November 13, 2020

Ms. Betsy Watson
STANTEC
801 Jones Franklin Road, Suite 300
Raleigh, NC 27606

TIP No.:	U-6241
County:	Wake
Project Description:	Main Street from West of Burlington Mills to Southtown Circle Street Improvements
Subject:	Roadway Geotechnical Recommendations

As authorized, Falcon Engineering, Inc. (Falcon) has completed the geotechnical subsurface investigation for the proposed Main Street from West of Burlington Mills to South Town Circle Street Improvements in Wake County, North Carolina. This report includes roadway geotechnical recommendations for the preparation of final design, right of way plans, construction cost estimates, and construction procedures.

Recommendations and evaluations provided by Falcon are based on the information provided by STANTEC and established NCDOT standards. Modifications of our recommendations and evaluations may be required if there are changes to the design. Recommendations in this report are in part based on data obtained from soil borings. The nature and extent of variations between borings may not become evident until construction.

Our professional services for this project have been performed in accordance with generally accepted engineering practices. No other warranty, expressed or implied, is made. Falcon appreciates the opportunity to have provided you with geotechnical engineering services for this project. If you have any questions regarding this report, please contact our office.

Respectfully submitted:

FALCON ENGINEERING, INC.

NORTH CAROLINA PROFESSIONAL SEAL 36283 ENGINEER W. SCOTT HUNSBERGER

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W. Scott Hunsberger 11/13/2020
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W. Scott Hunsberger, PE
Geotechnical Engineer

Jeremy R. Hamm, PE
Geotechnical Engineering Manager

TIP No.: U-6241
COUNTY: Wake
DESCRIPTION: Main Street from West of Burlington Mills to Southtown Circle Street Improvements

SUBJECT: Roadway Subsurface Investigation – Recommendations

Falcon has completed the subsurface investigation for this project and submits the following recommendations:

I. Slope/Embankment Stability

A. Slope Design

It is recommended that all roadway embankment fill and cut slopes be constructed at a 2:1 (H:V) ratio or flatter for this project. Slopes on the order of 2 or less feet in height are anticipated based on proposed grades.

B. Undercut for Embankment Stability

Soft surficial soils are present in portions of the site where new embankments will be placed. These soils may not provide adequate stability for construction of embankments.

To assist in embankment stabilization in such locations, it is recommended that a quantity of **200 CY** of undercut be included in the contract as a contingency to be used at the discretion of the engineer.

C. Geotextile for Soil Stabilization

To aid in the placement of fill over unstable soil, it is recommended that a quantity of **200 SY** of Geotextile for Soil Stabilization be included in the contract as a contingency to be used at the discretion of the engineer.

II. Subgrade Stability

A. Undercut for Subgrade Stability

It is recommended an additional quantity of **200** CY of undercut be included in the contract as a contingency to be used at the discretion of the Engineer. Undercut for subgrade stability should be made to a depth of three feet, or to competent material, whichever is less, and to a width of one foot beyond edge of pavement or back of curb.

B. Geotextile for Soil Stabilization

It is recommended an additional quantity of quantity of **200** SY of Geotextile for Soil Stabilization be included in the contract as a contingency to be used at the discretion of the Engineer.

C. Aggregate Subgrade

Shallow utilities, existing roadway, and/or staging of traffic is likely to make full depth undercut impractical in many areas, and subgrade repair should instead be facilitated with Aggregate Subgrade. Therefore we recommend quantities of **150 CY** of Shallow Undercut, **300 tons** of Class IV Subgrade Stabilization, and **450 SY** of Geotextile for Soil Stabilization be included in the

contract to be used at the discretion of the Engineer. Aggregate Subgrade shall be performed in accordance with Section 505 of the Standard Specifications, to a width of one foot beyond edge of pavement or back of curb, as necessary.

III. Borrow Specifications

A. Disposal of Waste Materials

Waste Materials may be disposed of in non-structural areas, such as outside of the embankment slopes at the discretion of the engineer.

B. Common Borrow

Common borrow for embankment fill shall meet the Statewide Criteria outlined in the Standard Specification, Article 1018-2, Section II (A).

C. Select Granular Material

Select granular material for embankment/backfill, geotextile for soil stabilization, or for fill in standing water shall meet the criteria outlined in the Standard Specifications, Article 1016-3, Class II and/or III. The select granular material should be placed to a height of 3 feet above geotextile for soil stabilization and/or water level.

It is recommended a quantity of **200 CY** of Select Granular Material be included in the contract for use in the areas identified in Section I. B, Undercut for Embankment Stabilization. It is recommended an additional quantity of **200 CY** of Select Granular Material be included in the contract in conjunction with the contingency quantity included in Section II, A, Undercut for Subgrade Stability.

D. Shrinkage Factor

A shrinkage factor of **20 percent** is recommended to be used in the earthwork computations for this project.

IV. Miscellaneous

A. Reduction of Unclassified Excavation – Loss Due to Clearing and Grubbing

It is recommended that Unclassified Excavation on the project be reduced by **100 CY** due to clearing and grubbing.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
Summary of Quantities

WBS Number: N/A | County: Wake | Project Engineer: Hunsberger, W. S.

TIP Number: U-6241 | Field Office: Consultant | Project Geologist: Goodnight, D. J.

Description: Main Street from West of Burlington Mills to Southtown Circle Street Improvements

Pay Item No.	Pay Item/ Quantity Adjustment	Spec Book Section No. or Special Provision (SP) Reference	Report Section	Alignment	Begin Station	End Station	Quantity	Units / %
0036000000-E	Undercut Excavation	225 - Roadway Excavation	I. B	Contingency	N/A	N/A	200	CY
0036000000-E	Undercut Excavation	225 - Roadway Excavation	II. A	Contingency	N/A	N/A	200	CY
						Total Quantity of Undercut Excavation =	**400**	**CY**
0195000000-E	Select Granular Material	265 - Select Granular Material	III. C	Contingency	N/A	N/A	400	CY
						Total Quantity of Select Granular Material =	**400**	**CY**
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	I. C	Contingency	N/A	N/A	200	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. B	Contingency	N/A	N/A	200	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. C	Contingency	N/A	N/A	450	SY
						Total Quantity of Geotextile for Soil Stabilization =	**850**	**SY**
1099500000-E	Shallow Undercut	505 - Aggregate Subgrade	II. C	Contingency	N/A	N/A	150	CY
						Total Quantity of Shallow Undercut =	**150**	**CY**
1099700000-E	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	II. C	Contingency	N/A	N/A	300	TON
						Total Quantity of Class IV Subgrade Stabilization =	**300**	**TON**

These Items Only Impact Earthwork Totals								
N/A	Shrinkage Factor	235 - Embankments	III. D	N/A	N/A	N/A	20	%
N/A	Unclassified Excavation - Unsuitable Waste	225 - Roadway Excavation	IV. A	N/A	N/A	N/A	100	CY