SOIL SURVEY SUMMARY

Prepared For

Sigman Road Widening and Improvement
(From Lester Road to Irwin Bridge Road)

Rockdale County, Georgia

P.I.No. 0013163

MAAI Project No. ROCK1203/GEO
March 28, 2016
(Revised May 5th, 2016)
SOIL SURVEY SUMMARY

Sigman Road Widening and Improvement
(From Lester Road to Irwin Bridge Road)
Rockdale County, Georgia
P.I.No. 0013163

1. Location / Description
This project is for the widening and improvement construction of Sigman Road. The project begins at Station 1100+00 east of Lester road and continues east to Station 1160+00 at Irwin Bridge road, approximately 1.14 miles in total length. The project lies northwest the city limits of Conyers in Rockdale County.

2. Geology
This project will be geologically sited in the Granitic Gneiss undifferentiated (Precambrian-Paleozoic) Formation of the Georgia Piedmont Region.

3. Rock
Hard rock outcrops were observed above grade at the following locations, blasting may be required to remove.

<table>
<thead>
<tr>
<th>Station to Station</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1118+50+/- to 1121+00+/-</td>
<td>Right</td>
</tr>
<tr>
<td>1119+00+/- to 1122+00+/-</td>
<td>Left</td>
</tr>
<tr>
<td>1128+50+/- to 1131+00+/-</td>
<td>Right</td>
</tr>
</tbody>
</table>

Additionally, rock in the form of boulders and/or rock layers, which may be removed by heavy equipment and/or light blasting, was encountered on this project. We estimate that this material will be encountered at the following locations:

<table>
<thead>
<tr>
<th>Station to Station</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>1140+50+/- to 1146+00+/-</td>
<td>Right</td>
</tr>
</tbody>
</table>

4. Removal
The soils near the proposed grade in the following areas were found to have in-place moisture contents far above the optimum moisture contents. This condition has the potential to cause severe pumping problems during subgrade and base construction. After excavation in these areas is complete, we recommend that 24 inches of subgrade soils beneath the pavement and shoulders be removed and either dried out and replaced, or replaced with drier soils:

<table>
<thead>
<tr>
<th>Station to Station</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1110+00+/- to 1111+00+/-</td>
<td>Left</td>
</tr>
</tbody>
</table>

This work should be done at the direction of the Engineer, and may be eliminated if the subgrade soils are dry and stable at the time of construction.
5. **Subgrade Materials**

No additional subgrade material will be required for this project.

6. **Pavement Design Values**

We recommend the following values for use in the pavement design calculations for this project:

- **Soil Support Value** = 2.5
- **Regional Factor** = 1.6
- **Subgrade Reaction, k** = 130 pci

Graded aggregate base is the only base material recommended for use on this project.

7. **Ditch Lining**

USCS soil classification tests were performed for representative samples at stations 1105+00, 1140+00 and 1155+00, we recommend the following average values for use in the ditch lining calculations for this project:

- **Plasticity Index, PI** = 14
- **D75 (mm)** = 0.585
- **Unified Soils Classification System (USCS)** = SC

8. **Slopes**

Maximum 2:1 slopes will be safe for this project.

9. **Groundwater**

Groundwater was not encountered at locations of subsurface borings on the project at the time of the investigation.

However, a low wet area was encountered on this project. Ditching will be required prior to construction of the embankment in the following areas/area:

<table>
<thead>
<tr>
<th>Station to Station</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1115+50 +/- to 1118+00 +/-</td>
<td>Left</td>
</tr>
</tbody>
</table>

If these areas are inundated and it is not feasible to drain them during construction, a mat of rock embankment should be placed to a height of 18 inches above the water level prior to placing normal fills.

10. **Shrinkage**

We recommend an average shrinkage factor of 25% for use in the earthwork calculations for this project.

11. **Rock Swell**

We recommend the use of an average swell factor of 25% for material shown as hard rock.

12. **Culverts**

We recommend that a 12-inch blanket of Type II Foundation Backfill material be placed under the barrel of all culverts and 48-inch diameter and larger cross-drains on this project.
13. Corrosion
Reference should be made to the attached “Pipe Culvert Material Alternates” chart for materials allowable by the Laboratory corrosion test.

14. Bench Detail
Where new fills are to be placed on existing slopes steeper than 3:1, the existing slope should be benched in accordance with the attached detail.

15. Pavement Design
We recommend the use of a minimum 10 inches of graded aggregate base in the pavement section for this project due to subgrade soils of low soil support values. However, this depth of base material may be slightly reduced on side streets with low-volume traffic.

16. Special Problems
We recommend that all bridge approach slabs on this project be constructed in accordance with the notched detail on Georgia Standard 9017-R.

Reported By:
Yong Shao, PhD, PE
Appendix A – FIGURES AND DETAILS
### Pipe Culvert Material Alternates

<table>
<thead>
<tr>
<th>TYPE OF INSTALLATION</th>
<th>CONCRETE</th>
<th>STEEL</th>
<th>ALUMINUM</th>
<th>THERMOPLASTIC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>REINFORCED CONCRETE AASHTO M-170</td>
<td>CORRUGATED STEEL ALUMINUM COATED (TYPE 2) AASHTO M-36</td>
<td>CORRUGATED STEEL PLAIN ZINC COATED AASHTO M-36</td>
<td>POLYMER COATED STEEL AASHTO M-245</td>
</tr>
<tr>
<td>STORM DRAIN</td>
<td>INTERSTATE</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NON INTERSTATE</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>ADT &lt; 1,500</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>1,500 &lt; ADT &lt; 5,000</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>5,000 &lt; ADT &lt; 15,000</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ADT &gt; 15,000 &amp; INTERSTATES</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GRADE &gt; 10%</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>SIDE DRAIN</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>PERMANENT SLOPE DRAIN</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>PERFORATED UNDERDRAIN</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**NOTES:**

1. Allowable materials are indicated by an "X".

2. Structural, installation, fill height and backfill requirements of storm drain pipe will be in accordance with Georgia Standard 1030-D or 1030-P and the Standard Specifications.

3. The Contractor shall provide additional storm sewer capacity calculations if a pipe material other than concrete is selected.

4. Pipe used under mechanically stabilized earth (MSE) walls, within MSE wall backfill, or within five feet of an MSE wall face shall be Class V Concrete Pipe.
1. WHERE THE EMBANKMENT IS TO BE PLACED ON A HILLSIDE OR ANOTHER EXISTING EMBANKMENT HAVING A SLOPE OF 3 TO 1 OR STEEPER, THE FOUNDATION MUST BE BENCHING WHILE THE EMBANKMENT IS BEING MADE. (SEE DIAGRAM AT LEFT.)


3. THE PROCESS OF BENCHING IS CONSIDERED INCIDENTAL TO THE ITEM OF UNCLASSIFIED EXCAVATION AND BORROW OR GRADING COMPLETE IN CONSTRUCTION OF THE EMBANKMENT AND NO ADDITIONAL MEASUREMENT OF QUANTITY OR PAYMENT WILL BE MADE FOR BENCHING.
PROJECT PHOTO 1: STATION 1120+00+/-, LEFT

PROJECT PHOTO 2: STATION 1122+00+/-, LEFT
Appendix B – SOIL SURVEY FIELD NOTES
### Soil Survey Field Notes
#### Sigman Road, Phase I

<table>
<thead>
<tr>
<th>Borings</th>
<th>Line</th>
<th>Station</th>
<th>Distance to centerline</th>
<th>Boring Depth, ft</th>
<th>Ground water table, ft</th>
<th>Lab Number</th>
<th>Field Moisture</th>
<th>GDOT</th>
<th>Field Soil Description and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-1</td>
<td>Sigman Road</td>
<td>1105+00</td>
<td>30’ Lt</td>
<td>BT at 5’</td>
<td>NE</td>
<td>6352</td>
<td>15.4%</td>
<td>IIB3</td>
<td>0.0’ to 0.5” Top Soil 0.5” to 5.0” Reddish brown clayey sand</td>
</tr>
<tr>
<td>S-2</td>
<td>Sigman Road</td>
<td>1110+00</td>
<td>30’ Lt</td>
<td>BT at 5’</td>
<td>NE</td>
<td>6359</td>
<td>20.4%</td>
<td>IIB3</td>
<td>0.0’ to 0.5” Top Soil 0.5” to 5.0” Yellowish brown clayey sand, moist</td>
</tr>
<tr>
<td>S-3</td>
<td>Sigman Road</td>
<td>1115+00</td>
<td>30’ Lt</td>
<td>BT at 5’</td>
<td>NE</td>
<td>6360</td>
<td>16.9%</td>
<td>IIB3</td>
<td>4.0’ below the road</td>
</tr>
<tr>
<td>S-4</td>
<td>Sigman Road</td>
<td>1120+00</td>
<td>40’ Rt</td>
<td>BT at 5’</td>
<td>NE</td>
<td>6360</td>
<td>16.2%</td>
<td>IIB3</td>
<td>0.0’ to 0.5” Top Soil 0.5” to 3.5” Sandy silt, yellowish, moist 3.5” to 5.0” Clayey silt, reddish, moist</td>
</tr>
<tr>
<td>S-5</td>
<td>Sigman Road</td>
<td>1125+00</td>
<td>30’ Lt</td>
<td>BT at 5’</td>
<td>NE</td>
<td>6355</td>
<td>13.3%</td>
<td>IIB2</td>
<td>0.0’ to 0.5” Top Soil 0.5” to 2.5” Sandy silt, brown, moist 2.5” to 3.0” Clayey silt, red moist 3.0” to 5.0” Sand, white, moist</td>
</tr>
<tr>
<td>S-6</td>
<td>Sigman Road</td>
<td>1130+00</td>
<td></td>
<td></td>
<td></td>
<td>6355</td>
<td></td>
<td></td>
<td>Rock outcrop observed at following sta 1128+50+/- to 1131+00+/-, right Proposed retaining wall on left from sta. 1123+00+/- to 1125+00+/-</td>
</tr>
</tbody>
</table>

BT - Boring Termination  
AR - Auger Refusal  
HAR - Hand Auger Refusal  
NE - Not Encountered
### Soil Survey Field Notes
#### Sigman Road, Phase I

<table>
<thead>
<tr>
<th>Borings</th>
<th>Line</th>
<th>Station</th>
<th>Distance to centerline</th>
<th>Boring Depth, ft</th>
<th>Ground water table, ft</th>
<th>Lab Number</th>
<th>Field Moisture</th>
<th>GDOT</th>
<th>Field Soil Description and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-7</td>
<td>Sigman Road</td>
<td>1135+00</td>
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<td>Steep slope, MSE wall proposed on</td>
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<td>right side from sta. 1133+50+/-</td>
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<td>to 1137+00+/-, portion of pavement</td>
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<td>on MSE wall fill</td>
</tr>
<tr>
<td>S-8</td>
<td>Sigman Road</td>
<td>1140+00</td>
<td>40’ Rt</td>
<td>HAR at 2.5’</td>
<td>NE</td>
<td>6354</td>
<td>19.3%</td>
<td>IIB3</td>
<td>0.0’ to 0.5’</td>
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<td>silty clay, brown, moist</td>
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<td>clayey silt, moist, yellowish brown</td>
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<td></td>
<td>White Sand, moist</td>
</tr>
<tr>
<td>S-9</td>
<td>Sigman Road</td>
<td>1145+00</td>
<td>40’ Rt</td>
<td>HAR at 2.0’</td>
<td>NE</td>
<td>6354</td>
<td>14.4%</td>
<td>IIB3</td>
<td>0.0’ to 0.5’</td>
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<td>Top Soil</td>
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<td>0.5’ to 1.8’</td>
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<td>silty clay, brown, moist</td>
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<td></td>
<td></td>
<td>White sand, moist</td>
</tr>
<tr>
<td>S-10</td>
<td>Sigman Road</td>
<td>1150+00</td>
<td>40’ Lt</td>
<td>BT at 5’</td>
<td>NE</td>
<td>6356</td>
<td>14.3%</td>
<td>IA2</td>
<td>0.0’ to 0.5’</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>brown sandy silt, moist</td>
</tr>
<tr>
<td>S-11</td>
<td>Sigman Road</td>
<td>1155+00</td>
<td>30’ Rt</td>
<td>BT at 5’</td>
<td>NE</td>
<td>6357</td>
<td>14.8%</td>
<td>IIB2</td>
<td>0.0’ to 0.5’</td>
</tr>
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<td></td>
<td>Silty sand, reddish brown, moist</td>
</tr>
</tbody>
</table>

**Legend:**
- **BT** - Boring Termination
- **AR** - Auger Refusal
- **HAR** - Hand Auger Refusal
- **NE** - Not Encountered

Moreland Altobelli Associates, Inc.
Appendix C – SUMMARY OF LAB TESTS
## Summary of Soil Laboratory Tests

### Project Details
- **Project Name:** Sigman Road (from Lester Road to Irwin Bridge Road)
- **GDOT Project No.:** 0013163
- **MAAI Project No.:** ROCK1203/GEO

### Sample Locations
- Station 1105+00, 30' Lt
- Station 1110+00, 30' Lt
- Station 1115+00, 30' Lt
- Station 1125+00, 30' Lt

### Sample Details
- **Lab No.:** 6352 6359 6360 6355
- **Date Sampled:** 2/11/2016 2/12/2016 2/12/2016 2/11/2016

### Soil Description
- Reddish brown clayey sand
- Yellowish brown clayey sand
- Reddish brown clayey silt
- Reddish brown sandy silt

### Percent Passing
- **No. 10:** 100.0 100.0 100.0 100.0
- **No. 20:** 87.8 82.1 90.6 84.2
- **No. 40:** 70.7 62.9 75.8 64.9
- **No. 60:** 60.4 51.7 67.5 54.3
- **No. 100:** 50.8 40.6 56.5 43.8
- **No. 200:** 41.3 31.7 55.8 35.3

### Texture
- **% Clay:** 30.4 21.6 39.0 23.9
- **D₇₅ (mm):** 0.506 0.658 0.404 0.611

### Physical Properties
- **Total Volume Change:** 12.0 10.2 10.9 5.0
- **% Swell:** 9.8 8.4 8.4 2.7
- **% Shrinkage:** 2.2 1.8 2.5 2.3
- **Max. Dry Density (pcf):** 106.3 109.0 107.5 114.8
- **% Optimal Moisture:** 14.5 15.2 15.8 13.0
- **Liquid Limit:** 39 32 32 32
- **Plastic Limit:** 25 24 24 24
- **Plasticity Index:** 14 8 8 8
- **Erosion Index:** 5.09 6.32 3.36 5.83
- **CBR:**
- **Resistivity:**
- **In-situ Moist Content, %:** 15.4% 20.4% 16.9% 13.3%
- **Ph:**
- **Organic:**

### Classification
- **GDOT Class:** IIB3 IIB3 IIB3 IIB2
- **USCS Class:** SC SC SC SC

### Remarks:
GDOT Methods GDT-4, GDT-6, GDT-67

Moreland Altobelli Associates, Inc.
# Summary of Soil Laboratory Tests

**Project Name:** Sigman Road (from Lester Road to Irwin Bridge Road)  
**GDOT Project No.:** 0013163  
**GDOT P.I. No.:** 6354  
**MAAI Project No.:** ROCK1203/GEO

<table>
<thead>
<tr>
<th>Sample location</th>
<th>Sample 1140+00, 40' Rt</th>
<th>Sample 1150+00, 40' Lt</th>
<th>Sample 1155+00, 30' Rt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab No.</td>
<td>6354</td>
<td>6356</td>
<td>6357</td>
</tr>
<tr>
<td>Date sampled</td>
<td>2/11/2016</td>
<td>2/12/2016</td>
<td>2/12/2016</td>
</tr>
<tr>
<td>Soil description</td>
<td>Yellowish brown clayey silt</td>
<td>Brown sandy silt</td>
<td>Reddish brown silty sand</td>
</tr>
<tr>
<td>% Passing No. 10</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>% Passing No. 20</td>
<td>84.4</td>
<td>79.2</td>
<td>88.3</td>
</tr>
<tr>
<td>% Passing No. 40</td>
<td>65.3</td>
<td>57.1</td>
<td>69.1</td>
</tr>
<tr>
<td>% Passing No. 60</td>
<td>53.9</td>
<td>44.3</td>
<td>57.2</td>
</tr>
<tr>
<td>% Passing No. 100</td>
<td>44.9</td>
<td>33.0</td>
<td>45.3</td>
</tr>
<tr>
<td>% Passing No. 200</td>
<td>38.7</td>
<td>24.3</td>
<td>36.7</td>
</tr>
<tr>
<td>% Clay</td>
<td>27.3</td>
<td>15.9</td>
<td>26.2</td>
</tr>
<tr>
<td>D75 (mm)</td>
<td>0.604</td>
<td>0.745</td>
<td>0.526</td>
</tr>
<tr>
<td>Total volume change</td>
<td>7.7</td>
<td>3.1</td>
<td>3.8</td>
</tr>
<tr>
<td>% Swell</td>
<td>4.4</td>
<td>1.1</td>
<td>1.7</td>
</tr>
<tr>
<td>% Shrinkage</td>
<td>3.3</td>
<td>2.0</td>
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<td>Liquid Limit</td>
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<td>Plastic Limit</td>
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<td>Erosion index</td>
<td>5.46</td>
<td>7.18</td>
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<td>Resistivity</td>
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<tr>
<td><strong>USCS Class:</strong></td>
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Remarks: GDOT Methods GDT-4, GDT-6, GDT-67

Moreland Altobelli Associates, Inc.