert design plans certified (sealed, signed, and dated) by a Professional Engineer licensed in the State of North Carolina demonstrating that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing".

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Designed by ____

Assisted by ____

Date ____

NORTH CAROLINA PROFESSIONAL SEAL 20646 ENGINEER MATTHEW D. FOSTER

Signed by: Matthew D Foster 7/27/2026 | 12:28:00 PM EDT
7B1932BFAFC8472...

Johnson, Mirmiran, & Thompson Inc.
108 Asheville Commerce Parkway
Candler, NC, 28715
License No: C-3097

Reviewed by ____ Date ____

REV 7/27/2026

Initial MDF

SITE DATA

Drainage Area ____ Source ____

River Basin Yadkin - PeeDee Character ____

Stream Classification (e.g., Trout, High Quality Water) B; Tr, ORW

Debris Potential: Low ☐ Moderate ☒ High ☐

Existing Structure - Source of Available Data NCEM Private Roads and Bridges Inspection Team

Existing Structure - Description 1 @ 25 ft. +/- timber bridge

Estimated Waterway Opening 86.8 ft²

Design Control Elev ____ ft Source ____

Gage Station No ____ Period of Records ____

Max Discharge ____ cfs Date ____ Frequency ____

Historical Flood Information:

Date ____ Elev ____ ft Est Freq ____ yr Source ____ Period of Knowledge ____ yrs

Historical Scour Info: General ____ ft Contraction ____ ft Local ____ ft

Channel Slope ____ ft/ft Source ____ Normal Water Surface Elev ____ ft

Manning's n: Left OB ____ Channel ____ Right OB ____ Source ____

Flood Study / Status N/A, Trout Creek is a Tributary to Elk Creek, LDS

Flood Study 100-yr Discharge ____ cfs WS Elev: With Floodway ____ ft Without Floodway ____ ft River Station ____

DESIGN DATA

Hydrological Method ____

Hydraulic Design Method Disaster Specific Guidance for the Replacement of Private Roads and Bridges 2/14/2025

Floods Evaluated	Frequency (year)	Discharge (cfs)	Elevation (ft)	Backwater (ft)	Bridge Opening Velocity (fps)

Waterway Opening Provided Below: Design WS Elev ____ sf 100-yr WS Elev ____ sf Total 113.0 sf

Average Channel Velocity (Design) ____ fps Average Overbank Velocity (Design) ____ fps

Computed Scour: General ____ ft Contraction ____ ft Local ____ ft

INFORMATION TO BE SHOWN ON PLANS

HYDRAULIC DATA

DESIGN DISCHARGE	= 260	C.F.S.
FREQUENCY OF DESIGN FLOOD	= 25	YRS.
DESIGN HIGH WATER ELEVATION	= ____	
DRAINAGE AREA	= 0.94	SQ. MI.
BASIC DISCHARGE (Q100)	= 420	C.F.S.
BASIC HIGH WATER ELEVATION	= ____	

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= ____	C.F.S.
FREQUENCY OF OVERRTOPPING FLOOD	= ____	YRS.
OVERTOPPING FLOOD ELEVATION	= ____	*

*NOTE LOCATION OF OVERTOPPING

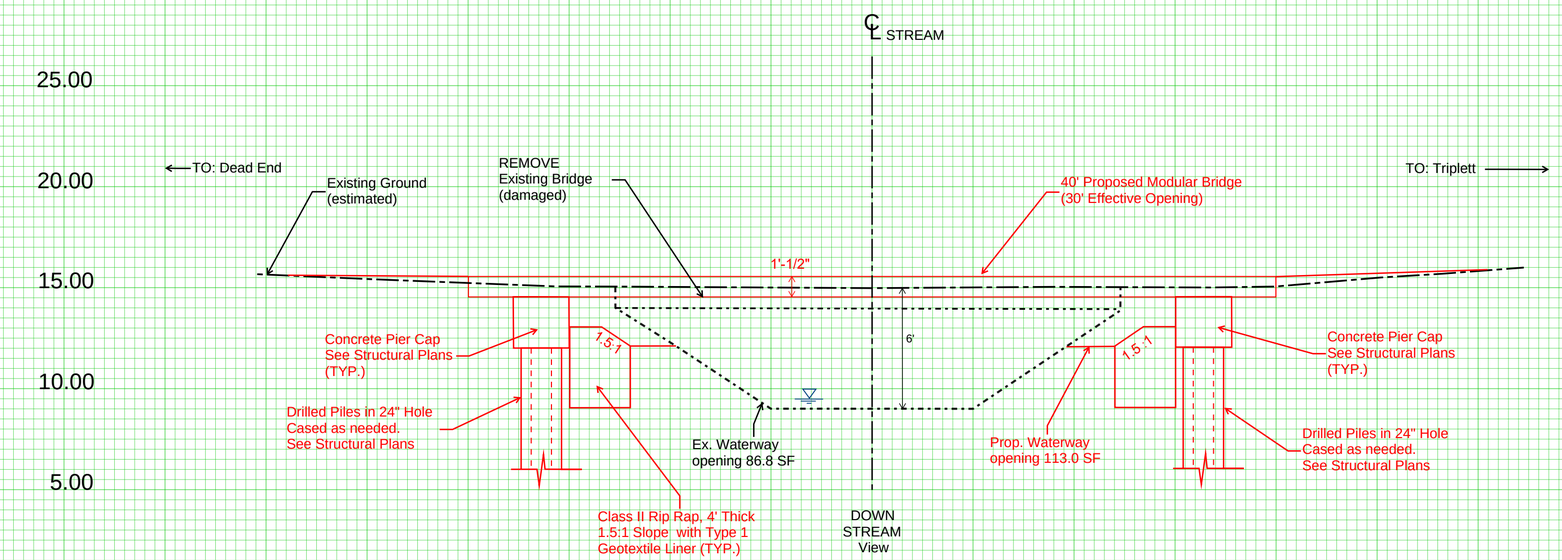
WS EL. Taken @ River Station ?

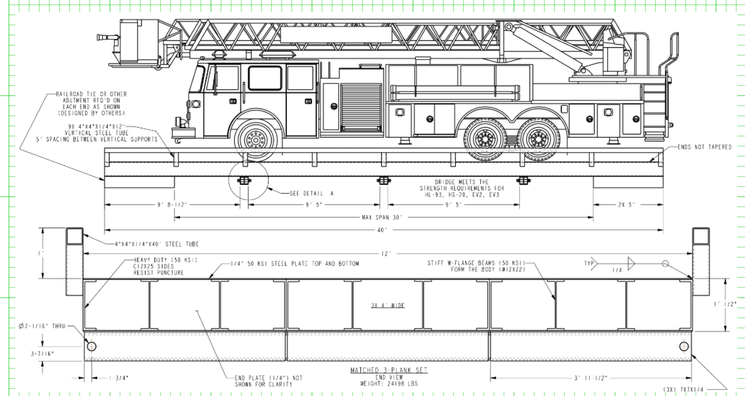
ADDITIONAL INFORMATION AND COMPUTATIONS

Number of Homes Confirmed	Yes
Number of Homes	5
Churches Confirmed	Yes
Number of Churches	0
Schools Confirmed	Yes
Number of Schools	0
Recreational/Business Areas Confirmed	Yes
Number of Recreational/Business Areas	0
General Description	Note same road has site 095-01-9347b farther down for 3 of the same houses. Ridge needs new upstream support beam and bridge is warping.
Overall Condition	Intact
Condition Other	
Site Repair Status	No Repair
Condition Description	Needs repair for cracked support beams. Still holding due to rock under beam.
Expected Level of Effort	Repair
Other Level of Effort	
Horizontal Curve	No
Number of Travel Lanes (LOS)	1
Inclination	No
Roadway Divider	No
Road/Bridge Width (ft)	12.00
Span/Gap Estimate (ft)	25.00
Surface to Water (ft)	6.00
Utility/Mechanical	No
Utility Types	
Pipe Needs Sizing	No
Depth of Pipe	
Geotechnical	Erosion/scour
Other Geotechnical	

12" W12X22 beam
+ 0.25" Steel Plate
+ 0.25" Steel Plate
=12.5" (1'-1/2") ft structure depth)

Proposed Conveyance Area has been reduced by 0.9 sf to account for blockage created by 3 Plank Connectors as shown in Detail A of the Typical Section.





Stationing and elevations shown are relative to the site.
Based on an assumed datum.
No survey grade field work was performed.

BSR based on MODULAR BRIDGE PLANS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	095-01-b9ecb	1	

REFERENCE: N/A

PROJECT: N/A

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *WATAUGA*

PROJECT DESCRIPTION *NORTH CAROLINA EMERGENCY MANAGEMENT-PRIVATE ROADS, BRIDGE REPAIR AND REPLACEMENT PROGRAM*

SITE DESCRIPTION *928 JAMES HAYES ROAD FOR BRIDGE OVER TROUT CREEK*

CONTENTS

PERSONNEL

C. BRAKE, G.I.T.

S. DAVIS

TY. BEARD

INVESTIGATED BY *F&R, Inc.*

DRAWN BY *T.T. WALKER*

CHECKED BY *P. ALTON, P.E.*

SUBMITTED BY *P. ALTON, P.E.*

DATE *APRIL 2026*

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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NOTES:

1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE GEOTECHNICAL ENGINEER AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

SINCE 1881

Prepared in the Office of:

FROEHLING & ROBERTSON, INC.

Engineering Stability Since 1881

310 Hubert Street
Raleigh, North Carolina 27603-2302
License No. F-0266
Bus: 919.828.3441 Fax: 919.828.5751

NORTH CAROLINA PROFESSIONAL SEAL 033758 ENGINEER W. PATRICK ALTON

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
095-01-b9ecb	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 1 OF 2)

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTD T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT PLASTIC RANGE (PI) PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, CPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFERDUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS
S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] CME-550X
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

PROJECT REFERENCE NO.	SHEET NO.
095-01-b9ecb	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 2 OF 2)

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)		NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)		FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)		FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)		COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELOSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELOSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REDUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: N/A

ELEVATION: N/A FEET

NOTES:

FIAD= FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
095-01-b9ecb	3

SITE PLAN

0 50 100

FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 095-01-b9ecb	**TIP** N/A	**COUNTY** WATAUGA	**GEOLOGIST** C. Brake	
SITE DESCRIPTION 928 James Hayes Road for Bridge over Trout Creek				**GROUND WTR (ft)**
BORING NO. EB1	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** -L-	**0 HR.** 5.0
COLLAR ELEV. 0.0 ft	**TOTAL DEPTH** 30.7 ft	**NORTHING** 901,399	**EASTING** 1,239,643	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 89% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER W. Shenberger	**START DATE** 03/23/26	**COMP. DATE** 03/23/26	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
0										0.0 GROUND SURFACE 0.0
	0.0	0.0	2	1	4	5		M		**ARTIFICIAL FILL**
	-2.0	2.0								-2.0 Brown, Silty Fine to Coarse SAND (A-2-4) with Gravel 2.0
	-3.5	3.5								**ALLUVIAL**
-5			31	16	14	30		M		Brown-Gray, Silty Fine to Coarse Sandy GRAVEL (A-1-a) with Trace Cobble
	-8.5	8.5								
-10			8	15	15	30		W		
	-13.5	13.5								
-15			21	24	59	83		W		
	-17.5	17.5								-17.5 **WEATHERED ROCK** 17.5
	-18.5	18.5	100/0.3			100/0.3				Tan-Gray MYLONITIC GNEISS
-20										
	-23.0	23.0								-23.0 23.0
	-23.5	23.5								
-25	-24.5	24.5	60/0.1			60/0.1				-24.5 **CRYSTALLINE ROCK** 24.5
			30	61	39/0.1					MYLONITIC GNEISS
						100/0.6				**WEATHERED ROCK**
	-28.5	28.5								Tan MYLONITIC GNEISS with intermittent Soil Layers
-30			7	100/0.3		100/0.3				
	-30.7	30.7	60/0.0			60/0.0				-30.7 30.7
										Boring Terminated with Standard Penetration Test Refusal at Elevation -30.7 ft in CRYSTALLINE ROCK (MYLONITIC GNEISS)
										Note: Driller Indicated Harder Drilling 17.5'

SITE PHOTOGRAPHS:

928 James Hayes Road for Bridge over Trout Creek

Photograph No. 1: View looking North

Photograph No. 2: View looking South

Photograph No. 3: View looking upstream

Photograph No. 4: View looking downstream

SITE ID: 097-01-10fb2

SITE ADDRESS: 715 CHATHAM ST.,
RONDA, NC 28670

North Carolina Emergency Management – Private Roads and Bridges

Site Information Form

Site Number: 097-01-10fb2

Site Address: 715 Chatham Street, Ronda, NC 28670

GPS Coordinates: 36.2142,-80.9452

County: Wilkes

Bridge Type: Steel I-beam with Timber Decking or Modular Steel Bridge

Span Length: 50 ft Standard Bridge or 60 ft Modular Bridge. Refer to BSR for required waterway opening.

Bridge Width: 12'-0" Clear Width

Substructure Type: Concrete Cap on Drilled-In Piles

Geotechnical Information: See Standard Bridge Plans or the Modular Bridge Substructure Plans for Notes

Additional Notes:

Timber bridge railing is required for Steel I-beam with timber decking option.

Modular Steel Bridge option shall include guardrail as part of the system.

Wingwalls are not required.

The existing bridge is in place and must be removed by the Contractor prior to the start of construction.

No known debris or obstructions in the stream requiring removal.

BRIDGE SURVEY & HYDRAULIC DESIGN REPORT

NC DEPARTMENT OF EMERGENCY MANAGEMENT
PRIVATE ROADS AND BRIDGES PROGRAM

Site Number 097-01-10fb2 Latitude 36.21390 Longitude -80.94550

County Wilkes Address 604 Chatham St.

City Ronda , NC Zip Code 28670

Recommended Structure 1 @ 60' Modular Steel Bridge (50' effective flow length)

Recommended Width of Roadway ..... Skew .....

Recommended Location is (At, Upstream, Downstream) of Existing Crossing .....

Temporary Crossing .....

I hereby certify that I have reviewed the existing hydraulic conveyance at this site which was a 44 ft existing bridge with the proposed conveyance provided by the proposed 60 ft. bridge.

The proposed bridge low chord for the bridge shall be set in accordance with the the FEMA Disaster Specific Guidance for the Replacement of Private Roads and Bridges issued on 14 February 2025, "to provide bridge/culvert design plans certified (sealed, signed, and dated) by a Professional Engineer licensed in the State of North Carolina demonstrating that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing".

This certification demonstrates that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing. This is based on the best available data provided from post storm evaluations. Portions of the existing structures may have been destroyed, removed, modified or shifted from their original location or elevation.

Designed by .....

Assisted by .....

Date .....

NORTH CAROLINA PROFESSIONAL SEAL 20646 ENGINEER MATTHEW D. FOSTER

Signed by: Matthew D Foster 7B1932BFAFC8472...

7/27/2026 | 12:18:31 PM EDT

Johnson, Mirmiran, & Thompson Inc.
108 Asheville Commerce Parkway
Candler, NC, 28715
License No: C-3097

Reviewed by ..... Date .....

REV 7/27/2026

Initial MDF

SITE DATA

Drainage Area ..... Source .....

River Basin Yadkin River Character .....

Stream Classification (e.g., Trout, High Quality Water) WS-IV, (for the Yadkin River. UT has no Class).

Debris Potential: Low ☐ Moderate ☒ High ☐

Existing Structure - Source of Available Data NCEM Private Roads and Bridges Inspection Team

Existing Structure - Description 1 @ 44'+/- private bridge (damaged by Helene)

Estimated Waterway Opening 341.0 ft²

Design Control Elev ..... ft Source .....

Gage Station No ..... Period of Records .....

Max Discharge ..... cfs Date ..... Frequency .....

Historical Flood Information:

Date ..... Elev ..... ft Est Freq ..... yr Source ..... Period of Knowledge ..... yrs

Historical Scour Info: General ..... ft Contraction ..... ft Local ..... ft

Channel Slope ..... ft/ft Source ..... Normal Water Surface Elev ..... ft

Manning's n: Left OB ..... Channel ..... Right OB ..... Source .....

Flood Study / Status N/A (UT to Yadkin River). Note - bridge is subject to backwater from Yadkin River

Flood Study 100-yr Discharge ..... cfs WS Elev: With Floodway ..... ft Without Floodway ..... ft River Station .....

DESIGN DATA

Hydrological Method .....

Hydraulic Design Method Disaster Specific Guidance for the Replacement of Private Roads and Bridges 2/14/2025

Floods Evaluated	Frequency (year)	Discharge (cfs)	Elevation (ft)	Backwater (ft)	Bridge Opening Velocity (fps)

Waterway Opening Provided Below: Design WS Elev ..... sf 100-yr WS Elev ..... sf Total 409.8 sf

Average Channel Velocity (Design) ..... fps Average Overbank Velocity (Design) ..... fps

Computed Scour: General ..... ft Contraction ..... ft Local ..... ft

INFORMATION TO BE SHOWN ON PLANS

HYDRAULIC DATA

DESIGN DISCHARGE	= 280	C.F.S.
FREQUENCY OF DESIGN FLOOD	= 25	YRS.
DESIGN HIGH WATER ELEVATION	= _____	
DRAINAGE AREA	= 0.44	SQ. MI.
BASIC DISCHARGE (Q100)	= 390	C.F.S.
BASIC HIGH WATER ELEVATION	= _____	

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= _____	C.F.S.
FREQUENCY OF OVERRTOPPING FLOOD	= _____	YRS.
OVERTOPPING FLOOD ELEVATION	= _____*	

** NOTE LOCATION OF OVERTOPPING*

WS EL. Taken @ River Station ?

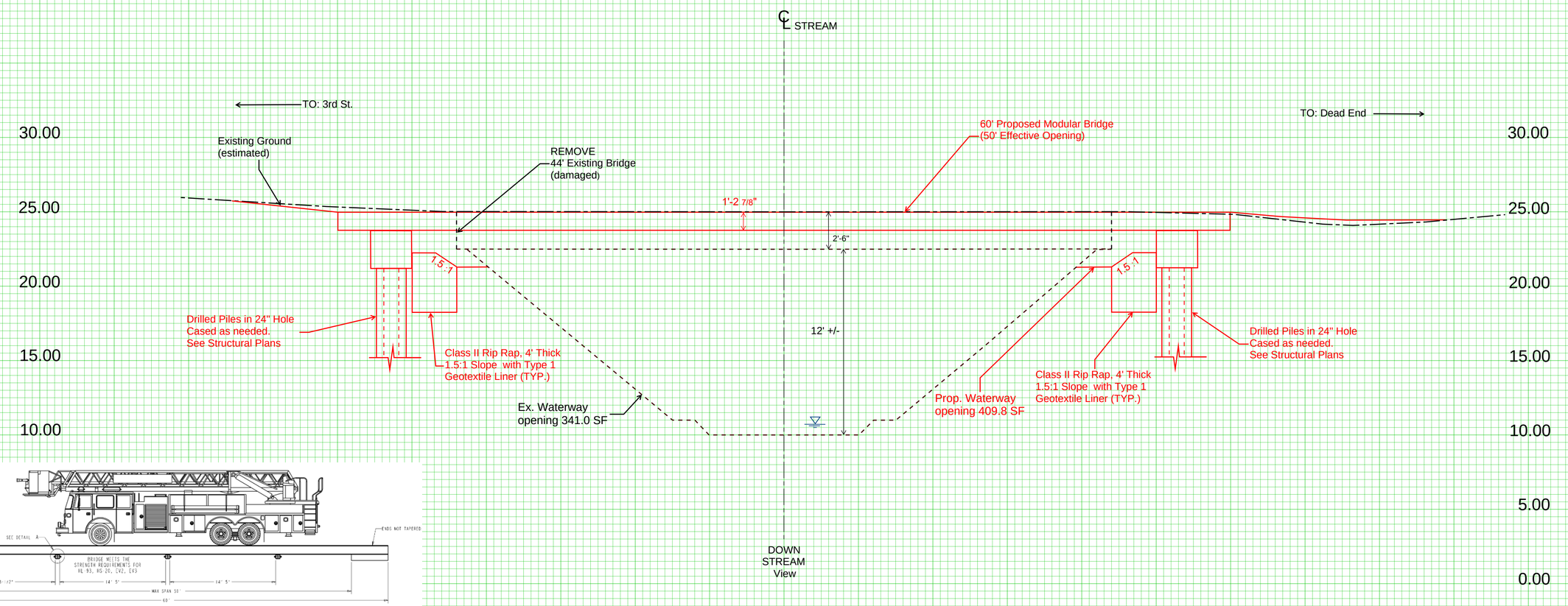
ADDITIONAL INFORMATION AND COMPUTATIONS

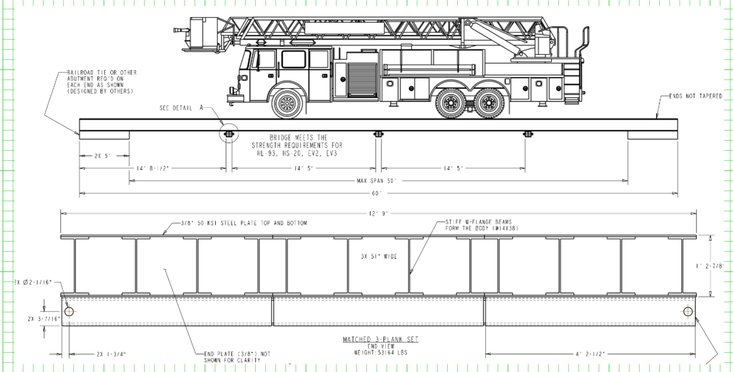
Emergency Vehicle Access Possible?	No
Number of Homes Confirmed	Yes
Number of Homes	4
Churches Confirmed	Yes
Number of Churches	0
Schools Confirmed	Yes
Number of Schools	0
Recreational/Business Areas Confirmed	Yes
Number of Recreational/Business Areas	1
General Description	Bridge is constructed of concrete end bents,steel beams, and wooden deck and rails. It is a one span bridge. It is damaged beyond repair and a redesign and replacement is needed.
Overall Condition	Damage
Condition Other	
Site Repair Status	No Repair
Condition Description	Bridge is damaged beyond repair. Apparently, rising water pushed up the leading edge of the bridge and it appears one beam is missing and others may have moved off their seats.
Expected Level of Effort	Full Redesign
Other Level of Effort	
Horizontal Curve	No
Number of Travel Lanes (LOS)	1
Inclination	No
Roadway Divider	No
Road/Bridge Width (ft)	17.00
Span/Gap Estimate (ft)	46.00
Surface to Water (ft)	15.00
Utility/Mechanical	No

14" W14X38 beam
+ 0.25" Steel Plate
+ 0.25" Steel Plate
=14.5" (1'-2.5") ft structure depth)

Proposed Conveyance Area has been reduced by 0.9 sf to account for blockage created by 3 Plank Connectors as shown in Detail A of the Typical Section.

10+00 10+05 10+10 10+15 10+20 10+25 10+30 10+35 10+40 10+45 10+50 10+55 10+60 10+65 10+70





Stationing and elevations shown are relative to the site.
Based on an assumed datum.
No survey grade field work was performed.

BSR based on MODULAR BRIDGE PLANS

BRIDGE SURVEY & HYDRAULIC DESIGN REPORT

NC DEPARTMENT OF EMERGENCY MANAGEMENT
PRIVATE ROADS AND BRIDGES PROGRAM

Site Number 097-01-10fb2 Latitude 36.21390 Longitude -80.94550

County Wilkes Address 604 Chatham St.

City Ronda , NC Zip Code 28670

Recommended Structure 1 @ 50' Steel Girder Bridge with timber deck

Recommended Width of Roadway ..... Skew .....

Recommended Location is (At, Upstream, Downstream) of Existing Crossing .....

Temporary Crossing .....

I hereby certify that that I have reviewed the existing hydraulic conveyance at this site which was a 44 ft existing bridge with the proposed conveyance provided by the proposed 50.0 ft. bridge.

The proposed bridge low chord for the bridge shall be set in accordance with the the FEMA Disaster Specific Guidance for the Replacement of Private Roads and Bridges issued on 14 February 2025, "to provide bridge/culvert design plans certified (sealed, signed, and dated) by a Professional Engineer licensed in the State of North Carolina demonstrating that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing".

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Designed by .....

Assisted by .....

Date .....

NORTH CAROLINA PROFESSIONAL SEAL 20646 ENGINEER MATTHEW D. FOSTER

Signed by: Matthew D Foster 7/27/2026 | 12:18:31 PM EDT
7B1932BFAFC8472...

Reviewed by ..... Date .....

REV 7/27/2026 Initial MDF

Johnson, Mirmiran, & Thompson Inc.
108 Asheville Commerce Parkway
Candler, NC, 28715
License No: C-3097

SITE DATA

Drainage Area ..... Source .....

River Basin Yadkin River Character .....

Stream Classification (e.g., Trout, High Quality Water) WS-IV, (for the Yadkin River. UT has no Class).

Debris Potential: Low ☐ Moderate ☒ High ☐

Existing Structure - Source of Available Data NCEM Private Roads and Bridges Inspection Team

Existing Structure - Description 1 @ 44'+/- private bridge (damaged by Helene)

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Gage Station No ..... Period of Records .....

Max Discharge ..... cfs Date ..... Frequency .....

Historical Flood Information:

Date ..... Elev ..... ft Est Freq ..... yr Source ..... Period of Knowledge ..... yrs

Historical Scour Info: General ..... ft Contraction ..... ft Local ..... ft

Channel Slope ..... ft/ft Source ..... Normal Water Surface Elev ..... ft

Manning's n: Left OB ..... Channel ..... Right OB ..... Source .....

Flood Study / Status N/A (UT to Yadkin River). Note - bridge is subject to backwater from Yadkin River

Flood Study 100-yr Discharge ..... cfs WS Elev: With Floodway ..... ft Without Floodway ..... ft River Station .....

DESIGN DATA

Hydrological Method .....

Hydraulic Design Method Disaster Specific Guidance for the Replacement of Private Roads and Bridges 2/14/2025

Floods Evaluated	Frequency (year)	Discharge (cfs)	Elevation (ft)	Backwater (ft)	Bridge Opening Velocity (fps)

Waterway Opening Provided Below: Design WS Elev ..... sf 100-yr WS Elev ..... sf Total 352.4 sf

Average Channel Velocity (Design) ..... fps Average Overbank Velocity (Design) ..... fps

Computed Scour: General ..... ft Contraction ..... ft Local ..... ft

INFORMATION TO BE SHOWN ON PLANS

HYDRAULIC DATA

DESIGN DISCHARGE	= 280	C.F.S.
FREQUENCY OF DESIGN FLOOD	= 25	YRS.
DESIGN HIGH WATER ELEVATION	=	
DRAINAGE AREA	= 0.44	SQ. MI.
BASIC DISCHARGE (Q100)	= 390	C.F.S.
BASIC HIGH WATER ELEVATION	=	

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	=	C.F.S.
FREQUENCY OF OVERRTOPPING FLOOD	=	YRS.
OVERTOPPING FLOOD ELEVATION	=	*

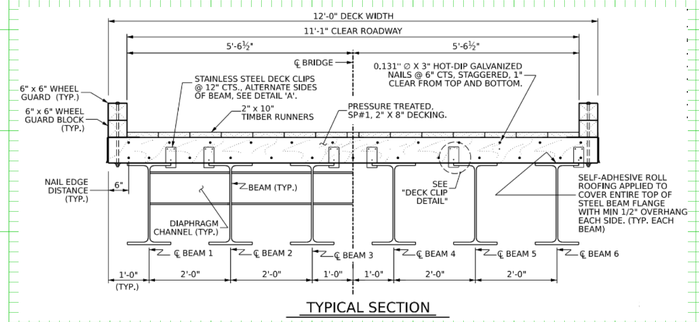
** NOTE LOCATION OF OVERTOPPING*

WS EL. Taken @ River Station ?

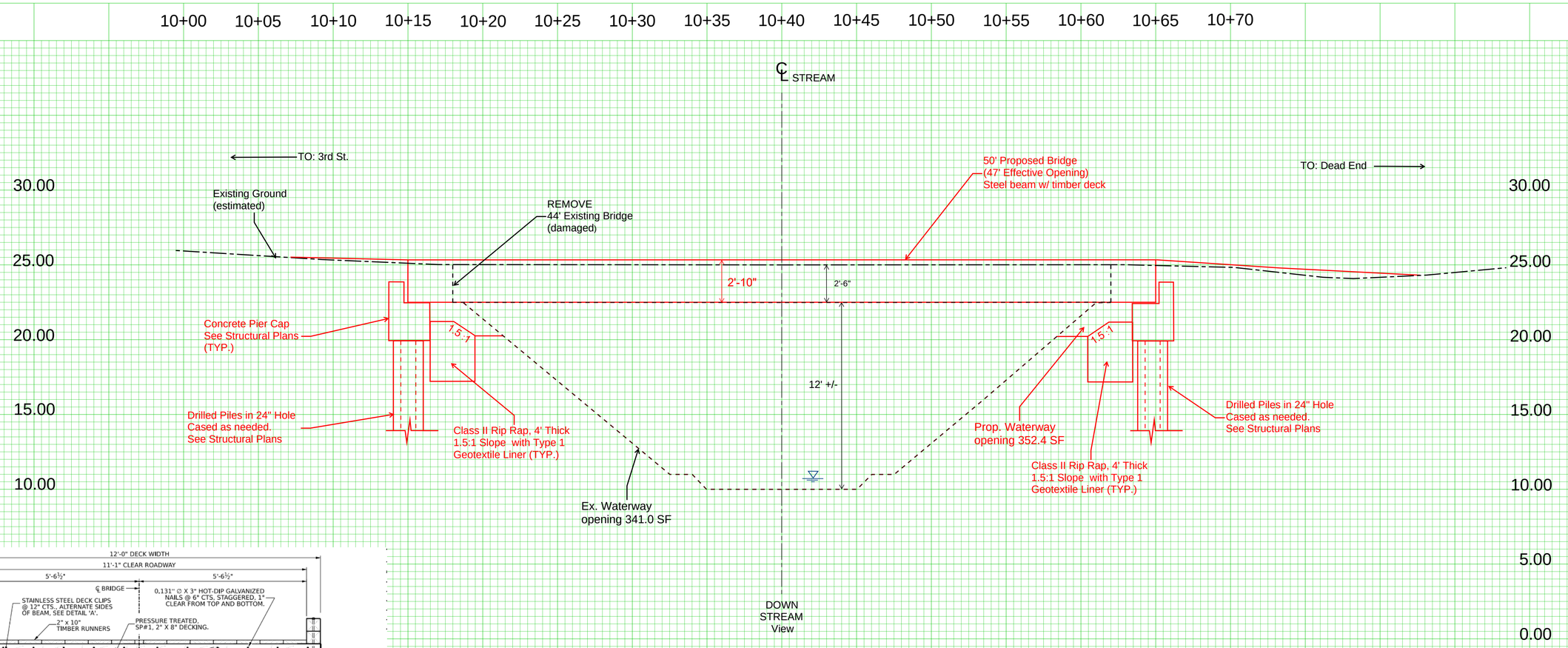
ADDITIONAL INFORMATION AND COMPUTATIONS

Emergency Vehicle Access Possible?	No
Number of Homes Confirmed	Yes
Number of Homes	4
Churches Confirmed	Yes
Number of Churches	0
Schools Confirmed	Yes
Number of Schools	0
Recreational/Business Areas Confirmed	Yes
Number of Recreational/Business Areas	1
General Description	Bridge is constructed of concrete end bents,steel beams, and wooden deck and rails. It is a one span bridge. It is damaged beyond repair and a redesign and replacement is needed.
Overall Condition	Damage
Condition Other	
Site Repair Status	No Repair
Condition Description	Bridge is damaged beyond repair. Apparently, rising water pushed up the leading edge of the bridge and it appears one beam is missing and others may have moved off their seats.
Expected Level of Effort	Full Redesign
Other Level of Effort	
Horizontal Curve	No
Number of Travel Lanes (LOS)	1
Inclination	No
Roadway Divider	No
Road/Bridge Width (ft)	17.00
Span/Gap Estimate (ft)	46.00
Surface to Water (ft)	15.00
Utility/Mechanical	No

24" W24X104 beam
+ 8" Deck
+ 2" Runner
=34" (2'-10") ft structure depth)



TYPICAL SECTION



Stationing and elevations shown are relative to the site.
Based on an assumed datum.
No survey grade field work was performed.

BSR based on STANDARD BRIDGE PLANS

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 097-01-10fb2	**TIP** N/A	**COUNTY** WILKES	**GEOLOGIST** C. Brake	
SITE DESCRIPTION 715 Chatham Street Bridge over Dam Tailwater to Yadkin River				**GROUND WTR (ft)**
BORING NO. EB1	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** -L-	**0 HR.** 18.4
COLLAR ELEV. 0.0 ft	**TOTAL DEPTH** 38.7 ft	**NORTHING** 902,509	**EASTING** 1,426,164	**24 HR.** 15.5
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 89% 12/20/2024		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 03/11/26	**COMP. DATE** 03/11/26	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
0										0.0 GROUND SURFACE	0.0
	0.0	0.0	5	4	3	7		M		**ARTIFICIAL FILL**	
										-2.0 Gray, Silty Fine to Coarse SAND (A-2-4) with Some Gravel	2.0
-5	-3.5	3.5	2	2	1	3		M		Brown-Red, Fine Sandy Clayey SILT (A-5) with Trace Mica	
										-7.0	7.0
	-8.5	8.5	WOH	1	1	2		M		**ALLUVIAL** Brown, Fine Sandy SILT (A-4) with Trace Mica	
-10										-12.0	12.0
	-13.5	13.5	WOH	WOH	1	1		M		Brown, Fine Sandy Clayey SILT (A-5) with Trace Mica	
-15										-17.5	17.5
	-18.5	18.5	36	36	30	66		M		**RESIDUAL** Brown, Fine to Coarse Sandy SILT (A-4) with Trace Mica and Rock Fragments	
-20										-24.0	24.0
	-23.5	23.5	29	64	36/0.1	100/0.6				**WEATHERED ROCK** Brown, Gray, and Tan MYLONITIC MICA SCHIST	
-25											
	-28.5	28.5	100/0.2			100/0.2					
-30											
	-33.5	33.5	74	26/0.1		100/0.6					
-35											
	-38.5	38.5	100/0.2			100/0.2				-38.7	38.7
										Boring Terminated at Elevation -38.7 ft in WEATHERED ROCK (MYLONITIC MICA SCHIST)	
										Note: Driller noted harder drilling at 17.5 feet.	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 097-01-10fb2	**TIP** N/A	**COUNTY** WILKES	**GEOLOGIST** C. Brake	
SITE DESCRIPTION 715 Chatham Street Bridge over Dam Tailwater to Yadkin River				**GROUND WTR (ft)**
BORING NO. EB2	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 0.0 ft	**TOTAL DEPTH** 29.8 ft	**NORTHING** 902,462	**EASTING** 1,426,135	**24 HR.** 20.0
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 89% 12/20/2024		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 03/11/26	**COMP. DATE** 03/11/26	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
0										0.0 GROUND SURFACE	0.0
	0.0	0.0	6	7	5	12		M		-1.0 **ARTIFICIAL FILL**	1.0
	-3.5	3.5	4	5	10	15		M		-2.0 Gray, Silty Fine to Coarse SAND (A-2-4) with Some Gravel	2.0
-5										Red-Brown, Fine to Coarse Sandy Silty CLAY (A-7) with Trace Gravel and Roots	
	-8.5	8.5	12	12	16	28		M		-7.0 **RESIDUAL**	7.0
-10										Orange-Tan, Fine to Coarse Sandy Clayey SILT (A-5) with Trace Mica and Rock Fragments	
	-13.5	13.5	28	50	50/0.4					Brown-Tan, Fine to Coarse Sandy SILT (A-4) with Trace Mica and Rock Fragments	
-15						100/0.9				-14.0	14.0
	-18.5	18.5	100/0.4			100/0.4				**WEATHERED ROCK** Tan-Gray MYLONITIC MICA SCHIST	
-20											
	-23.5	23.5	100/0.4			100/0.4					
-25											
	-28.5	28.5	38	42	58/0.3	100/0.8				-29.8	29.8
										Boring Terminated at Elevation -29.8 ft in WEATHERED ROCK (MYLONITIC MICA SCHIST)	

SITE ID: 097-01-132d4

SITE ADDRESS: 1089 ANNIE-SOPHIA LANE
ROARING RIVER, NC 28669

North Carolina Emergency Management – Private Roads and Bridges

Site Information Form

Site Number: 097-01-132d4

Site Address: 1089 Annie Sophia Lane, Roaring River, NC 28669

GPS Coordinates: 36.2813,-80.9680

County: Wilkes

Bridge Type: Steel I-beam with Timber Decking or Modular Steel Bridge

Span Length: 30 ft Standard Bridge or 40 ft Modular Bridge. Refer to BSR for required waterway opening.

Bridge Width: 12'-0" Clear Width

Substructure Type: Concrete Cap on Drilled-in Piles

Geotechnical Information: See Standard Bridge Plans or the Modular Bridge Substructure Plans for Notes

Additional Notes:

Timber bridge railing not required for Steel I-beam with timber decking option.

Modular Steel Bridge option shall include guardrail as part of the system.

Wingwalls are not required.

The existing bridge is in place and must be removed by the Contractor prior to the start of construction.

No known debris or obstructions in the stream requiring removal.

BRIDGE SURVEY & HYDRAULIC DESIGN REPORT

NC DEPARTMENT OF EMERGENCY MANAGEMENT
PRIVATE ROADS AND BRIDGES PROGRAM

Site Number 097-01-132d4 Latitude 36.28129 Longitude -80.968050

County Wilkes Address near 1089 Annie Sophia Lane

City Roaring River, NC Zip Code 28669

Recommended Structure 1 @ 30' Steel Girder Bridge with timber deck

Recommended Width of Roadway _____ Skew _____

Recommended Location is (At, Upstream, Downstream) of Existing Crossing _____

Temporary Crossing _____

I hereby certify that that I have reviewed the existing hydraulic conveyance at this site which was a 2@48" CMP existing culverts with the proposed conveyance provided by the proposed 30 ft. bridge.

The proposed bridge low chord for the bridge shall be set in accordance with the the FEMA Disaster Specific Guidance for the Replacement of Private Roads and Bridges issued on 14 February 2025, "to provide bridge/culvert design plans certified (sealed, signed, and dated) by a Professional Engineer licensed in the State of North Carolina demonstrating that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing".

This certification demonstrates that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing. This is based on the best available data provided from post storm evaluations. Portions of the existing structures may have been destroyed, removed, modified or shifted from their original location or elevation.

Designed by _____

Assisted by _____

Date _____

NORTH CAROLINA PROFESSIONAL SEAL 20646 ENGINEER MATTHEW D. FOSTER

Signed by: Matthew D Foster 6/10/2026 10:54:34 AM EDT
7B1932BFAFC8472...

Johnson, Mirmiran, & Thompson Inc.
108 Asheville Commerce Parkway
Candler, NC, 28715
License No: C-3097

Reviewed by _____ Date _____

SITE DATA

Drainage Area _____ Source _____

River Basin Yadkin Pee-Dee Character _____

Stream Classification (e.g., Trout, High Quality Water) Class C

Debris Potential: Low ☐ Moderate ☒ High ☐

Existing Structure - Source of Available Data NCEM Private Roads and Bridges Inspection Team

Existing Structure - Description 2 @ 48 inch CMP

Estimated Waterway Opening 25.1 ft²

Design Control Elev _____ ft Source _____

Gage Station No _____ Period of Records _____

Max Discharge _____ cfs Date _____ Frequency _____

Historical Flood Information:

Date _____ Elev _____ ft Est Freq _____ yr Source _____ Period of Knowledge _____ yrs

Historical Scour Info: General _____ ft Contraction _____ ft Local _____ ft

Channel Slope _____ ft/ft Source _____ Normal Water Surface Elev _____ ft

Manning's n: Left OB _____ Channel _____ Right OB _____ Source _____

Flood Study / Status FEMA Study LDS (Big Bugaboo Creek)

Flood Study 100-yr Discharge 1732 cfs WS Elev: With Floodway 1187.15 ft Without Floodway 1186.46 ft River Station 32578

DESIGN DATA

Hydrological Method _____

Hydraulic Design Method Disaster Specific Guidance for the Replacement of Private Roads and Bridges 2/14/2025

Floods Evaluated	Frequency (year)	Discharge (cfs)	Elevation (ft)	Backwater (ft)	Bridge Opening Velocity (fps)

Waterway Opening Provided Below: Design WS Elev _____ sf 100-yr WS Elev _____ sf Total 83.6 sf

Average Channel Velocity (Design) _____ fps Average Overbank Velocity (Design) _____ fps

Computed Scour: General _____ ft Contraction _____ ft Local _____ ft

INFORMATION TO BE SHOWN ON PLANS

HYDRAULIC DATA

DESIGN DISCHARGE	= 1130 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 25 YRS.
DESIGN HIGH WATER ELEVATION	= _____
DRAINAGE AREA	= 3.88 SQ. MI.
BASIC DISCHARGE (Q100)	= 1640 C.F.S.
BASIC HIGH WATER ELEVATION	= _____

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= _____ C.F.S.
FREQUENCY OF OVERRTOPPING FLOOD	= _____ YRS.
OVERTOPPING FLOOD ELEVATION	= _____ *

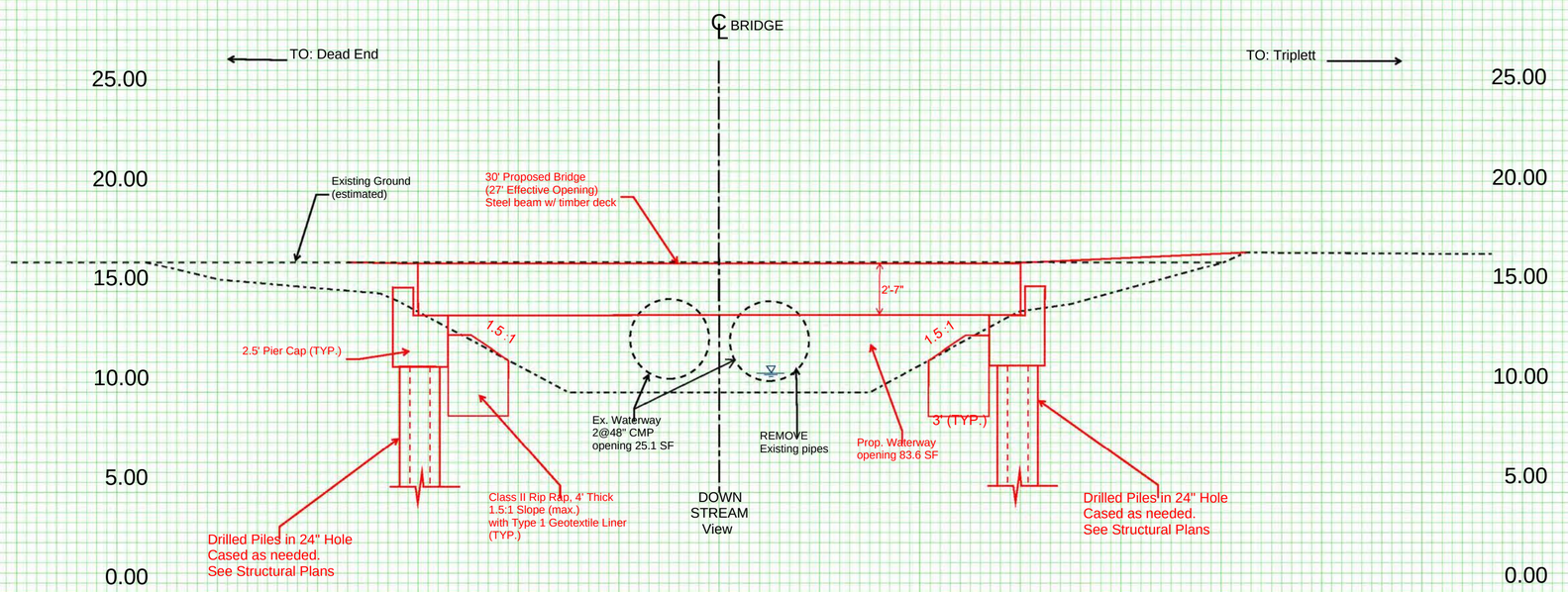
*NOTE LOCATION OF OVERTOPPING

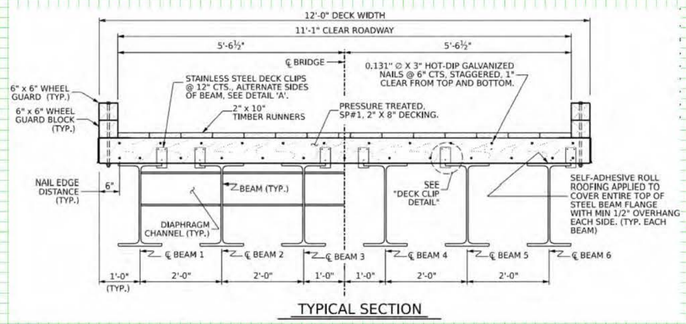
WS EL. Taken @ River Station ?

ADDITIONAL INFORMATION AND COMPUTATIONS

Number of Homes Confirmed	Yes
Number of Homes	10
Churches Confirmed	Yes
Number of Churches	0
Schools Confirmed	Yes
Number of Schools	0
Recreational/Business Areas Confirmed	Yes
Number of Recreational/Business Areas	0
General Description	Road and culvert crossing are severely damaged. Crossing consists of 2-48" CMP.
Overall Condition	Damage
Condition Other	
Site Repair Status	Temporary Repair
Condition Description	Road and culvert crossing are in poor condition and appear to be undersized. Replacement culverts need to be sized properly with endwalls. Estimate includes replacement of the culvert at the same size and will need to be revised once sized properly.
Expected Level of Effort	Replace
Other Level of Effort	
Horizontal Curve	No
Number of Travel Lanes (LOS)	1
Inclination	No
Roadway Divider	No
Road/Bridge Width (ft)	11.00
Span/Gap Estimate (ft)	
Surface to Water (ft)	5.00
Utility/Mechanical	No
Utility Types	
Pipe Needs Sizing	Yes
Depth of Pipe	1.00
Geotechnical	Other
Other Geotechnical	None

Proposed
21" W21X48 beam
+ 8" Deck
+ 2" Runner
=31" (2'-7" structure depth)





Stationing and elevations shown are relative to the site.
Based on an assumed datum.
No survey grade field work was performed.

BSR based on STANDARD BRIDGE PLANS

BRIDGE SURVEY & HYDRAULIC DESIGN REPORT

NC DEPARTMENT OF EMERGENCY MANAGEMENT
PRIVATE ROADS AND BRIDGES PROGRAM

Site Number 097-01-132d4 Latitude 36.28129 Longitude -80.968050

County Wilkes Address near 1089 Annie Sophia Lane

City Roaring River, NC Zip Code 28669

Recommended Structure 1 @ 40' Steel Modular Bridge (30' effective length)

Recommended Width of Roadway ..... Skew .....

Recommended Location is (At, Upstream, Downstream) of Existing Crossing .....

Temporary Crossing .....

I hereby certify that that I have reviewed the existing hydraulic conveyance at this site which was a 2@48" CMP existing culverts with the proposed conveyance provided by the proposed 40 ft. bridge.

The proposed bridge low chord for the bridge shall be set in accordance with the the FEMA Disaster Specific Guidance for the Replacement of Private Roads and Bridges issued on 14 February 2025, "to provide bridge/culvert design plans certified (sealed, signed, and dated) by a Professional Engineer licensed in the State of North Carolina demonstrating that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing".

This certification demonstrates that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing. This is based on the best available data provided from post storm evaluations. Portions of the existing structures may have been destroyed, removed, modified or shifted from their original location or elevation.

Designed by .....

Assisted by .....

Date .....

NORTH CAROLINA PROFESSIONAL SEAL 20646 ENGINEER MATTHEW D. FOSTER

Signed by: Matthew D Foster 7B1932BFAFC8472... 6/10/2026 10:54:34 AM EDT

JMT Johnson, Mirmiran, & Thompson Inc.
108 Asheville Commerce Parkway
Candler, NC, 28715
License No: C-3097

Reviewed by ..... Date .....

SITE DATA

Drainage Area ..... Source .....

River Basin Yadkin Pee-Dee Character .....

Stream Classification (e.g., Trout, High Quality Water) Class C

Debris Potential: Low ☐ Moderate ☒ High ☐

Existing Structure - Source of Available Data NCEM Private Roads and Bridges Inspection Team

Existing Structure - Description 2 @ 48 inch CMP

Estimated Waterway Opening 25.1 ft²

Design Control Elev ..... ft Source .....

Gage Station No ..... Period of Records .....

Max Discharge ..... cfs Date ..... Frequency .....

Historical Flood Information:

Date ..... Elev ..... ft Est Freq ..... yr Source ..... Period of Knowledge ..... yrs

Historical Scour Info: General ..... ft Contraction ..... ft Local ..... ft

Channel Slope ..... ft/ft Source ..... Normal Water Surface Elev ..... ft

Manning's n: Left OB ..... Channel ..... Right OB ..... Source .....

Flood Study / Status FEMA Study LDS (Big Bugaboo Creek)

Flood Study 100-yr Discharge 1732 cfs WS Elev: With Floodway 1187.15 ft Without Floodway 1186.46 ft River Station 32578

DESIGN DATA

Hydrological Method .....

Hydraulic Design Method Disaster Specific Guidance for the Replacement of Private Roads and Bridges 2/14/2025

Floods Evaluated	Frequency (year)	Discharge (cfs)	Elevation (ft)	Backwater (ft)	Bridge Opening Velocity (fps)

Waterway Opening Provided Below: Design WS Elev ..... sf 100-yr WS Elev ..... sf Total 130.3 sf

Average Channel Velocity (Design) ..... fps Average Overbank Velocity (Design) ..... fps

Computed Scour: General ..... ft Contraction ..... ft Local ..... ft

INFORMATION TO BE SHOWN ON PLANS

HYDRAULIC DATA

DESIGN DISCHARGE	= 1130 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 25 YRS.
DESIGN HIGH WATER ELEVATION	= _____
DRAINAGE AREA	= 3.88 SQ. MI.
BASIC DISCHARGE (Q100)	= 1640 C.F.S.
BASIC HIGH WATER ELEVATION	= _____

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= _____ C.F.S.
FREQUENCY OF OVERRTOPPING FLOOD	= _____ YRS.
OVERTOPPING FLOOD ELEVATION	= _____*

*NOTE LOCATION OF OVERTOPPING

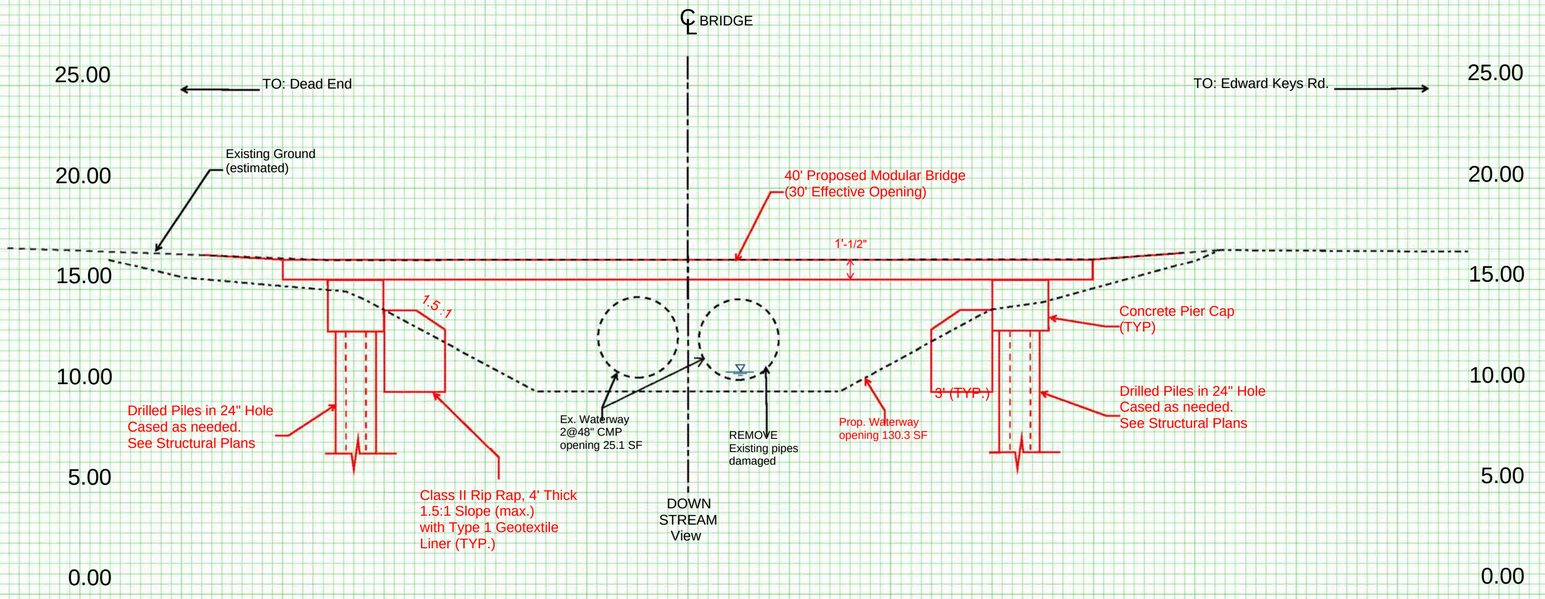
WS EL. Taken @ River Station ?

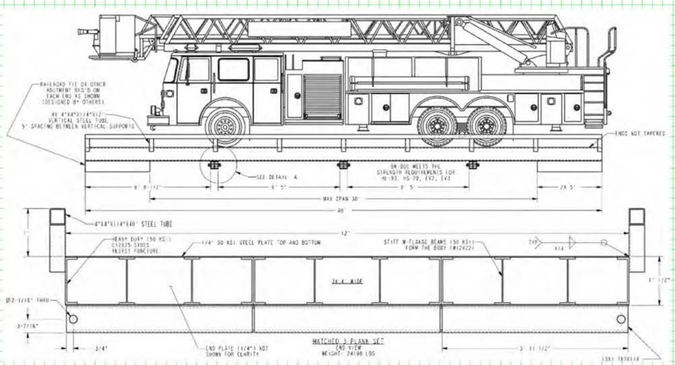
ADDITIONAL INFORMATION AND COMPUTATIONS

Number of Homes Confirmed	Yes
Number of Homes	10
Churches Confirmed	Yes
Number of Churches	0
Schools Confirmed	Yes
Number of Schools	0
Recreational/Business Areas Confirmed	Yes
Number of Recreational/Business Areas	0
General Description	Road and culvert crossing are severely damaged. Crossing consists of 2-48" CMP.
Overall Condition	Damage
Condition Other	
Site Repair Status	Temporary Repair
Condition Description	Road and culvert crossing are in poor condition and appear to be undersized. Replacement culverts need to be sized properly with endwalls. Estimate includes replacement of the culvert at the same size and will need to be revised once sized properly.
Expected Level of Effort	Replace
Other Level of Effort	
Horizontal Curve	No
Number of Travel Lanes (LOS)	1
Inclination	No
Roadway Divider	No
Road/Bridge Width (ft)	11.00
Span/Gap Estimate (ft)	
Surface to Water (ft)	5.00
Utility/Mechanical	No
Utility Types	
Pipe Needs Sizing	Yes
Depth of Pipe	1.00
Geotechnical	Other
Other Geotechnical	None

12" W121X25 beam
+ 0.25" Steel Plate
+ 0.25" Steel Plate
=12.5" (1'-1/2") ft structure depth)

Proposed Conveyance Area has been reduced by 0.9 sf to account for blockage created by 3 Plank Connectors as shown in Detail A of the Typical Section.





Stationing and elevations shown are relative to the site.
Based on an assumed datum.
No survey grade field work was performed.

BSR based on MODULAR BRIDGE PLANS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	097-01-132d4	1	

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *WILKES*

PROJECT DESCRIPTION *NORTH CAROLINA EMERGENCY MANAGEMENT-PRIVATE ROADS, BRIDGE REPAIR AND REPLACEMENT PROGRAM*

SITE DESCRIPTION *1089 ANNE-SOPHIA LANE FOR BRIDGE OVER BIG BUGABOO CREEK*

REFERENCE: N/A

PROJECT: N/A

CONTENTS

PERSONNEL

C. BRAKE, G.I.T.

S. DAVIS

TY. BEARD

INVESTIGATED BY *F&R, Inc.*

DRAWN BY *T.T. WALKER*

CHECKED BY *P. ALTON, P.E.*

SUBMITTED BY *P. ALTON, P.E.*

DATE *APRIL 2026*

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE GEOTECHNICAL ENGINEER DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE GEOTECHNICAL ENGINEER AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO PERFORM INDEPENDENT SUBSURFACE INVESTIGATIONS AND MAKE INTERPRETATIONS AS NECESSARY TO CONFIRM CONDITIONS ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTES:

1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE GEOTECHNICAL ENGINEER AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

SINCE 1881

Prepared in the Office of:

FROEHLING & ROBERTSON, INC.

Engineering Stability Since 1881

310 Hubert Street
Raleigh, North Carolina 27603-2302
License No. F-0266
Bus: 919.828.3441 Fax: 919.828.5751

NORTH CAROLINA PROFESSIONAL SEAL 033758 ENGINEER W. PATRICK ALTON

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
097-01-132d4	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 1 OF 2)

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTD T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10	50 MX													
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40														
LL	–		–	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PI	6 MX		NP	10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	< 4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	> 50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	< 2	< 0.25
	SOFT	2 TO 4	0.25 TO 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	> 30	> 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/825 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, CPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFERDUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS
S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] CME-750X
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [X] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [X] -N Q3

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
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SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 2 OF 2)

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)		NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)		FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)		FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)		COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELOSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELOSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REDUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: N/A

ELEVATION: N/A FEET

NOTES:

FIAD= FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (PAGE 1 OF 2)

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)

From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.

STRUCTURE

SURFACE CONDITIONS

VERY GOOD Very rough, fresh unweathered surfaces

GOOD Rough, slightly weathered, iron stained surfaces

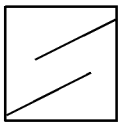
FAIR Smooth, moderately weathered and altered surfaces

POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments

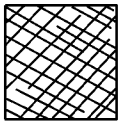
VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings

DECREASING SURFACE QUALITY ⟹

DECREASING INTERLOCKING OF ROCK PIECES ⟱



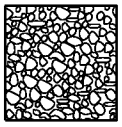
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities



BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets

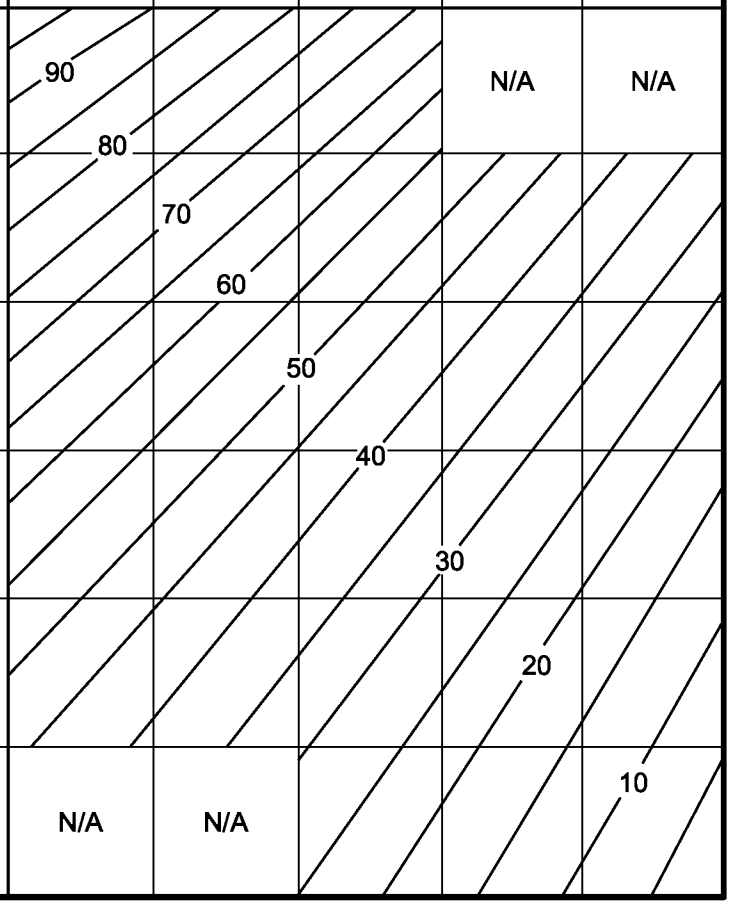
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets

BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity



DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces

LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes



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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (PAGE 2 OF 2)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

COMPOSITION AND STRUCTURE

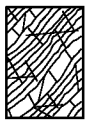
SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)

VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	**VERY POOR** - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings

A. *Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.*

B. *Sandstone with thin interlayers of siltstone*

C. *Sandstone and siltstone in similar amounts*



D. *Siltstone or silty shale with sandstone layers*

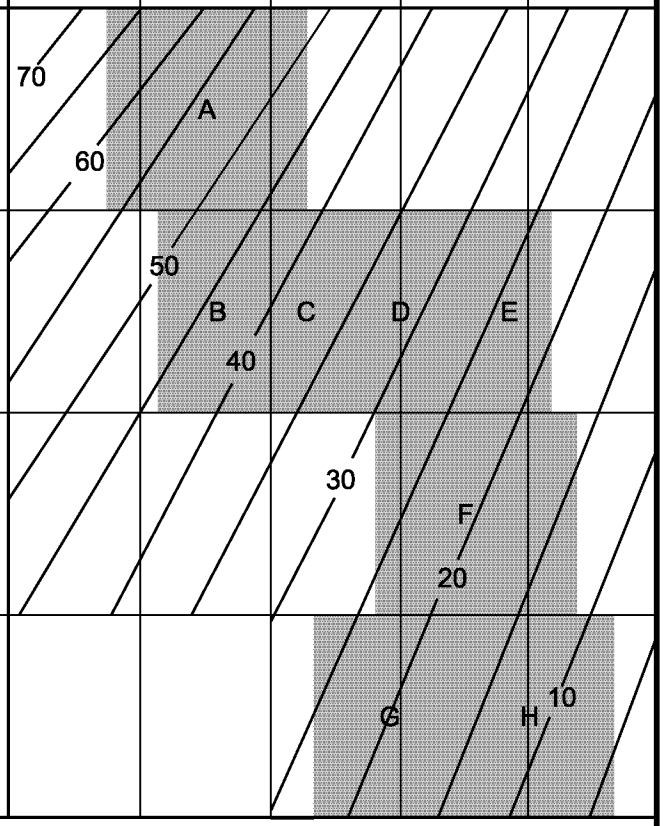
E. *Weak siltstone or clayey shale with sandstone layers*

C, D, E, and **G** - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to **F** and **H**.

F. *Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure*

G. *Undisturbed silty or clayey shale with or without a few very thin sandstone layers*

H. *Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.*



Means deformation after tectonic disturbance

DATE: 8-19-16

PROJECT REFERENCE NO.	SHEET NO.
097-01-132d4	3

SITE PLAN

0 50 100

FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 097-01-132d4	**TIP** N/A	**COUNTY** WILKES	**GEOLOGIST** C. Brake	
SITE DESCRIPTION 1089 Anne-Sophia Lane for Bridge over Big Bugaboo Creek				**GROUND WTR (ft)**
BORING NO. EB1	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** -L-	**0 HR.** 8.5
COLLAR ELEV. 0.0 ft	**TOTAL DEPTH** 24.1 ft	**NORTHING** 927,044	**EASTING** 1,419,928	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 89% 12/20/2024		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 03/13/26	**COMP. DATE** 03/13/26	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
0										ELEV. (ft) DEPTH (ft)
	0.0	0.0	3	5	5	10		M		0.0 GROUND SURFACE 0.0
										ARTIFICIAL FILL
	-3.5	3.5								-2.0 Brown, Clayey Silty Fine to Coarse SAND (A-2-4) with Some Gravel 2.0
-5			2	1	3	4		W		**ALLUVIAL**
										-5.5 Tan, Fine Sandy SILT (A-4) with Trace Gravel 5.5
	-8.5	8.5								**WEATHERED ROCK**
-10			100/0.4			100/0.4				Gray MICA PHYLLITE
	-13.5	13.5								
-15			100/0.3			100/0.3				
	-18.5	18.5								
-20			100/0.2			100/0.2				
	-23.5	23.5								
			65	35/0.1		100/0.6				-24.1 24.1

Boring Terminated at Elevation -24.1 ft in WEATHERED ROCK (MICA PHYLLITE)

Notes:
1. Surficial Organic Soil= 0.0'-0.2'
2. Driller Indicated Harder Drilling at 5.5'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 097-01-132d4	**TIP** N/A	**COUNTY** WILKES	**GEOLOGIST** C. Brake	
SITE DESCRIPTION 1089 Anne-Sophia Lane for Bridge over Big Bugaboo Creek				**GROUND WTR (ft)**
BORING NO. EB2	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** -L-	**0 HR.** 3.8
COLLAR ELEV. 0.0 ft	**TOTAL DEPTH** 19.0 ft	**NORTHING** 927,131	**EASTING** 1,419,960	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 89% 12/20/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 03/13/26	**COMP. DATE** 03/13/26	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
0										0.0 GROUND SURFACE	0.0
	0.0	0.0	2	1	2	3		M		**ALLUVIAL** Tan, Silty Fine to Coarse SAND (A-2-4) with Some Gravel	
-5	-3.5	3.5	3	4	7	11		Sat.		-5.5	5.5
	-8.5	8.5	32	68/0.2		100/0.7				**WEATHERED ROCK** Gray MICA PHYLLITE	
-10	-11.7	11.7	60/0.1			60/0.1				-11.8	11.8
	-14.3	14.3	60/0.0			60/0.0				-12.5 **CRYSTALLINE ROCK** -13.6 Moderately to Severely Weathered, Hard to Medium Hard, Brown MICA PHYLLITE with Very Close Fracture Spacing	12.5 13.6
-15										**WEATHERED ROCK** No Recovery	
										-19.0	19.0
										CRYSTALLINE ROCK Moderately to Very Slightly Weathered, Hard to Medium Hard, Brown and Gray MICA PHYLLITE with Very Close to Moderately Close Fracture Spacing	
										Boring Terminated at Elevation -19.0 ft in CRYSTALLINE ROCK (MICA PHYLLITE)	

Notes:
1. Surficial Organic Soil= 0.0'-0.1'
2. Harder Drilliing Noted by Driller at 5.5'`
3. Auger Refusal at 11.7', Began Coring at 11.8'

NCDOT BORE SINGLE SITE 097-01-132D4 WILKES COUNTY BORING LOGS.GPJ NC_DOT.GDT 4/20/26

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 097-01-132d4	**TIP** N/A	**COUNTY** WILKES	**GEOLOGIST** C. Brake	
SITE DESCRIPTION 1089 Anne-Sophia Lane for Bridge over Big Bugaboo Creek				**GROUND WTR (ft)**
BORING NO. EB2	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** -L-	**0 HR.** 3.8
COLLAR ELEV. 0.0 ft	**TOTAL DEPTH** 19.0 ft	**NORTHING** 927,131	**EASTING** 1,419,960	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 89% 12/20/2024		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 03/13/26	**COMP. DATE** 03/13/26	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 7.2 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) / DEPTH (ft)
-11.8											Begin Coring @ 11.8 ft
	-11.8	11.8	2.5	0:29/0.5 0:39/1.0 1:35/1.0	(1.4) 56%	(0.0) 0%		(0.7) 100%	(0.0) 0%		**CRYSTALLINE ROCK** Moderately to Severely Weathered, Hard to Medium Hard, Brown MICA PHYLLITE with Very Close Fracture Spacing
-15	-14.3	14.3	4.7	*N=60/0.0* 1:46/1.0 1:50/1.0 1:50/1.0 1:27/1.0 1:40/0.7	(4.7) 100%	(3.5) 74%		(0.0) 0% (5.4) 100%	(0.0) 0% (3.5) 65%		**WEATHERED ROCK** No Recovery **CRYSTALLINE ROCK** Moderately to Very Slightly Weathered, Hard to Medium Hard, Brown and Gray MICA PHYLLITE with Very Close to Moderately Close Fracture Spacing
	-19.0	19.0									Boring Terminated at Elevation -19.0 ft in CRYSTALLINE ROCK (MICA PHYLLITE)

-11.8 / 11.8 — -12.5 / 12.5 — -13.6 / 13.6 — -19.0 / 19.0

Notes:
1. Surficial Organic Soil= 0.0'-0.1'
2. Harder Drilliing Noted by Driller at 5.5'`
3. Auger Refusal at 11.7', Began Coring at 11.8'

CORE PHOTOGRAPH (EB2):

1089 Anne-Sophia Lane for bridge over Big Bugaboo Creek

Begin Run 1
11.8 feet

End Run 1
14.3 feet
SPT N=60/0'
Begin Run 2
14.3 feet

End Run 2
19.0 feet

SITE PHOTOGRAPHS:

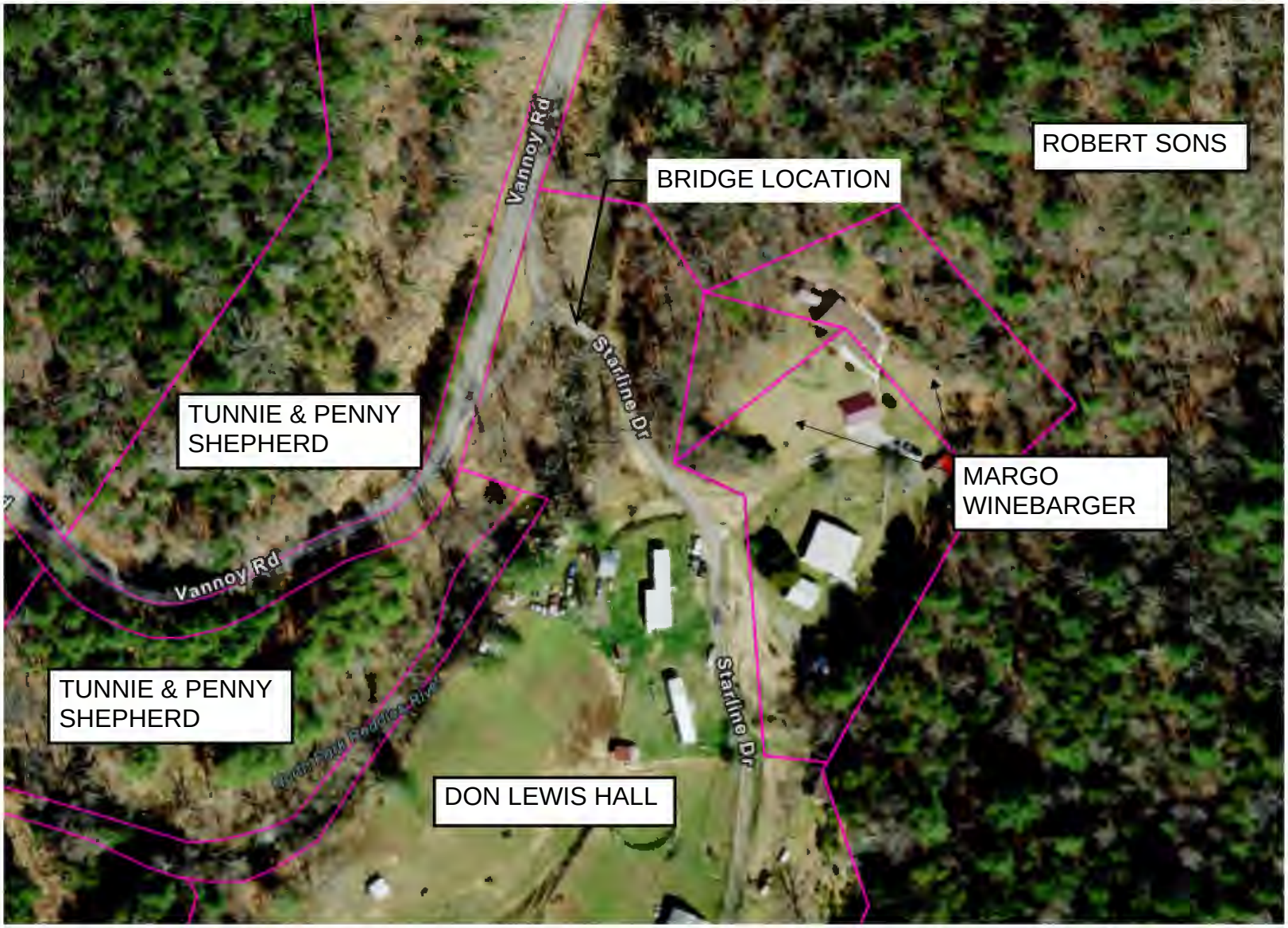
1089 Anne-Sophia Lane for bridge over Big Bugaboo Creek

Photograph No. 1: View looking North

Photograph No. 2: View looking South

Photograph No. 3: View looking upstream

Photograph No. 4: View looking downstream



SITE ID: 097-01-7b48b

SITE ADDRESS: 167 STARLIND DR.,
MCGRADY, NC 28649

North Carolina Emergency Management – Private Roads and Bridges

Site Information Form

Site Number: 097-01-7b48b

Site Address: 167 Starline Drive, McGrady, NC 28649

GPS Coordinates: 36.3133,-81.2699

County: Wilkes

Bridge Type: Steel I-beam with Timber Decking or Modular Steel Bridge

Span Length: 40 ft Standard Bridge or 40 ft Modular Bridge. Refer to BSR for required waterway opening.

Bridge Width: 12'-0" Clear Width

Substructure Type: Concrete Cap on Drilled-in Piles

Geotechnical Information: See Standard Bridge Plans or the Modular Bridge Substructure Plans for Notes

Additional Notes:

Timber bridge railing not required for Steel I-beam with timber decking option.

Modular Steel Bridge option shall include guardrail as part of the system.

Wingwalls are not required.

The existing bridge is in place and must be removed by the Contractor prior to the start of construction.

No known debris or obstructions in the stream requiring removal.

BRIDGE SURVEY & HYDRAULIC DESIGN REPORT

NC DEPARTMENT OF EMERGENCY MANAGEMENT
PRIVATE ROADS AND BRIDGES PROGRAM

Site Number 097-01-7b48b Latitude 36.31333 Longitude -81.26981

County Wilkes Address near 167 Starline Drive

City McGrady, NC Zip Code 28649

Recommended Structure 1 @ 40' Steel Girder Bridge with timber deck

Recommended Width of Roadway _____ Skew _____

Recommended Location is (At, Upstream, Downstream) of Existing Crossing _____

Temporary Crossing _____

I hereby certify that that I have reviewed the existing hydraulic conveyance at this site which was a 24 ft. timber bridge with the proposed conveyance provided by the proposed 40 ft. bridge.

The proposed bridge low chord for the bridge shall be set in accordance with the the FEMA Disaster Specific Guidance for the Replacement of Private Roads and Bridges issued on 14 February 2025, "to provide bridge/culvert design plans certified (sealed, signed, and dated) by a Professional Engineer licensed in the State of North Carolina demonstrating that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing".

This certification demonstrates that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing. This is based on the best available data provided from post storm evaluations. Portions of the existing structures may have been destroyed, removed, modified or shifted from their original location or elevation.

Designed by _____

Assisted by _____

Date _____

NORTH CAROLINA PROFESSIONAL SEAL 20646 ENGINEER MATTHEW D. FOSTER

Signed by: Matthew D Foster 6/12/2026 10:42:15 AM EDT
781932BFAFC8472...

Johnson, Mirmiran, & Thompson Inc.
108 Asheville Commerce Parkway
Candler, NC, 28715
License No: C-3097

Reviewed by _____ Date _____

SITE DATA

Drainage Area _____ Source _____

River Basin Yadkin Pee-Dee Character _____

Stream Classification (e.g., Trout, High Quality Water) Class WS-II, Tr, HQW

Debris Potential: Low ☐ Moderate ☒ High ☐

Existing Structure - Source of Available Data NCEM Private Roads and Bridges Inspection Team

Existing Structure - Description 1 @ 24 ft timber bridge

Estimated Waterway Opening 78.6 ft²

Design Control Elev _____ ft Source _____

Gage Station No _____ Period of Records _____

Max Discharge _____ cfs Date _____ Frequency _____

Historical Flood Information:

Date _____ Elev _____ ft Est Freq _____ yr Source _____ Period of Knowledge _____ yrs

Historical Scour Info: General _____ ft Contraction _____ ft Local _____ ft

Channel Slope _____ ft/ft Source _____ Normal Water Surface Elev _____ ft

Manning's n: Left OB _____ Channel _____ Right OB _____ Source _____

Flood Study / Status FEMA Study LDS (North Fork Reddies River)

Flood Study 100-yr Discharge 3162 cfs WS Elev: With Floodway 1421.03 ft Without Floodway 1421.00 ft River Station 35034

DESIGN DATA

Hydrological Method _____

Hydraulic Design Method Disaster Specific Guidance for the Replacement of Private Roads and Bridges 2/14/2025

Floods Evaluated	Frequency (year)	Discharge (cfs)	Elevation (ft)	Backwater (ft)	Bridge Opening Velocity (fps)

Waterway Opening Provided Below: Design WS Elev _____ sf 100-yr WS Elev _____ sf Total 93.7 sf

Average Channel Velocity (Design) _____ fps Average Overbank Velocity (Design) _____ fps

Computed Scour: General _____ ft Contraction _____ ft Local _____ ft

INFORMATION TO BE SHOWN ON PLANS

HYDRAULIC DATA

DESIGN DISCHARGE	= 1710 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 25 YRS.
DESIGN HIGH WATER ELEVATION	= _____
DRAINAGE AREA	= 10.1 SQ. MI.
BASIC DISCHARGE (Q100)	= 2570 C.F.S.
BASIC HIGH WATER ELEVATION	= _____

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= _____ C.F.S.
FREQUENCY OF OVERRTOPPING FLOOD	= _____ YRS.
OVERTOPPING FLOOD ELEVATION	= _____ *

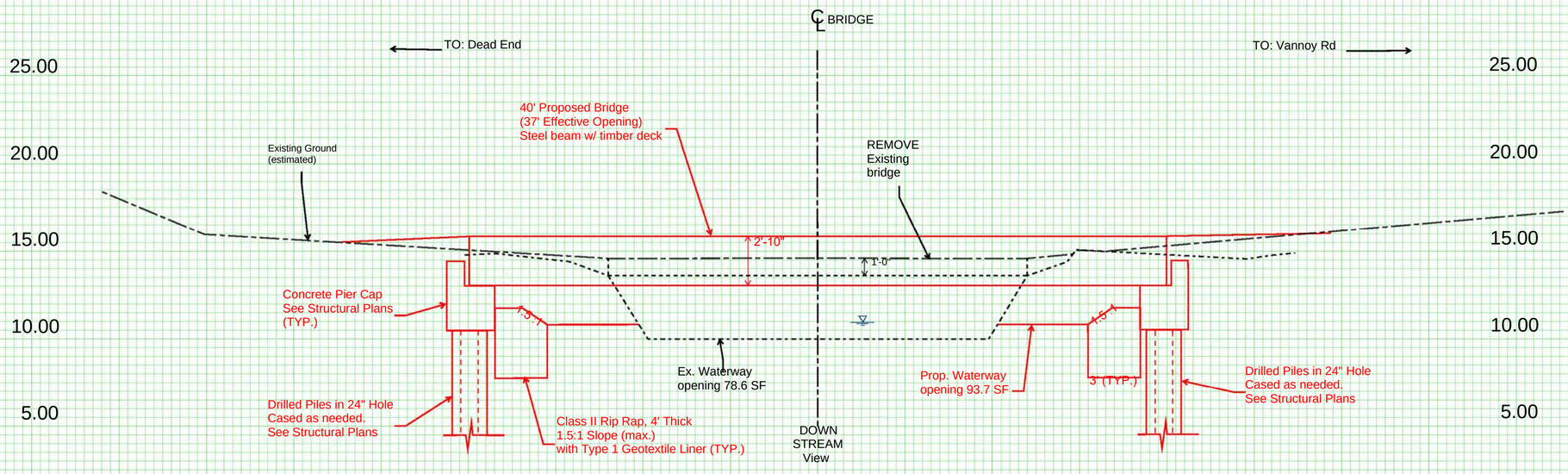
*NOTE LOCATION OF OVERTOPPING

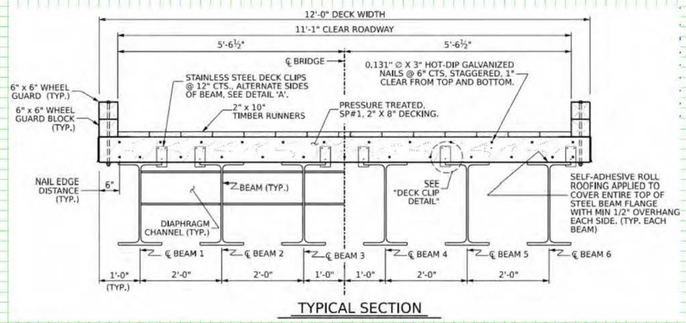
WS EL. Taken @ River Station ?

ADDITIONAL INFORMATION AND COMPUTATIONS

Emergency Vehicle Access Possible?	No
Number of Homes Confirmed	No
Number of Homes	5
Churches Confirmed	No
Number of Churches	0
Schools Confirmed	No
Number of Schools	0
Recreational/Business Areas Confirmed	No
Number of Recreational/Business Areas	0
General Description	Bridge over the creek is the primary access to multiple homes on Starlite Drive. It is damaged and in a state of disrepair.
Overall Condition	Damage
Condition Other	
Site Repair Status	Temporary Repair
Condition Description	Damaged and in poor condition.
Expected Level of Effort	Replace
Other Level of Effort	
Horizontal Curve	No
Number of Travel Lanes (LOS)	1
Inclination	No
Roadway Divider	No
Road/Bridge Width (ft)	10.00
Span/Gap Estimate (ft)	30.00
Surface to Water (ft)	5.00
Utility/Mechanical	No
Utility Types	

Proposed
24" W24X76 beam
+ 8" Deck
+ 2" Runner
=34" (2'-10" structure depth)





TYPICAL SECTION

Stationing and elevations shown are relative to the site.
Based on an assumed datum.
No survey grade field work was performed.

BSR based on STANDARD BRIDGE PLANS

BRIDGE SURVEY & HYDRAULIC DESIGN REPORT

NC DEPARTMENT OF EMERGENCY MANAGEMENT
PRIVATE ROADS AND BRIDGES PROGRAM

Site Number 097-01-7b48b Latitude 36.31333 Longitude -81.26981

County Wilkes Address near 167 Starline Drive

City McGrady, NC Zip Code 28649

Recommended Structure 1 @ 40' Steel Modular Bridge (30' effective length)

Recommended Width of Roadway ____ Skew ____

Recommended Location is (At, Upstream, Downstream) of Existing Crossing ____

Temporary Crossing ____

I hereby certify that that I have reviewed the existing hydraulic conveyance at this site which was a 24 ft. timber bridge with the proposed conveyance provided by the proposed 40 ft. bridge.

The proposed bridge low chord for the bridge shall be set in accordance with the the FEMA Disaster Specific Guidance for the Replacement of Private Roads and Bridges issued on 14 February 2025, "to provide bridge/culvert design plans certified (sealed, signed, and dated) by a Professional Engineer licensed in the State of North Carolina demonstrating that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing".

This certification demonstrates that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing. This is based on the best available data provided from post storm evaluations. Portions of the existing structures may have been destroyed, removed, modified or shifted from their original location or elevation.

Designed by ____

Assisted by ____

Date ____

NORTH CAROLINA PROFESSIONAL SEAL 20646 ENGINEER MATTHEW D. FOSTER

Signed by: Matthew D Foster 7B1932BFAFC8472... 6/12/2026 | 10:42:15 AM EDT

Johnson, Mirmiran, & Thompson Inc.
108 Asheville Commerce Parkway
Candler, NC, 28715
License No: C-3097

Reviewed by ____ Date ____

SITE DATA

Drainage Area ____ Source ____

River Basin Yadkin Pee-Dee Character ____

Stream Classification (e.g., Trout, High Quality Water) Class WS-II, Tr, HQW

Debris Potential: Low ☐ Moderate ☒ High ☐

Existing Structure - Source of Available Data NCEM Private Roads and Bridges Inspection Team

Existing Structure - Description 1 @ 24 ft timber bridge

Estimated Waterway Opening 78.6 ft²

Design Control Elev ____ ft Source ____

Gage Station No ____ Period of Records ____

Max Discharge ____ cfs Date ____ Frequency ____

Historical Flood Information:

Date ____ Elev ____ ft Est Freq ____ yr Source ____ Period of Knowledge ____ yrs

Historical Scour Info: General ____ ft Contraction ____ ft Local ____ ft

Channel Slope ____ ft/ft Source ____ Normal Water Surface Elev ____ ft

Manning's n: Left OB ____ Channel ____ Right OB ____ Source ____

Flood Study / Status FEMA Study LDS (North Fork Reddies River)

Flood Study 100-yr Discharge 3162 cfs WS Elev: With Floodway 1421.03 ft Without Floodway 1421.00 ft River Station 35034

DESIGN DATA

Hydrological Method ____

Hydraulic Design Method Disaster Specific Guidance for the Replacement of Private Roads and Bridges 2/14/2025

Floods Evaluated	Frequency (year)	Discharge (cfs)	Elevation (ft)	Backwater (ft)	Bridge Opening Velocity (fps)

Waterway Opening Provided Below: Design WS Elev ____ sf 100-yr WS Elev ____ sf Total 108.0 sf

Average Channel Velocity (Design) ____ fps Average Overbank Velocity (Design) ____ fps

Computed Scour: General ____ ft Contraction ____ ft Local ____ ft

INFORMATION TO BE SHOWN ON PLANS

HYDRAULIC DATA

DESIGN DISCHARGE	= 1710 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 25 YRS.
DESIGN HIGH WATER ELEVATION	= ____
DRAINAGE AREA	= 10.1 SQ. MI.
BASIC DISCHARGE (Q100)	= 2570 C.F.S.
BASIC HIGH WATER ELEVATION	= ____

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= ____ C.F.S.
FREQUENCY OF OVERRTOPPING FLOOD	= ____ YRS.
OVERTOPPING FLOOD ELEVATION	= ____ *

*NOTE LOCATION OF OVERTOPPING

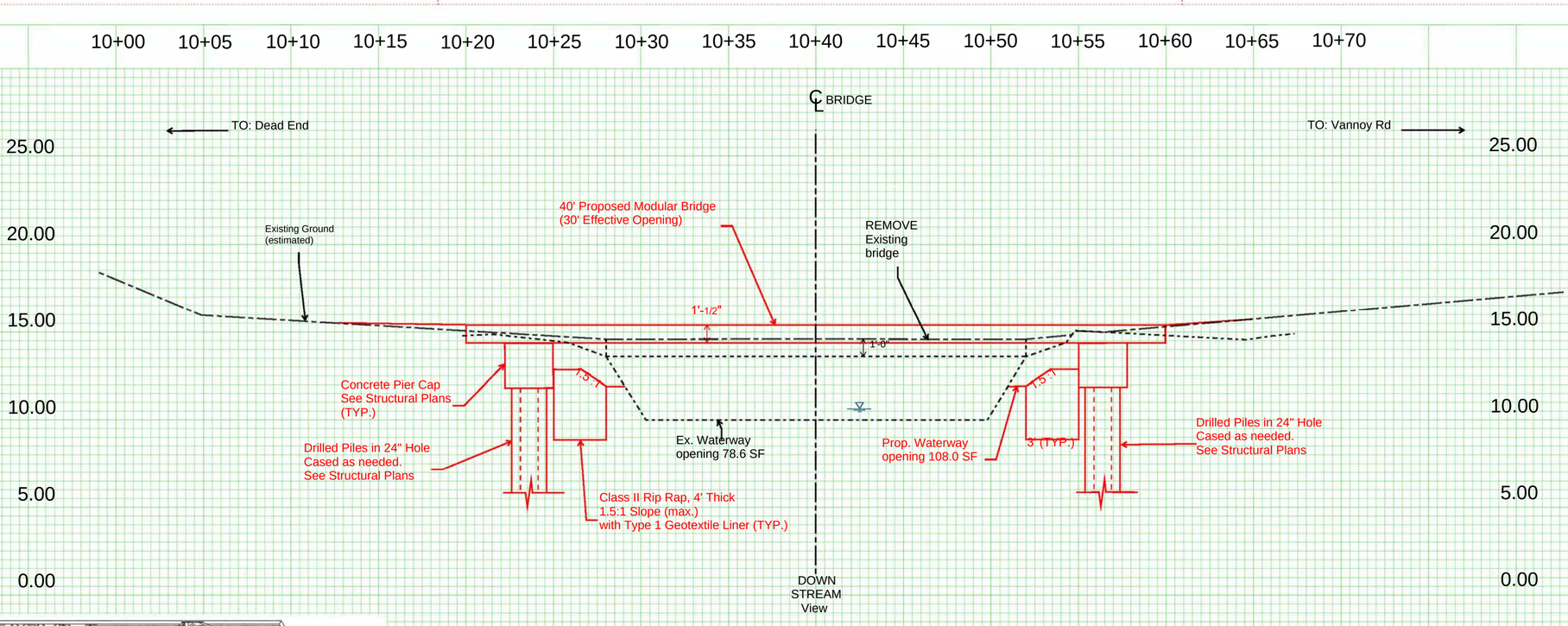
WS EL. Taken @ River Station ?

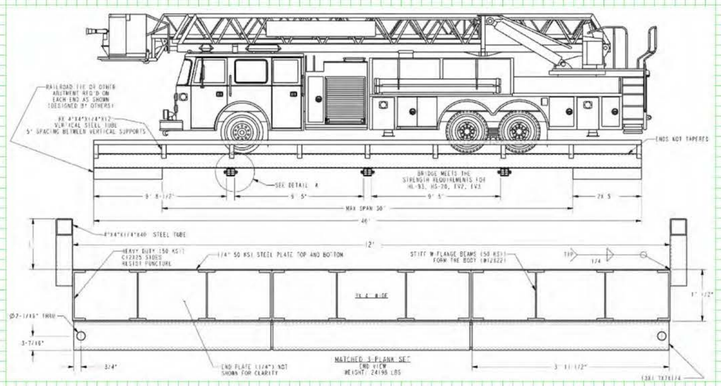
ADDITIONAL INFORMATION AND COMPUTATIONS

Emergency Vehicle Access Possible?	No
Number of Homes Confirmed	No
Number of Homes	5
Churches Confirmed	No
Number of Churches	0
Schools Confirmed	No
Number of Schools	0
Recreational/Business Areas Confirmed	No
Number of Recreational/Business Areas	0
General Description	Bridge over the creek is the primary access to multiple homes on Starlite Drive. It is damaged and in a state of disrepair.
Overall Condition	Damage
Condition Other	
Site Repair Status	Temporary Repair
Condition Description	Damaged and in poor condition.
Expected Level of Effort	Replace
Other Level of Effort	
Horizontal Curve	No
Number of Travel Lanes (LOS)	1
Inclination	No
Roadway Divider	No
Road/Bridge Width (ft)	10.00
Span/Gap Estimate (ft)	30.00
Surface to Water (ft)	5.00
Utility/Mechanical	No
Utility Types	

12" W121X22 beam
+ 0.25" Steel Plate
+ 0.25" Steel Plate
=12.5" (1'-1/2") ft structure depth)

Proposed Conveyance Area has been reduced by 0.9 sf to account for blockage created by 3 Plank Connectors as shown in Detail A of the Typical Section.





Stationing and elevations shown are relative to the site.
Based on an assumed datum.
No survey grade field work was performed.

BSR based on MODULAR BRIDGE PLANS

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 097-01-7B48B	**TIP** N/A	**COUNTY** WILKES	**GEOLOGIST** J. Baskin	
SITE DESCRIPTION 167 Starline Drive for Bridge over North Fork Reddies River				**GROUND WTR (ft)**
BORING NO. EB1	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 0.0 ft	**TOTAL DEPTH** 10.6 ft	**NORTHING** 940,623	**EASTING** 1,331,247	**24 HR.** 4.5
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 05/26/26	**COMP. DATE** 05/26/26	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
0										0.0 GROUND SURFACE	0.0
	0.0	0.0	WOH	WOH	2	2		M		**ALLUVIAL**	
	-3.5	3.5	2	7	38	45				-2.0 Brown, Fine to Coarse Sandy Clayey SILT (A-4) with Trace Roots and Mica	2.0
-5								M		Brown, Clayey Silty Fine to Coarse SAND (A-2-4) with Trace Mica and Trace Gravel	
	-8.5	8.5	7	30	58					-9.0	9.0
-10	-10.6	10.6	60/0.0			88 60/0.0		Sat.		-10.0 **RESIDUAL** Gray, Silty Fine to Coarse SAND (A-1-b) with Rock Fragments	10.0
										-10.6 **WEATHERED ROCK** Gray GRANITIC GNEISS	10.6
										Boring Terminated with Standard Penetration Test Refusal at Elevation -10.6 ft on CRYSTALLINE ROCK (GRANITIC GNEISS)	

Note:
1. Auger Refusal at 10.6'.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 097-01-7B48B	**TIP** N/A	**COUNTY** WILKES	**GEOLOGIST** J. Baskin
SITE DESCRIPTION 167 Starline Drive for Bridge over North Fork Reddies River			**GROUND WTR (ft)**
BORING NO. EB2	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 0.0 ft	**TOTAL DEPTH** 16.2 ft	**NORTHING** 940,599	**EASTING** 1,331,282	**24 HR.** 3.5
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 05/26/26	**COMP. DATE** 05/27/26	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
0										0.0 GROUND SURFACE 0.0
	0.0	0.0	1	1	3	4		M		**ALLUVIAL** Brown and Gray, Clayey Silty Fine to Coarse SAND (A-2-4) with Trace Mica and Trace Organics
	-3.5	3.5								
-5			2	2	3	5		M		
	-6.8	6.8	60/0.1			60/0.1				-6.8 6.8
										-6.9 6.9 **CRYSTALLINE ROCK** Moderately Severe to Very Slightly Weathered, Moderately Hard to Hard, White-Black GRANITIC GNEISS with Very Close to Moderately Close Fracture Spacing
-10										
-15										-16.2 16.2
										Boring Terminated at Elevation -16.2 ft in CRYSTALLINE ROCK (GRANITIC GNEISS)
										Note: 1. Auger Refusal at 6.8'. Begin Coring at 6.9'.

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 097-01-7B48B	**TIP** N/A	**COUNTY** WILKES	**GEOLOGIST** J. Baskin
SITE DESCRIPTION 167 Starline Drive for Bridge over North Fork Reddies River			**GROUND WTR (ft)**
BORING NO. EB2	**STATION** N/A	**OFFSET** N/A	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 0.0 ft	**TOTAL DEPTH** 16.2 ft	**NORTHING** 940,599	**EASTING** 1,331,282	**24 HR.** 3.5
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER S. Davis	**START DATE** 05/26/26	**COMP. DATE** 05/27/26	**SURFACE WATER DEPTH** N/A
CORE SIZE NQ	**TOTAL RUN** 9.3 ft		

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
-6.9											Begin Coring @ 6.9 ft
	-6.9	6.9	4.3	0:06/0.3 0:54/1.0 0:28/1.0 0:33/1.0 1:03/1.0	(2.8) 65%	(2.6) 60%		(7.6) 82%	(6.8) 73%		-6.9 **CRYSTALLINE ROCK** 6.9 Moderately Severe to Very Slightly Weathered, Moderately Hard to Hard, White-Black GRANITIC GNEISS with Very Close to Moderately Close Fracture Spacing
-10											
	-11.2	11.2	5.0	0:57/1.0 0:35/1.0 0:52/1.0 1:01/1.0 1:26/1.0	(4.8) 96%	(4.2) 84%					
-15											
	-16.2	16.2									-16.2 16.2 Boring Terminated at Elevation -16.2 ft in CRYSTALLINE ROCK (GRANITIC GNEISS) Note: 1. Auger Refusal at 6.8'. Begin Coring at 6.9'.