Structure Foundation Recommendation Report REV1
Bridge No. 750352 on SR 2143 over Bush Creek
Randolph County, North Carolina
ID No. SF-750352
WBS Element No. 17BP.8.R.132
S&ME Project No. 6235-18-011

PREPARED FOR:

CH Engineering, PLLC
3220 Glen Royal Road
Raleigh, North Carolina 27617

PREPARED BY:

S&ME, Inc.
9751 Southern Pine Boulevard
Charlotte, North Carolina 28273

March 28, 2019

March 28, 2019

CH Engineering, PLLC
3220 Glen Royal Road
Raleigh, North Carolina 27617

Attention: Mr. Brian A. Wiles, P.E.

Reference: **Structure Foundation Recommendation Report REV1**
Bridge No. 750352 on SR 2143 over Bush Creek
Randolph County, North Carolina
ID No. SF-750352
WBS Element No. 17BP.8.R.132
S&ME Project No. 6235-18-011
NC PE Firm License No. F-0176

Dear Mr. Wiles:

S&ME, Inc. (S&ME) has completed the authorized foundation recommendation report for the above-referenced project. Our services were performed in general accordance with the subcontract agreement between CH Engineering, PLLC (CH) and S&ME.

This report presents the Foundation Recommendations, Notes, and Comments prepared by S&ME. Structure plans and dimensions were provided by CH between June and December 2018. The supporting Structure Subsurface Investigation Report and Geotechnical Calculation Package for this project are being provided under separate cover.

S&ME appreciates the opportunity to provide our services on this project. Please contact us if you have any questions regarding this report or if we may be of further assistance.

Sincerely,

S&ME, Inc.

DocuSigned by:
Luis Campos
72275FD8BA3843...

Luis A. Campos, P.E.
Project Engineer
NC Registration No. 037845

NORTH CAROLINA PROFESSIONAL SEAL 037845 ENGINEER LUIS A. CAMPOS

Stewart S. Laney, P.E.
Senior Project Engineer
NC Registration No. 031013

Senior Review By: Kristen H. Hill, P.E., P.G.

Attachments

Foundation Recommendation Summary Sheet
Foundation Recommendation Notes on Plans and Comments
Bearing Pile Pay Item Quantities
Drilled Pier Pay Item Quantities

Attachments

FOUNDATION RECOMMENDATIONS

PROJECT	17BP.8.R.132	DESCRIPTION	Bridge No. 750352 on SR 2143
TIP NO.	SF-750352		(Carl Allred Road) over Bush Creek
COUNTY	Randolph		
STATION	15+62.50 -L-		

P.E. SEAL

DocuSigned by:
Stewart Laney
75BB4AB1AB3B4CB...

SIGNATURE

	INITIALS	DATE
DESIGN	LAC	3/27/2019
CHECK	KHH	3/27/2019
	SSL	3/28/2019

	BENT STATION	FOUNDATION TYPE	FACTORED RESISTANCE	ADDITIONAL INFORMATION
END BENT 1	14+91.21 -L-	Cap on HP 12 x 53 Steel H-Piles	55 Tons/Pile	Bottom of Cap Elev. = 578.3 ft Average Estimated Pile Length = 25' LT / 35' RT Number of Piles/Cap = 7
BENT 1	15+27.44 -L-	Cap on 36 Inch Diameter Drilled Pier	360 Tons/Pier	Bottom of Cap Elev. = 579.0 ft Top of Pier Elev. = 562 ft LEFT Point of Fixity Elev. = 553.0 ft LEFT Tip No Higher Than = 550.8 ft CENTER Point of Fixity Elev. = 544.0 ft CENTER Tip No Higher Than = 528.1 ft RIGHT Point of Fixity Elev. = 544.0 ft RIGHT Tip No Higher Than = 528.1 ft Number of Piers = 3 ft
BENT 2	15+92.57 -L-	Cap on 36 Inch Diameter Drilled Pier	360 Tons/Pier	Bottom of Cap Elev. = 579.3 ft Top of Pier Elev. = 560 ft LEFT Point of Fixity Elev. = 547.0 ft LEFT Tip No Higher Than = 542.0 ft CENTER Point of Fixity Elev. = 545.0 ft CENTER Tip No Higher Than = 537.2 ft RIGHT Point of Fixity Elev. = 545.0 ft RIGHT Tip No Higher Than = 537.2 ft Number of Piers = 3 ft
END BENT 2	16+33.80 -L-	Cap on HP 12 x 53 Steel H-Piles	59 Tons/Pile	Bottom of Cap Elev. = 578.8 ft Average Estimated Pile Length = 35' LT / 30' RT Number of Piles/Cap = 7

(SEE NOTES ON PLANS AND COMMENTS ON FOLLOWING PAGES.)

FOUNDATION RECOMMENDATIONS NOTES ON PLANS

1. FOR PILES, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.
2. FOR DRILLED PIERS, SEE SECTION 411 OF THE STANDARD SPECIFICATIONS.
3. PILES AT END BENT NO. 1 ARE DESIGNED FOR A FACTORED RESISTANCE OF 55 TONS PER PILE.
4. PILES AT END BENT NO. 2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 59 TONS PER PILE.
5. DRIVE PILES AT END BENT NO. 1 TO A REQUIRED DRIVING RESISTANCE OF 95 TONS PER PILE.
6. DRIVE PILES AT END BENT NO. 2 TO A REQUIRED DRIVING RESISTANCE OF 100 TONS PER PILE.
7. IT HAS BEEN ESTIMATED THAT A HAMMER WITH AN EQUIVALENT RATED ENERGY IN THE RANGE OF 30 TO 40 FT-KIPS PER BLOW WILL BE REQUIRED TO DRIVE PILES AT END BENT NO. 1 AND END BENT NO. 2. THIS ESTIMATED ENERGY RANGE DOES NOT RELEASE THE CONTRACTOR FROM PROVIDING DRIVING EQUIPMENT IN ACCORDANCE WITH SUBARTICLE 450-3(D)(2) OF THE STANDARD SPECIFICATIONS.
8. DRILLED PIERS AT BENT NO. 1 ARE DESIGNED FOR A FACTORED RESISTANCE OF 360 TONS PER PIER. NO TIP RESISTANCE REQUIRED.
9. DRILLED PIERS AT BENT NO. 2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 360 TONS PER PIER. CHECK FIELD CONDITIONS FOR THE REQUIRED TIP RESITANCE OF 40 TSF.
10. INSTALL DRILLED PIERS AT BENT NO. 1 LEFT TO A TIP ELEVATION NO HIGHER THAN 550.8 FT AND A PENETRATION OF AT LEAST 4.5 FT INTO ROCK AS DEFINED BY ARTICLE 411-1 OF THE STANDARD SPECIFICATIONS.
11. INSTALL DRILLED PIERS AT BENT NO. 1 CENTER AND RIGHT TO A TIP ELEVATION NO HIGHER THAN 528.1 FT AND A PENETRATION OF AT LEAST 4.5 FT INTO ROCK AS DEFINED BY ARTICLE 411-1 OF THE STANDARD SPECIFICATIONS.
12. INSTALL DRILLED PIERS AT BENT NO. 2 LEFT TO A TIP ELEVATION NO HIGHER THAN 542.0 FT AND A PENETRATION OF AT LEAST 7 FT INTO ROCK AS DEFINED BY ARTICLE 411-1 OF THE STANDARD SPECIFICATIONS.
13. INSTALL DRILLED PIERS AT BENT NO. 2 CENTER AND RIGHT TO A TIP ELEVATION NO HIGHER THAN 537.2 FT AND A PENETRATION OF AT LEAST 7 FT INTO ROCK AS DEFINED BY ARTICLE 411-1 OF THE STANDARD SPECIFICATIONS.
14. PERMANENT STEEL CASINGS MAY BE REQUIRED FOR DRILLED PIERS AT BENT NO. 1 AND BENT NO 2. IF REQUIRED, DO NOT EXTEND PERMANENT CASINGS BELOW ELEVATION 558.5 FT AT BENT NO. 1 AND 556 FT AT BENT NO. 2 WITHOUT PRIOR APPROVAL FROM THE ENGINEER. THE ENGINEER WILL DETERMINE THE NEED FOR PERMANENT CASINGS.

FOUNDATION RECOMMENDATIONS NOTES ON PLANS

15. INSTALL PERMANENT STEEL CASING AT BENT NO. 1 AND BENT NO. 2 BY VIBRATING, SCREWING OR DRIVING PERMANENT CASINGS BEFORE EXCAVATION OR DISTRUBING ANY MATERIAL BELOW ELEVATION 558.5 AND 556 FT, RESPECTIVELY.

16. THE SCOUR CRITICAL ELEVATIONS FOR BENT NO. 1 IS ELEVATION 556.8 FT FOR THE LEFT SIDE AND ELEVATION 542.6 FT FOR THE CENTER AND RIGHT SIDE. SCOUR CRITICAL ELEVATIONS ARE USED TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF THE STRUCTURE.

17. THE SCOUR CRITICAL ELEVATIONS FOR BENT NO. 2 IS ELEVATION 554.1 FT. SCOUR CRITICAL ELEVATIONS ARE USED TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF THE STRUCTURE.

18. SID INSPECTIONS MAY BE REQUIRED FOR DRILLED PIERS. THE ENGINEER WILL DETERMINE THE NEED FOR SID INSPECTIONS. FOR SID INSPECTIONS, SEE SECTION 411 OF THE STANDARD SPECIFICATIONS.

19. CSL TUBES ARE REQUIRED AND CSL TESTING MAY BE REQUIRED FOR DRILLED PIERS. THE ENGINEER WILL DETERMINE THE NEED FOR CSL TESTING. FOR CSL TESTING, SEE SECTION 411 OF THE STANDARD SPECIFICATIONS.

FOUNDATION RECOMMENDATIONS COMMENTS

1. Bridge end bent slopes of 1.5:1 (H:V) are ok with slope protection.
2. For sub-regional tier bridges, use Type II - Modified Bridge Approach Fill.
3. The factored axial load for End Bent No. 1 is 55 tons per pile.
4. The factored axial load for End Bent No. 2 is 59 tons per pile.
5. The design scour elevation at Bent No. 1 is 560.5 feet.
6. The design scour elevation at Bent No. 2 is 558 feet.
7. No waiting period is required between embankment construction and end bent construction.

(Revised 8/15/12)

WBS ELEMENT 17BP.8.R.132 DATE 3/28/2019

TIP NO. DESIGNED BY LAC

COUNTY Randolph CHECKED BY KHH

STATION 15+62.50 -L-

DESCRIPTION Bridge No. 750352 on SR 2143 (Carl Allred Road) over Bush Creek

NUMBER OF BENTS WITH PILES
NUMBER OF PILES PER BENT
NUMBER OF END BENTS WITH PILES
NUMBER OF PILES PER END BENT

Only required for "Predrilling for Piles" & "Pile Excavation" pay items

	PILE PAY ITEM QUANTITIES						
					Pile Excavation (per linear ft)		
Bent # or End Bent #	Steel Pile Points (yes/no)	Pipe Pile Plates (yes/no/maybe)	Predrilling For Piles (per linear ft)	Pile Redrives (per each)	In Soil	Not In Soil	PDA Testing (per each)
End Bent 1	no	no	no	0	0	0	
End Bent 2	no	no	no	0	0	0	
TOTALS			0	0	0	0	0

Notes:

Blanks or "no" represent quantity of zero.

If steel pile points are required, calculate quantity of "Steel Pile Points" as equal to the number of steel piles.

If pipe pile plates are or may be required, calculate the quantity of "Pipe Pile Plates" as equal to the number of pipe piles.

Show quantity of "PDA Testing" on the plans as total only.

(For LRFD Projects - Revised 8/15/12)

WBS ELEMENT 17BP.8.R.132 DATE 3/28/2019

TIP NO. DESIGNED BY LAC

COUNTY Randolph CHECKED BY KHH

STATION 15+62.50 -L-

DESCRIPTION Bridge No. 750352 on SR 2143 (Carl Allred Road) over Bush Creek

NUMBER OF BENTS WITH DRILLED PIERS 2

NUMBER OF DRILLED PIERS PER BENT 3

NUMBER OF END BENTS WITH DRILLED PIERS

NUMBER OF DRILLED PIERS PER END BENT

	DRILLED PIER PAY ITEM QUANTITIES				
Bent # or End Bent #	**Permanent Steel Casing For 36" Dia. Drilled Pier (yes/no/maybe)**	**36" Dia. Drilled Piers Not In Soil (per linear ft)**	**SID Inspections (per each)**	**SPT Testing (per each)**	**CSL Testing (per each)**
Bent 1	maybe	14	1		1
Bent 2	maybe	22	1		1
TOTALS		36	2	0	2

Notes:

Blanks or "no" represent quantity of zero.

If drilled piers not in soil are required, calculate quantity of 36" Dia. Drilled Piers in Soil" as the difference between the total drilled pier length and the 36" Dia. Drilled Piers Not in Soil" from the table above. If there is none or zero quantity for drilled piers not in soil in the table above, calculate quantity of 36" Dia. Drilled Piers" as the total drilled pier length and do not use the 36" Dia. Drilled Piers in Soil" pay item.

If permanent steel casing is or may be required, calculate quantity of "Permanent Steel Casing for 36" Dia. Drilled Pier" as the difference between the ground line or top of drilled pier elevation, whichever is higher, and the elevation the permanent casing can not extend below from the foundation recommendations.

If "SID Inspections", "SPT Testing" or "CSL Testing" may be required, show quantities of these pay items on the plans as totals only. If "SID Inspections", "SPT Testing" or "CSL Testing" is required, show quantities of these pay items on the plans for each bent or end bent.

The number of CSL tubes required per drilled pier is equal to one tube per foot of design pier diameter with at least 4 tubes per pier. Calculate the length of each CSL tube as the total drilled pier length plus 1.5 ft.