Dewberry

MEMORANDUM

Date: December 9, 2016
Revised: December 21, 2016

To: David Smith, PE LS (Town of Vernon, CT)

From: Donald Heck, PE

Subject: Replacement of Bridge No. 04575 – Main Street over Tankerhoosen River
Vernon, Connecticut, State Project No. 146-199

Message:

Two (2) borings were drilled by New England Boring Contractors, Inc. of Glastonbury, Connecticut at the subject bridge on November 30, 2016 and this memo provides a brief summary of the findings along with preliminary foundation recommendations.

The borings typically encountered 2 inches of asphalt, which was underlain by red-brown, loose to very dense coarse to fine sand with varying amounts of medium to fine gravel and silt. This layer was encountered to depths varying between 15 ft. and 25 ft. (El. 195 to El. 185.5) below roadway grade. Very dense gravel was encountered below the sand layer and extended to depths varying between 18 ft. and 30 ft. (El. 192 to El. 180.5). The gravel layer was then underlain by highly weathered, closely jointed conglomerate bedrock that extended to the bottom of borings.

Standard Penetration Test N-values, which is the number of blows required to drive the split spoon sampler from 6 to 18 inches at the sampling depth, typically ranged from 7 blows per foot (bpf) to more than 100 bpf in the sand stratum and were generally more than 100 bpf within the very dense gravel stratum. Bedrock core recovery ranged from 53% to 100% and Rock Quality Designation (RQD) ranged from 0% to 63%, indicating very poor to fair quality rock.

Groundwater was observed at a depth ranging from 9.5 to 10 feet (El. 200.5) in both borings during drilling operations.

Based on the results of the subsurface investigation and the estimated depth of scour, it is anticipated that conventional spread footings may be suitable for the support of full height abutments and wingwalls. Spread footings for the south abutment must be constructed at or below El. 185.5 in the very dense gravel stratum. It is recommended that spread footings for the north abutment be founded on rock at or below El. 192.

Provided footings are constructed at these elevations, a factored bearing resistance of 6 ksf (3 tsf) is preliminarily recommended for the design of the proposed foundations. Settlement of spread footings on rock will be less than ¼ in. and will be complete at the end of construction. Settlement of spread footings on very dense gravel will be less than ½ in. and will be complete at the end of construction.

Alternatively, should integral abutments be utilized for the support of the superstructure, then deep foundations, such as micropiles or H-piles constructed in drilled rock sockets may be economic alternatives. Provided deep foundations are socketed into competent bedrock, it is anticipated that nominal axial pile resistance in excess of 125 tons is feasible.

Three (3) bridge replacement alternatives are being considered but no preferred alternative has been selected at this time.

Should the new bridge be located in the area of the existing bridge, it is anticipated that fill heights up to 2 feet will be required to meet the proposed vertical alignment, however up to 5 feet of fill will be required to widen the existing roadway embankment to the east and west depending on the alternative.

Based on the results of the borings, elastic settlement of the existing soil under the proposed fill will be less than 2 inches and will be complete at the end of fill placement.

Should the new bridge be located approximately 25 feet east of the existing bridge, it is anticipated that fill heights up to 5 feet will be required to meet the proposed vertical alignment along the roadway. Based on the results of the borings, elastic settlement of the existing soil under the proposed fill will be less than 2 inches and will be complete at the end of fill placement.

Based on the soils encountered in the borings, and provided compacted, granular soils are used as roadway embankment fills, roadway side slopes constructed at 2H:1V will exhibit a suitable factored resistance for global stability.

In accordance with the provisions of the AASHTO LRFD Bridge Design Specifications, Table 3.10.3.1-1 (Site Class Definitions) the site is classified as Seismic Site Class C, very dense soil profile. Liquefaction of site soils due to a seismic event is unlikely, due to the high relative density of the encountered granular soils beneath the proposed foundations.

General Construction Recommendations

Rock excavation will be required to construct the proposed footings on a level bearing surface. Based on the results of the borings, conventional rock excavation equipment, including hoe-rams, may be suitable. It is anticipated that blasting will not be required, provided excavations do not extend more than 4 ft. into bedrock. The bottom of all rock excavations should be rough trimmed, to provide frictional resistance against sliding of the proposed footings.

Abutment and wingwalls should be backfilled in 1-foot maximum loose lifts with structural fill consisting of well-graded, coarse to fine sand and gravel with a maximum 15% non-plastic fines. Structural fill should be placed within 5% of optimum moisture and compacted to 95% of the maximum density as determined by ASTM D 1557, the Modified Proctor, using a walk behind, smooth drum vibratory roller. Heavy compaction equipment should not be used within 10 feet of the back of any cast-in-place abutments or wingwalls.

Boulders were not encountered in the borings, however if boulders are encountered during excavation for foundations, they should be removed such that no part protrudes into the bottom or sides of the excavation. The possible presence of boulders, cobbles, and debris should be considered during the selection, design, and construction of temporary support of excavation.

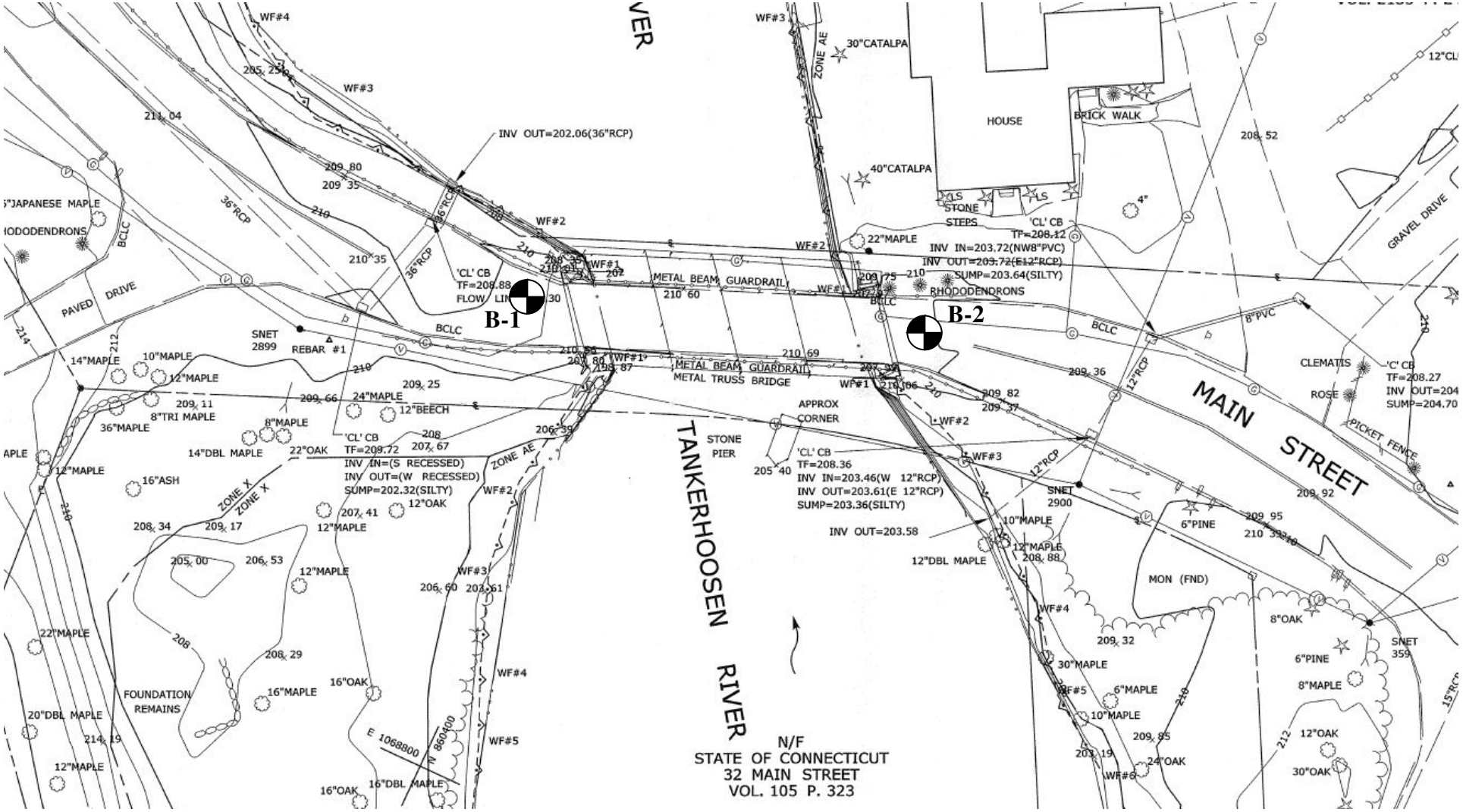
Temporary sheeting, cofferdams, shoring, sloping, or benching of the excavation sidewalls is required per OSHA standards and to facilitate construction of footings below the anticipated groundwater level. Based upon the material characteristics and estimated strength of the soils encountered during the subsurface investigation, the soils present on site are considered to be OSHA Type C and should be sloped no steeper than 1.5H:1V per OSHA requirements. All sheeting, cofferdams, shoring and bracing shall be designed by a professional engineer licensed in the State of Connecticut.

Attachments:

1. Boring Location Plan
2. Boring Logs

cc:

Brian Jecker, P.E. (Dewberry)



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LEGEND:

B-1 Test Boring Location

BORING LOCATION PLAN

Replacement of Bridge No. 04575
Main Street over Tankerhoosen River
Vernon, Connecticut
State Project No. 146-199

Dewberry
200 Broadacres Drive, Suite 410
Bloomfield, New Jersey

SCALE: N.T.S. **DATE: 12-7-16**

ROUTE LOCAL NAME: Main Street over Tankerhoosen River BORING NO. B-1

SECTION: Vernon, Connecticut FIELD BORING NO.

STATION: OFFSET: REFERENCE LINE: GROUND ELEVATION: ±210.5

BORING BY: New England Boring Contractors DATE STARTED: 11/30/16

INSPECTOR: C. Hardie DATE COMPLETED: 11/30/16

GROUND WATER ELEVATION
0 Hr. El. ±200.5 (10') Date: 11/30/16
24 Hr. Date:
ft. P.P. installed

DEPTH (ft)	CASING BLOWS	SAMPLE NO.	DEPTH		Blows on Spoon 0 / 6	6 / 12	12 / 18	REC. (in)	SOIL DESCRIPTION AND STRATIFICATION	(ft)
	Casing	S-1	0.5	2	8	12		6"	2 in. Asphalt	
	⇓				12	-			Red-brown m-f GRAVEL, little m-f Sand, little Silt	
		S-2	2	4	22	23		18"	Red-brown c-f SAND, some m-f Gravel, trace Silt	
					10	7				
5		S-3	4	6	4	5		15"	SAME	
					7	8				
		S-4	6	8	6	6		8"	SAME	
					3	4				
		S-5	8	10	4	5		12"	SAME	
10					6	7				
		S-6	10	12	3	4		8"	Red-brown c-f SAND, and m-f Gravel, little Silt	
					4	6				
15										
		S-7	15	17	4	3		11"	Red-brown c-f GRAVEL, and c-f Sand, trace Silt	
					4	6				
20										
		S-8	20	22	3	3		6"	Red-brown c-f SAND, and m-f Gravel, little Silt; timber pile	
					4	8				
25										
		S-9	25	25.9	25	100/5"		4"	Red-brown m-f GRAVEL, some Silt, little c-f Sand	
30									Top of Rock	
	Water	C-1	30	35			Run	60"	Highly weathered red-brown, medium to closely jointed	
	⇓						Rec	100%	CONGLOMERATE; soft, Granular infilling at joints	
							RQD	18%		
35										
		C-2	35	40			Run	60"		
							Rec	100%		
							RQD	57%		
40									End of boring at 40 ft.	

Nominal I.D. of Casing	4 ¼ in.	
Nominal I.D. of Split Barrel Sampler	1 ⅜ in.	
Weight/type of Hammer on Drive Pipe	300 lb.	Safety
Weight/type of Hammer on Split Barrel	140 lb.	Safety
Drop of Hammer on Drive Pipe	30 in.	
Drop of Hammer on Split Barrel	30 in.	
Core Size	NX	

Soil descriptions represent a field identification after D.M. Burmister unless otherwise noted.

The subsurface information shown hereon was obtained for the Owner's design and estimate purposes. It is made available to authorized users only that they may have access to the same information available to the Owner. It is presented in good faith, but is not intended as a substitute for investigations, interpretation or judgment of such authorized users.

Approximate Change in Strata _____

Inferred Change in Strata ----------

ROUTE LOCAL NAME: Main Street over Tankerhoosen River BORING NO. B-2

SECTION: Vernon, Connecticut FIELD BORING NO.

STATION: OFFSET: REFERENCE LINE: GROUND ELEVATION: ±210

BORING BY: New England Boring Contractors DATE STARTED: 11/30/16

INSPECTOR: C. Hardie DATE COMPLETED: 11/30/16

GROUND WATER ELEVATION
0 Hr. El. ±200.5 (9.5') Date: 11/30/16
24 Hr. Date:
ft. P.P. installed

DEPTH (ft)	CASING BLOWS	SAMPLE NO.	DEPTH		Blows on Spoon 0 / 6	6 / 12	12 / 18	REC. (in)	SOIL DESCRIPTION AND STRATIFICATION	(ft)
	Casing	S-1	0.5	2.5	19	25		4"	2 in. Asphalt	
	⇓				27	25			Red-brown m-f GRAVEL, some Silt, little m-f Sand	
		S-2	2.5	4.5	16	15		12"	Red-brown m-f SAND, some Silt, little f Gravel	
					14	8				
5		S-3	4.5	6.5	4	2		14"	Red-brown c-f SAND, some m-f Gravel, little Silt	
					3	4				
		S-4	6.5	8.5	10	9		12"	Red-brown m-f GRAVEL, some c-f Sand, some Silt	
					13	9				
		S-5	8.5	10.3	19	13		12"	Red-brown c-f SAND, some Silt, little f Gravel	
10					65	50/3"				
		S-6	10.5	12	44	55		14"	Red-brown c-f SAND, some m-f Gravel, little Silt	
					65	-				
15										
		S-7	15	15.3	100/3"			3"	Red-brown m-f GRAVEL, some c-f Sand, some Silt	
	Water								Top of Rock	
	⇓	C-1	18	21			Run	36"	Highly weathered red-brown, closely to very close jointed	
20							Rec	94%	CONGLOMERATE; soft, Granular infilling at joints	
							RQD	61%		
		C-2	21	23.8			Run	32"		
							Rec	53%		
							RQD	0%		
25		C-3	24	29			Run	60"		
							Rec	100%		
							RQD	63%		
30									End of boring at 29 ft.	
35										
40										

Nominal I.D. of Casing	4 ¼ in.	
Nominal I.D. of Split Barrel Sampler	1 ⅜ in.	
Weight/type of Hammer on Drive Pipe	300 lb.	Safety
Weight/type of Hammer on Split Barrel	140 lb.	Safety
Drop of Hammer on Drive Pipe	30 in.	
Drop of Hammer on Split Barrel	30 in.	
Core Size	NX	

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