ADDENDUM NO. 1

CONTRACT 17-09

18th Avenue Sanitary Sewer & Water Main Extension
Schloemer Drive to Decorah Road

CITY OF WEST BEND

The following is being provided for reference purposes only. There are no corrections, additions and/or changes to be made to the plans and specifications for the above project.

1. Geotechnical report for WisDOT Project ID 2707-00-09, 18th Avenue, Vogt Drive to Decorah Road, as prepared by Professional Service Industries, Inc. (PSI) on October 15th, 2015.

Date

Max Marechal
City Engineer

Note To Bidders: This addendum is to be acknowledged by the Bidder by signing, dating, and attaching it to the bidding document behind the Bid Proposal.
GEOTECHNICAL EXPLORATION REPORT

For the

Project ID: 2707-00-09
18th Avenue
Vogt Drive to Decorah Road
Local Street
Washington County

Prepared for:

Alfred Benesch & Company
1300 West Canal Street, Suite 150
Milwaukee, WI 53233

Prepared by:

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, Wisconsin 53189
Phone (262) 521-2125
Fax (262) 521-2471

PSI Report Number: 00521299R2

October 15, 2015

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October 15, 2015

Alfred Benesch & Company
1300 West Canal Street, Suite 150
Milwaukee, WI 53233

Attn: Ms. Amanda Zacharias, P.E., AVS
Design Group Manager

Re: Geotechnical Exploration Report
Project ID: 2707-00-09
18th Avenue
Vogt Drive to Decorah Road
Local Street
Washington County
PSI Report No. 00521299R2

Dear Ms. Zacharias:

Professional Service Industries, Inc. (PSI) is pleased to submit our Geotechnical Exploration Report for the proposed 18th Avenue Reconstruction project located in Washington County, Wisconsin. This report includes the results of field and laboratory testing, recommendations for the reconstruction of the roadway as well as general site development recommendations.

PSI appreciates the opportunity to perform this Geotechnical Study and looks forward to continuing our participation during the design and construction phases of this project. If you have questions pertaining to this report, or if PSI may be of further service, please contact us at your convenience.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.

Timothy M. Leonard, E.I.T
Staff Engineer
Geotechnical Services

Paul J. Koszarek, P.E.
Department Manager
Geotechnical Services

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</tbody>
</table>
PROJECT INFORMATION

Project Authorization

The following Table summarizes (in chronological order) the project authorization history for the services performed and represented in this report by Professional Service Industries, Inc. (PSI):

<table>
<thead>
<tr>
<th>DOCUMENT AND REFERENCE NUMBER</th>
<th>DATE</th>
<th>SOURCE OF REQUEST</th>
<th>AUTHOR OR AGENT &amp; TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSI Proposal Number: 143427R3</td>
<td>5/7/2015</td>
<td>PSI</td>
<td>Mr. Paul J. Koszarek, P.E.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mr. David M. Barndt, P.E.</td>
</tr>
<tr>
<td>Notice to Proceed (via Agreement)</td>
<td>5/29/2015</td>
<td>Alfred Benesch &amp; Company</td>
<td>Mr. John Van Huis</td>
</tr>
</tbody>
</table>

Project Description

PSI understands that the project includes the reconstruction of a portion of 18th Avenue from Vogt Drive to W. Decorah Road within Washington County, Wisconsin. The project will address the existing deteriorated pavement and drainage concerns. The current road layout contains 2-lanes (one northbound and one southbound) with designated northbound right turn lanes at the intersections of Schloemer Drive and W. Decorah Road. The reconstruction project will include a typical pavement section similar to the existing pavement section on the north end of the project area. The existing section on the north side of the project area is approximately 46 feet from face-to-face of curb, terrace and sidewalk.

The existing 2-lane roadway will be reconstructed and replaced with either asphalt or concrete pavement based on a life-cycle cost analysis. PSI understands that the profile will likely be similar to the existing profile. There may be some grade modifications toward the north end of the project area to improve the sight distance over the vertical curve. In addition, the project may include construction of a retaining wall on the east side of 18th Avenue near the location of Boring B-5 between Schloemer Drive and W. Decorah Road. PSI was informed that the project also includes installing storm sewer the entire length of the project. The following Table lists the material and information provided for this project:

<table>
<thead>
<tr>
<th>DESCRIPTION OF MATERIAL</th>
<th>PROVIDER/SOURCE</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Soil Boring Location Plan</td>
<td>Ms. Amanda Zacharias, P.E., AVS</td>
<td>6/29/2015</td>
</tr>
<tr>
<td></td>
<td>Alfred Benesch &amp; Company</td>
<td></td>
</tr>
<tr>
<td>Soil Boring Elevations and Coordinates</td>
<td>Ms. Amanda Zacharias, P.E., AVS</td>
<td>Not Dated</td>
</tr>
<tr>
<td></td>
<td>Alfred Benesch &amp; Company</td>
<td></td>
</tr>
</tbody>
</table>
The geotechnical recommendations presented in this report are based on the available project information and the subsurface materials described in this report. If the noted information is incorrect, please inform PSI in writing so that we may amend the recommendations presented in this report if appropriate and if desired by the client. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

**Purpose and Scope of Services**

The purpose of the geotechnical exploration was to evaluate the subsurface soil conditions along the existing roadway alignment and evaluate if there is a need for special treatment of the underlying soils in order to adequately support the reconstructed roadway. In addition, pavement design parameters have also been provided. To obtain data to evaluate subsurface conditions at the site, PSI has completed six soil borings to a depth of approximately 10 feet below current ground surface.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air on or below, or around this site. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

**SITE AND SUBSURFACE CONDITIONS**

**Site Location and Description**

The proposed roadway project consists of reconstruction of approximately 0.5 miles of 18th Avenue from Vogt Drive to W. Decorah Road in Washington County, Wisconsin. The section of the roadway is primarily located within a residential area and is currently 2 lanes (one northbound and one southbound) with designated northbound right turn lanes at the intersections of Schloemer Drive and W. Decorah Road. A portion of 18th Avenue within the project area passes beneath SH 45. The following Table shows the Latitude and Longitude of the beginning and ending segment of the roadway:

<table>
<thead>
<tr>
<th>ROADWAY</th>
<th>BEGINNING LATITUDE (SOUTH END)</th>
<th>BEGINNING LONGITUDE (SOUTH END)</th>
<th>ENDING LATITUDE (NORTH END)</th>
<th>ENDING LONGITUDE (NORTH END)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18th Avenue</td>
<td>43.405653° N</td>
<td>88.201014° W</td>
<td>43.412594° N</td>
<td>88.201102° W</td>
</tr>
</tbody>
</table>
Site Pedology

The U.S. Department of Agriculture Soil Survey of Washington County, Wisconsin was reviewed with regard to the pedological classification of the soils along the existing roadway alignment. The soil survey indicates that the following soils are present within the area of the roadway alignment:

- Casco Loam
- Hochheim Loam (6 to 12 percent slopes)
- Hoccheim Loam (12 to 20 percent slopes)
- Lamartine Silt Loam
- Mayville Silt Loam
- Radford Silt Loam
- Theresa Silt Loam

These soils vary from being described as having moderate to moderately slow permeability characteristics. Lamartine Silt Loam and Radford Silt Loam soils along the alignment may also exhibit a seasonal high water table of 1 to 3 feet below ground surface. These soils are classified as ML, CL or SM using the USCS classification system; and as A-2, A-4 or A-6 using the AASHTO classification system. The soil survey indicates that the above soil series exhibit moderate to poor pavement subgrade support characteristics, with low to moderate shrink-swell potential and can exhibit instability when wet.

Subsurface Conditions

As requested, the subsurface conditions beneath the proposed 18th Avenue Reconstruction project were explored with six soil borings (i.e. B-1 through B-6). Three borings were performed in the existing roadway and three borings were completed off the roadway shoulder. The borings performed by PSI were completed to a depth of approximately 10 feet beneath existing grade. The borings were advanced utilizing hollow-stem auger drilling methods and soil samples were routinely obtained during the drilling process. Drilling and sampling techniques were accomplished generally in accordance with ASTM procedures.

The borings were located in the field by a representative of Alfred Benesch & Company prior to PSI’s mobilization to the site. The boring elevations, stations, offsets and coordinates were provided by Alfred Benesch & Company and were rounded to the nearest foot. Upon completion, the borings were backfilled in accordance with the State Code and the borings performed within the pavement were patched at the surface with cold mix asphalt patch. The approximate boring locations can be found in the form of a map within the appendix of this report. The following table provides the elevation, station, offset and general location of each boring.
Representative soil samples were obtained from the soil borings and were returned to PSI’s laboratory where they were visually classified using the Unified Soil Classification System (USCS) as a guideline. Further, PSI conducted limited laboratory testing on select soil samples to aid in identifying and describing the physical characteristics of the soils and to aid in defining the site soil stratigraphy. The results of the field exploration and laboratory tests were used in PSI’s engineering analysis and in the formulation of our engineering recommendations.

The subsurface conditions within the project limits of the proposed reconstruction area varied slightly from boring to boring. In Borings B-1, B-4 and B-6, existing asphalt thicknesses were observed in the range of approximately 4½ to 7½ inches thick and underlain by base course that was observed in the range of approximately 6 to 9 inches in thickness. In Borings B-2, B-3 and B-5, surficial topsoil was observed with thicknesses in the range of approximately 3 to 4 inches. The following Table shows either the existing asphalt and base course thicknesses or topsoil thicknesses and underlying soil type observed at each boring location:

<table>
<thead>
<tr>
<th>BORING NO.</th>
<th>EXISTING ASPHALT PAVEMENT THICKNESS (IN)</th>
<th>EXISTING BASE COURSE THICKNESS (IN)</th>
<th>EXISTING TOPSOIL THICKNESS (IN)</th>
<th>SOIL TYPE OBSERVED IMMEDIATELY BELOW PAVEMENT SECTION/TOPSOIL (AASHTO CLASSIFICATION)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1</td>
<td>4.5</td>
<td>9</td>
<td>---</td>
<td>Sand (A-1-a)</td>
</tr>
<tr>
<td>B-2</td>
<td>---</td>
<td>---</td>
<td>4</td>
<td>Lean Clay (A-6)</td>
</tr>
<tr>
<td>B-3</td>
<td>---</td>
<td>---</td>
<td>3</td>
<td>Sand (A-2-4)</td>
</tr>
<tr>
<td>B-4</td>
<td>7.5</td>
<td>8.5</td>
<td>---</td>
<td>Lean Clay (A-6)</td>
</tr>
<tr>
<td>B-5</td>
<td>---</td>
<td>---</td>
<td>4</td>
<td>Sand (A-2-4)</td>
</tr>
<tr>
<td>B-6</td>
<td>5</td>
<td>6</td>
<td>---</td>
<td>Silty Sand (A-2-4)</td>
</tr>
</tbody>
</table>

Beneath the pavement structure or surficial topsoil within four borings (B-2 through B-5), fill and possible fill materials were generally observed to depths ranging from 3 to 4 feet beneath existing grade. The fill and possible fill materials were generally classified as
sand and lean clay soils. The moisture contents within the granular fill material samples were observed to be in the range of 3% to 4%, which indicates a moist soil condition for granular soils. The moisture contents observed within the clay fill materials were typically within the range of 14% to 26% range, indicating moist to very moist soil conditions. The “N-Values” within the fill materials were observed in the range of 7 to greater than 50 blows per foot (bpf). It should be noted that fill materials consisting of lean clay with trace organics was observed beneath the pavement materials in Boring B-4.

Beneath the fill materials in the four borings and beneath the pavement materials in Borings B-1 and B-6, native sands soils with varying amounts of gravel were generally observed to the termination depth of the borings. An exception was observed in Boring B-4 where native lean clay was observed beneath the fill material and extended to approximately 5½ feet beneath existing grade. The native lean clay was observed in a moist condition, with a moisture content of 17%. The pocket penetrometer value within the native lean clay layer was observed to be 1¾ tons per square feet, indicating a stiff soil consistency.

The moisture contents within the native sand soils were observed in the range of 2% to 8%, indicating a moist soil condition. The Standard Penetration Test (SPT) “N-Values” within the native sand soils were observed in the range of 15 to greater than 50 blows per foot (bpf), indicating a medium dense to very dense relative soil density.

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The Boring logs included in the appendix should be reviewed for specific information at individual Boring locations. These records include soil descriptions, stratifications, penetration resistances, locations of the samples and laboratory test data. The stratifications shown on the Boring logs represent the conditions only at the actual Boring locations. Variations may occur and should be expected between Boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual. Water level information obtained during field operations is also shown on these Boring logs. The samples that were not discarded during classification or altered by laboratory testing will be retained for 60 days from the date of this report and then will be discarded.

Groundwater Information

Groundwater was not observed to enter the six borings during or at completion of drilling operations. Based upon the relatively permeable nature of the sandy soils observed at this site, it is likely that the groundwater level for this site is below PSI’s zone of exploration. Fluctuations in the groundwater level should be anticipated throughout the year depending on variations in climatological conditions and other factors not apparent at the time the Borings were performed. The possibility of groundwater level fluctuation and perched water conditions should be considered when developing the design and construction plans for the project.
EVALUATION AND RECOMMENDATIONS

Geotechnical Discussion

In general, the results of borings completed along the existing alignment of 18th Avenue from Vogt Drive to W. Decorah Road indicate that the current pavement sections are generally underlain by fill and possible fill materials to depths ranging from 3 to 4 feet beneath existing grade in four borings. Beneath the fill and possible fill materials in the four borings and beneath the pavement materials in Borings B-1 and B-6, native sand soils with varying amounts of gravel were generally observed to the termination depth of the borings. It should be noted that very moist lean clay fill material was observed beneath the surficial topsoil in Boring B-2 and extended to approximately 4 feet beneath existing grade. In addition, lean clay fill material with traces of organic soils were observed beneath the pavement materials in Boring B-4 and extended to approximately 4 feet beneath existing grade. After excavation to install the select materials required for this project, these soils will be exposed and are anticipated to be unstable.

For the best long-term performance of this section of roadway, the entire deposit of trace organic soils and very moist lean clay soils should be removed and replaced with materials meeting 209.2.1 of the Wisconsin Standard Specifications for Highway and Structure Construction. Typically, the length of EBS area is determined by extending the EBS area half way to the boring on either side of the poor borings for the full width of the roadway. The actual area requiring EBS and the stabilization program as recommended can be significantly smaller or larger. If greater accuracy is required for determination of the affected area, additional borings should be completed. The locations of anticipated EBS areas are shown in the following Table:

<table>
<thead>
<tr>
<th>Boring Location</th>
<th>Depth of EBS to Completely Remove Unsuitable Soils Below Existing Road Surface (ft.)</th>
<th>Approximate Starting Station To Remove Unsuitable Soils</th>
<th>Approximate Ending Station To Remove Unsuitable Soils</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-2</td>
<td>4</td>
<td>45+67</td>
<td>49+00</td>
</tr>
<tr>
<td>B-4</td>
<td>4</td>
<td>53+61</td>
<td>59+48</td>
</tr>
</tbody>
</table>

However, full removal of the trace organic soils and very moist lean clay soils may not be cost effective and given the relatively low organic and moisture contents below 2½ feet, a partial EBS to a depth of 12 inches below the planned bottom of select materials could also be performed and the trace organic soils and very moist clay soils stabilized using geogrid and 3 inch dense graded base as described below.

If this option is chosen, PSI recommends that the trace organic clay and very moist clay soils, observed at Borings B-2 and B-4, be removed to a depth of 12 inches below the bottom of the planned select materials and then underlain by a BX1200 geogrid and then backfilled with 3 inch dense graded base. The undercut through these areas
should be sloped to drain toward a subsurface draintile that is in turn sloped within a minimum of ½% positive slope toward the nearest storm sewer. The draintile should be hard connected to the storm sewer. This will allow this created low area to remain relatively well drained during its serviceable life and not create what is known as a “bath tub” effect. After the excavation below subgrade (EBS) is completed, PSI recommends that the soils be inspected under the direction of the geotechnical engineer.

The following depicts the recommended cross section for subgrade stabilization.

Prior to stabilizing the trace organic soils and very moist clay soils, the exposed ground surface should be evaluated by a geotechnical engineer prior to proofrolling to determine if the exposed soils can support the operation without causing more instability to the subgrade than is necessary. One option would be for the geotechnical engineer to observe the use of a 10-ton static smooth drum roller during subgrade preparation. If the geotechnical engineer determines that the exposed soils can support proofrolling operations, the exposed ground surface should be proofrolled using a full loaded triaxial dump truck moving at no more than 5 mph. Areas that rut more than 2 to 3 inches should be undercut a further 8 inches for a total undercut depth of 36 inches below bottom of base course elevation.

In areas where EBS is occurring within a clay matrix, PSI recommends that a series of PVC draintile be placed in order to reduce the “bath tub” effect that will be caused by creating a low spot in the subgrade soils where water will pond. The EBS areas should be sloped to drain to the tiles and in turn, the tiles sloped with a positive slope of ½% to 1% to the nearest storm sewers.

PSI recommends that a representative of the geotechnical engineer be present during excavation and stabilization activities in order to verify that the subsurface soil conditions are representative of those observed in PSI’s borings. Due to the extreme variability of the subgrade soil profile, it is possible that deeper overexcavation depths may be required, in between PSI’s borings, in order to further stabilize the subgrade soils.
Careful attention should be paid to the area immediately adjacent to existing catch basins and manholes. These are areas that commonly contain loose backfill materials. If loose backfill materials are observed, they should be removed and replaced with compacted engineered fill backfill materials. If clear stones are used to backfill the manholes, a non-woven filter fabric should be used in between the clear stone and the wall of the excavation in order to limit fines from moving into the clear stone.

After an acceptable subgrade condition is achieved, the placement and compaction of the pavement section or any base course or new fills may begin, as appropriate. The placement and compaction of all base course and fill soils should be monitored by a representative of the geotechnical engineer. The non-organic soils that are undercut during site preparation may be re-used as fill on the project site. The soils that are undercut and re-used as fill should be free of organic or other deleterious materials and have a maximum particle size less than 3 inches. Clay fills should have a liquid limit less than 45 and plasticity index less than 25 and greater than 11. If a fill soil has Atterberg limits outside of those recommended then the fill properties should be reviewed by the geotechnical engineer prior to use as an engineered fill. Portions of these soils may have moisture contents above that which would allow for proper recompaction. Drying, either by mechanical methods (scarification) or by chemical methods (lime/lime kiln dust). Chemical drying will allow for faster construction but will likely be more expensive than mechanical methods.

Fill and base course placement should be done in accordance with the State of Wisconsin’s Standard Specifications for Highway and Structure Construction. It is noted that this project is subject to high traffic volumes; therefore, PSI recommends fill and base course be compacted as per the State’s Standard Specifications for “Special Compaction” (Section 207.3.6.3 for fill and Section 301.3.4.3 for base course).

PSI recommends using a fill expansion factor for the materials observed within our borings of 1.11. If the excavation below subgrade (EBS) materials are used for non-structural embankments, PSI recommends using an EBS reduction factor of 0.9.

The following geotechnical related recommendations have been developed on the basis of the subsurface conditions encountered and PSI’s understanding of the proposed project. The soil test borings are widely spaced and the soil profile between the borings has been estimated by interpolation. Anomalies and unanticipated conditions may require the field determination of construction procedures. Should changes in the project criteria occur, a review must be made by PSI to determine if modification to our recommendations will be required.

**Pavement Recommendations**

This project area is included in the Select Materials inclusion area. The soils within this area consist of clayey soils at some locations and would not provide exemption from this standard. Therefore it should be planned to include at least 16 inches of Breaker Run Stone or 12 inches of Breaker Run Stone with a geogrid beneath the planned
bottom of base course elevation. The size of the geogrid will be dependent on the nominal size of the Breaker Run Stone. In this type of application, BX1300 would appear to be a suitable geogrid product. Additional EBS has been recommended in order to remove the trace organic soils and very moist lean clay soils for this project, as described in the Geotechnical Discussion section of the report.

The following pavement design parameters are based on existing soil conditions and may be used for the design of the 18th Avenue Reconstruction project. The soil support value (SSV) and subgrade reaction modulus value are based on select materials being used.

<table>
<thead>
<tr>
<th>AASHTO Soil Classification</th>
<th>Material</th>
<th>SSV</th>
<th>DGI</th>
<th>Subgrade Reaction Modulus, k (pci)</th>
<th>Resilient Modulus, M_R (psi)</th>
<th>CBR</th>
<th>Frost Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-6</td>
<td>II-Poorly Sorted</td>
<td>4.6</td>
<td>14</td>
<td>375</td>
<td>2,800</td>
<td>3</td>
<td>F-3</td>
</tr>
</tbody>
</table>

Note: The above parameters were estimated based upon the soil classification, boring information and were not measured in the laboratory.

Engineered fill added to raise grades must have design values at least equal to or greater than listed above. The CBR values given above have been estimated. For less conservative CBR values, PSI recommends that actual CBR tests be performed on each type of material, including the proposed base course material. Preparation of the existing ground surface and construction of the new subgrade and pavements should be in accordance with the Wisconsin Department of Transportation Standard Specifications (Standard Specifications).

If new granular base course is used for minor grade changes and replacement of existing base course, it should consist of well-graded crushed stone meeting the requirements from Section 305 of the Standard Specifications for a 1¼" dense graded base. The granular base course material should be placed and compacted to a minimum of 95% of maximum density as determined by standard Proctor (ASTM D 698) according to Section 301.3.4.3 of the Standard Specifications. Also, a representative of a qualified geotechnical engineer must test the base course material prior to, and during, placement. Concrete surface courses should meet the requirements from Section 415 of the Standard Specifications.

Pavements should be sloped to provide positive surface drainage. Water should not be allowed to pond on or adjacent to the pavement as this could saturate the subgrade and cause premature pavement deterioration. The granular base course should be protected from water inflow along drainage paths. Additionally, the granular base course should extend at least one foot beyond the edges of the pavement to allow water that enters the base stone a path for exit.
Drainage and Groundwater Concerns

Groundwater was not observed to enter the borings during or at completion of drilling operations. It is likely that water observed during reconstruction of the roadway should be able to be controlled by simple means such as pumping from sumps or the use of perimeter trenches to collect and discharge the water away from the work area. Fluctuations in the groundwater level should be anticipated throughout the year depending on variations in climatological conditions and other factors not apparent at the time the borings were performed. The possibility of groundwater level fluctuation and perched water conditions should be considered when developing the design and construction plans for the project.

PSI recommends that the roadways be designed so that surface water can be sheet drained and not reenter the base course. Additionally, if overexcavations are completed and backfilled with granular soils, PSI recommends that the bottom of the overexcavations be sloped to drain to a drain tile, daylight or storm sewer. If drainage to the overexcavated areas is not performed, these overexcavations will act as “bath tubs” allowing substantial volumes of water to pond directly below the base course. These water collection areas would lead to excessive frost heave and premature degradation of the subgrade soil strength and durability.
GEOTECHNICAL RISK

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed roadway will perform as planned. The engineering recommendations presented in the preceding section constitutes PSI's professional estimate of those measures that are necessary for the proposed roadway to perform according to the proposed design based on the information generated and referenced during this evaluation, and PSI's experience in working with these conditions.

REPORT LIMITATIONS

PSI’s recommendations are based on the subsurface conditions at the test boring locations and project details furnished by Alfred Benesch & Company. If there are any revisions to the plans for this project, or if the subsurface conditions that are encountered during construction differ from those described in this report, PSI must be notified immediately to determine if our recommendations must be changed. If PSI is not notified of project changes or subsurface variations, we will not be responsible for the impact of those conditions on the project.

The findings, recommendations, and professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

PSI should be retained and provided the opportunity to review the final plans and specifications and to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations or revise the recommendations provided in this report. This report has been prepared for the exclusive use by Alfred Benesch & Company for the proposed 18th Avenue Reconstruction project from Vogt Drive to Decorah Road in Washington County, Wisconsin.
Project Name: Prop. 18th Avenue Reconstruction
Project Location: Vogt Drive to Decorah Road
Washington County, WI

Boring Location Plan

PSI Project #: 00521299

821 Corporate Court
Waukesha, WI 53189
LOG OF BORING B-1

Station: 44+27  
Offset: 6.4' RT

MATERIAL DESCRIPTION

Surface Elev.: 989 ft

Asphalt (4.5"± Thick)  
Base Course (9"± Thick)  
Light Brown Well Graded Gravel and Sand, Trace Silt, Moist, Medium Dense to Dense

End of Boring at 10'
Cave In at 2'

STANDARD PENETRATION TEST DATA  
N in blows/ft  
PL  
LL

Additional Remarks

Completion Depth: 10.0 ft
Date Boring Started: 7/8/15
Date Boring Completed: 7/8/15
Logged By: SB
Drilling Contractor: PSI, Inc.

Sample Types:  
- Shelby Tube
- Auger Cutting
- Hand Auger
- Split-Spoon
- Calif. Sampler
- Rock Core
- Texas Cone

Latitude:
Longitude:
Drill Rig: Truck Rig
Remarks:
LOG OF BORING B-2

MATERIAL DESCRIPTION

Surface Elev.: 985 ft

Station: 47+08
Offset: 14.5' LT

Topsoil (4" ± Thick)
Fill, Dark Brown Mottled Rust Lean Clay, Trace Sand and Gravel, Very Moist

Light Brown Well Graded Sand with Gravel, Trace Silt, Moist, Medium Dense

End of Boring at 10'
Cave In at 5.5'

Additional Remarks

The stratification lines represent approximate boundaries. The transition may be gradual.
LOG OF BORING B-3

MATERIAL DESCRIPTION

Surface Elev.: 982 ft

Station: 50+91
Offset: 14.7' RT

OLPFILL

9-5-6
N=11

Topsoil (3" ± Thick)
Possible Fill, Brown Poorly Graded Sand, Trace Silt and Gravel, Moist

Brown Well Graded Sand with Gravel and Rock Fragments, Trace Silt, Moist

PFILL

25-24-23
N=47

N=50/1"

N=50/2"

End of Boring at 10'
Cave In at 4'

STRENGTH, tsf

Moisture, %

Additional Remarks

STANDARD PENETRATION TEST DATA
N in blows/ft

PL

LL

50

25

0

Moisture

PL

LL

0 2 4

STRENGTH, tsf

Qu

Qp

0 2 4

WATER LEVELS

While Drilling

Not Obvd.

Upon Completion Not Obvd.

Delay

N/A

The stratification lines represent approximate boundaries. The transition may be gradual.
LOG OF BORING B-4

Station: 56+31
Offset: 6.1' LT

MATERIAL DESCRIPTION

Surface Elev.: 978 ft

Asphalt (7.5" ± Thick)
Base Course (8.5" ± Thick)
Fill, Dark Gray Lean Clay, Trace Sand and Gravel, Moist

Olive Gray Mottled Rust Lean Clay, Trace Sand and Gravel, Moist, Stiff

Light Grayish Brown Poorly Graded Sand with Gravel, Trace Silt, Moist, Medium Dense to Dense

End of Boring at 10'
Cave In at 5'

LOI = 3.6%

Additional Remarks

Surface Elev.: 978 ft

Latitude: 43.061878
Longitude: -90.955833

WATER LEVELS

PSI Job No.: 00521299
Project: Proposed 18th Avenue Reconstruction
Location: Vogt Drive to Decorah Road

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location: Southbound Lane

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

Completion Depth: 10.0 ft
Date Boring Started: 7/8/15
Date Boring Completed: 7/8/15
Logged By: SB
Drilling Contractor: PSI, Inc.

Sample Types:
- Shelby Tube
- Auger Cutting
- Hand Auger
- Split-Spoon
- Calif. Sampler
- Rock Core
- Texas Cone

Latitude:
Longitude:
Drill Rig: Truck Rig
Remarks:

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

The stratification lines represent approximate boundaries. The transition may be gradual.
### LOG OF BORING B-5

**Station:** 62+64  
**Offset:** 14.3' RT  
**Surface Elev.:** 1002 ft

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Elevation (feet)</th>
<th>Material Description</th>
<th>USCS Classification</th>
<th>SPT Blows per 6-inch (SS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1000</td>
<td>Topsoil (4&quot; ± Thick)</td>
<td>OL</td>
<td>7</td>
</tr>
<tr>
<td>1</td>
<td>1000</td>
<td>Possible Fill, Brown Well Graded Sand with Gravel, Some Silt, Moist</td>
<td>PFILL</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>995</td>
<td>Light Brown Well Graded Sand with Gravel, Trace Silt, Moist, Dense</td>
<td>SWG</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>992</td>
<td>Light Brown Silty Sand with Gravel, Moist, Very Dense</td>
<td>SM</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>990</td>
<td>End of Boring at 10' Cave In at 3.5'</td>
<td>N=50/2&quot;</td>
<td>4</td>
</tr>
</tbody>
</table>

**STANDARD PENETRATION TEST DATA**

<table>
<thead>
<tr>
<th>Moisture</th>
<th>PL</th>
<th>LL</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ADDITIONAL REMARKS**

- **WATER LEVELS**
  - **Surface Elev.:** 1002 ft
  - **Elevation (feet):**
    - 1000 ft
    - 995 ft
    - 992 ft
    - 990 ft

**Additional Information**

- **Location:** Off Northbound Shoulder
- **Date Boring Started:** 7/8/15
- **Date Boring Completed:** 7/8/15
- **Logged By:** SB
- **Drilling Contractor:** PSI, Inc.
- **Latitude:**
- **Longitude:**
- **Drill Rig:** Truck Rig
- **Remarks:**

The stratification lines represent approximate boundaries. The transition may be gradual.
LOG OF BORING B-6

Sheet 1 of 1

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

Primary Services:
Project: Proposed 18th Avenue Reconstruction
Location: Vogt Drive to Decorah Road
Washington County, WI

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location: Northbound Lane

End of Boring at 10'
Cave In at 4'

STANDARD PENETRATION TEST DATA
N in blows/ft

Depth, (feet)
Graph Log
Sample Type
Recovery, (inches)

Station: 66+05
Offset: 9.3' RT
Surface Elev.: 1025 ft

0
1020
5
10
1015
1010
0
5
10

1
2
3
4
5

Asphalt (5± Thick)
Base Course (6± Thick)
Brown Silty Sand with Gravel, Moist, Dense to Very Dense

USCS Classification

Moisture, %

SPT Blows per 6-inch (SS)

Additional Remarks

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

Completion Depth: 10.0 ft
Date Boring Started: 7/8/15
Date Boring Completed: 7/8/15
Logged By: SB
Drilling Contractor: PSI, Inc.

Sample Types:
- Shelby Tube
- Auger Cutting
- Hand Auger
- Split-Spoon
- Calif. Sampler
- Rock Core
- Texas Cone

Latitude:
Longitude:
Drill Rig: Truck Rig
Remarks:
The stratification lines represent approximate boundaries. The transition may be gradual.
<table>
<thead>
<tr>
<th>Boring</th>
<th>Depth (ft)</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>Fines</th>
<th>Classification (*Visual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-2</td>
<td>1.8</td>
<td>33</td>
<td>20</td>
<td>13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ATTERBERG LIMIT RESULTS**

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

PSI Job No.: 00521299
Project: Proposed 18th Avenue Reconstruction
Location: Vogt Drive to Decorah Road
Washington County, WI
REPORT OF PARTICLE-SIZE ANALYSIS OF SOIL

U.S. STANDARD SIEVE NUMBERS

Percent Finer By Weight

ASTM Classification

Gravel

Sand

Fines (Silt and Clay)

Grain Size in Millimeters

0.010

0.001

0.0001

0.00001

100,000

10,000

1,000

100

10

1

Well Graded Sand with Gravel, Some Silt

1'-2.5'

Well Graded Gravel and Sand, Trace Silt

1'-2.5'

%Gravel

%Sand

%Fines

Key

Boring No.

Depth

Classification

64.2

32.2

3.6

39.0

48.6

12.4

Proposed 18th Avenue Reconstruction

File No.

00521299

Professional Service Industries • 821 Corporate Court • Waukesha, WI 53189 • 262-521-2125 • 262-521-2471 (Fax)
The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

**Drilling and Sampling Symbols**

- **SFA**: Solid Flight Auger - typically 4" diameter flights, except where noted.
- **HSA**: Hollow Stem Auger - typically 3¼" or ¾ I.D. openings, except where noted.
- **M.R.**: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
- **R.C.**: Diamond Bit Core Sampler
- **H.A.**: Hand Auger
- **P.A.**: Power Auger - Handheld motorized auger
- **SS**: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
- **ST**: Shelby Tube - 3" O.D., except where noted.
- **RC**: Rock Core
- **TC**: Texas Cone
- **BS**: Bulk Sample
- **PM**: Pressuremeter
- **CPT-U**: Cone Penetrometer Testing with Pore-Pressure Readings

**Soil Property Symbols**

- **N**: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
- **N<sub>60</sub>**: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
- **Q<sub>u</sub>**: Unconfined compressive strength, TSF
- **Q<sub>p</sub>**: Pocket penetrometer value, unconfined compressive strength, TSF
- **w%**: Moisture/water content, %
- **LL**: Liquid Limit, %
- **PL**: Plastic Limit, %
- **PI**: Plasticity Index = (LL-PL),%  
- **DD**: Dry unit weight, pcf

**Relative Density of Coarse-Grained Soils**

<table>
<thead>
<tr>
<th>Relative Density</th>
<th>N - Blows/foot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Loose</td>
<td>0 - 4</td>
</tr>
<tr>
<td>Loose</td>
<td>4 - 10</td>
</tr>
<tr>
<td>Medium Dense</td>
<td>10 - 30</td>
</tr>
<tr>
<td>Dense</td>
<td>30 - 50</td>
</tr>
<tr>
<td>Very Dense</td>
<td>50 - 80</td>
</tr>
<tr>
<td>Extremely Dense</td>
<td>80+</td>
</tr>
</tbody>
</table>

**Angularity of Coarse-Grained Particles**

<table>
<thead>
<tr>
<th>Description</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angular</td>
<td>Particles have sharp edges and relatively plane sides with unpolished surfaces</td>
</tr>
<tr>
<td>Subangular</td>
<td>Particles are similar to angular description, but have rounded edges</td>
</tr>
<tr>
<td>Subrounded</td>
<td>Particles have nearly plane sides, but have well-rounded corners and edges</td>
</tr>
<tr>
<td>Rounded</td>
<td>Particles have smoothly curved sides and no edges</td>
</tr>
</tbody>
</table>

**Grain-Size Terminology**

<table>
<thead>
<tr>
<th>Component</th>
<th>Size Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boulders</td>
<td>Over 300 mm (&gt;12 in.)</td>
</tr>
<tr>
<td>Cobblecs</td>
<td>75 mm to 300 mm</td>
</tr>
<tr>
<td>Coarse-Grained Gravel</td>
<td>19 mm to 75 mm</td>
</tr>
<tr>
<td>Fine-Grained Gravel</td>
<td>4.75 mm to 19 mm</td>
</tr>
<tr>
<td>Coarse-Grained Sand</td>
<td>2 mm to 4.75 mm</td>
</tr>
<tr>
<td>Medium-Grained Sand</td>
<td>0.42 mm to 2 mm</td>
</tr>
<tr>
<td>Fine-Grained Sand</td>
<td>0.075 mm to 0.42 mm</td>
</tr>
<tr>
<td>Silt</td>
<td>0.005 mm to 0.075 mm</td>
</tr>
<tr>
<td>Clay</td>
<td>&lt;0.005 mm</td>
</tr>
</tbody>
</table>

**Particle Shape**

<table>
<thead>
<tr>
<th>Description</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat</td>
<td>Particles with width/thickness ratio &gt; 3</td>
</tr>
<tr>
<td>Elongated</td>
<td>Particles with length/width ratio &gt; 3</td>
</tr>
<tr>
<td>Flat &amp; Elongated</td>
<td>Particles meet criteria for both flat and elongated</td>
</tr>
</tbody>
</table>

**Relative Proportions of Fines**

<table>
<thead>
<tr>
<th>Descriptive Term</th>
<th>% Dry Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace</td>
<td>&lt; 5%</td>
</tr>
<tr>
<td>With</td>
<td>5% to 12%</td>
</tr>
<tr>
<td>Modifier</td>
<td>&gt;12%</td>
</tr>
</tbody>
</table>
### CONSISTENCY OF FINE-GRAINED SOILS

<table>
<thead>
<tr>
<th>$Q_u$ - TSF</th>
<th>N - Blows/foot</th>
<th>Consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 0.25</td>
<td>0 - 2</td>
<td>Very Soft</td>
</tr>
<tr>
<td>0.25 - 0.50</td>
<td>2 - 4</td>
<td>Soft</td>
</tr>
<tr>
<td>0.50 - 1.00</td>
<td>4 - 8</td>
<td>Firm (Medium Stiff)</td>
</tr>
<tr>
<td>1.00 - 2.00</td>
<td>8 - 15</td>
<td>Stiff</td>
</tr>
<tr>
<td>2.00 - 4.00</td>
<td>15 - 30</td>
<td>Very Stiff</td>
</tr>
<tr>
<td>4.00 - 8.00</td>
<td>30 - 50</td>
<td>Hard</td>
</tr>
<tr>
<td>8.00+</td>
<td>50+</td>
<td>Very Hard</td>
</tr>
</tbody>
</table>

### MOISTURE CONDITION DESCRIPTION

<table>
<thead>
<tr>
<th>Description</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry</td>
<td>Absence of moisture, dusty, dry to the touch</td>
</tr>
<tr>
<td>Moist</td>
<td>Damp but no visible water</td>
</tr>
<tr>
<td>Wet</td>
<td>Visible free water, usually soil is below water table</td>
</tr>
</tbody>
</table>

### RELATIVE PROPORTIONS OF SAND AND GRAVEL

<table>
<thead>
<tr>
<th>Descriptive Term</th>
<th>% Dry Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace</td>
<td>&lt; 15%</td>
</tr>
<tr>
<td>With</td>
<td>15% to 30%</td>
</tr>
<tr>
<td>Modifier</td>
<td>&gt; 30%</td>
</tr>
</tbody>
</table>

### STRUCTURE DESCRIPTION

### SCALE OF RELATIVE ROCK HARDNESS

<table>
<thead>
<tr>
<th>$Q_u$ - TSF</th>
<th>Consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 - 10</td>
<td>Extremely Soft</td>
</tr>
<tr>
<td>10 - 50</td>
<td>Very Soft</td>
</tr>
<tr>
<td>50 - 250</td>
<td>Soft</td>
</tr>
<tr>
<td>250 - 525</td>
<td>Medium Hard</td>
</tr>
<tr>
<td>525 - 1,050</td>
<td>Moderately Hard</td>
</tr>
<tr>
<td>1,050 - 2,600</td>
<td>Hard</td>
</tr>
<tr>
<td>&gt;2,600</td>
<td>Very Hard</td>
</tr>
</tbody>
</table>

### ROCK BEDDING THICKNESSES

<table>
<thead>
<tr>
<th>Description</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Thick Bedded</td>
<td>Greater than 3-foot (&gt;1.0 m)</td>
</tr>
<tr>
<td>Thick Bedded</td>
<td>1-foot to 3-foot (0.3 m to 1.0 m)</td>
</tr>
<tr>
<td>Medium Bedded</td>
<td>4-inch to 1-foot (0.1 m to 0.3 m)</td>
</tr>
<tr>
<td>Thin Bedded</td>
<td>1¼-inch to 4-inch (30 mm to 100 mm)</td>
</tr>
<tr>
<td>Very Thin Bedded</td>
<td>½-inch to 1¼-inch (10 mm to 30 mm)</td>
</tr>
<tr>
<td>Thickly Laminated</td>
<td>1/8-inch to ½-inch (3 mm to 10 mm)</td>
</tr>
<tr>
<td>Thinly Laminated</td>
<td>1/8-inch or less &quot;paper thin&quot; (&lt;3 mm)</td>
</tr>
</tbody>
</table>

### ROCK VOIDS

<table>
<thead>
<tr>
<th>Voids</th>
<th>Void Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pit</td>
<td>&lt;6 mm (&lt;0.25 in)</td>
</tr>
<tr>
<td>Vug</td>
<td>6 mm to 50 mm (0.25 in to 2 in)</td>
</tr>
<tr>
<td>Cavity</td>
<td>50 mm to 600 mm (2 in to 24 in)</td>
</tr>
<tr>
<td>Cave</td>
<td>&gt;600 mm (&gt;24 in)</td>
</tr>
</tbody>
</table>

### ROCK QUALITY DESCRIPTION

<table>
<thead>
<tr>
<th>Rock Mass Description</th>
<th>RQD Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>90 - 100</td>
</tr>
<tr>
<td>Good</td>
<td>75 - 90</td>
</tr>
<tr>
<td>Fair</td>
<td>50 - 75</td>
</tr>
<tr>
<td>Poor</td>
<td>25 - 50</td>
</tr>
<tr>
<td>Very Poor</td>
<td>Less than 25</td>
</tr>
</tbody>
</table>

### DEGREE OF WEATHERING

<table>
<thead>
<tr>
<th>Degree of Weathering</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slightly Weathered</td>
<td>Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.</td>
</tr>
<tr>
<td>Weathered</td>
<td>Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.</td>
</tr>
<tr>
<td>Highly Weathered</td>
<td>Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.</td>
</tr>
</tbody>
</table>
## SOIL CLASSIFICATION CHART

**Note:** Dual symbols are used to indicate borderline soil classifications.

<table>
<thead>
<tr>
<th>MAJOR DIVISIONS</th>
<th>SYMBOLS</th>
<th>TYPICAL DESCRIPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COARSE GRAINED SOILS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRAVEL AND GRAVELLY SOILS</td>
<td>CLEAN GRAVELS&lt;br&gt;(LITTLE OR NO FINES)</td>
<td>GW&lt;br&gt;WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES</td>
</tr>
<tr>
<td></td>
<td>GRAVELS WITH FINES&lt;br&gt;(APPRECIABLE AMOUNT OF FINES)</td>
<td>GP&lt;br&gt;POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GM&lt;br&gt;SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GC&lt;br&gt;CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES</td>
</tr>
<tr>
<td>SAND AND SANDY SOILS</td>
<td>CLEAN SANDS&lt;br&gt;(LITTLE OR NO FINES)</td>
<td>SW&lt;br&gt;WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES</td>
</tr>
<tr>
<td></td>
<td>SANDS WITH FINES&lt;br&gt;(APPRECIABLE AMOUNT OF FINES)</td>
<td>SP&lt;br&gt;POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SM&lt;br&gt;SILTY SANDS, SAND - SILT MIXTURES</td>
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<td>SC&lt;br&gt;CLAYEY SANDS, SAND - CLAY MIXTURES</td>
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<tr>
<td><strong>FINE GRAINED SOILS</strong></td>
<td>SILTS AND CLAYS</td>
<td>ML&lt;br&gt;INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY</td>
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<td></td>
<td>LIQUID LIMIT LESS THAN 50</td>
<td>CL&lt;br&gt;INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS</td>
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<td></td>
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<td>OL&lt;br&gt;ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY</td>
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<tr>
<td></td>
<td>SILTS AND CLAYS</td>
<td>MH&lt;br&gt;INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS</td>
</tr>
<tr>
<td></td>
<td>LIQUID LIMIT GREATER THAN 50</td>
<td>CH&lt;br&gt;INORGANIC CLAYS OF HIGH PLASTICITY</td>
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<td>OH&lt;br&gt;ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS</td>
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<td><strong>HIGHLY ORGANIC SOILS</strong></td>
<td></td>
<td>PT&lt;br&gt;PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS</td>
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