GEOTECHNICAL INVESTIGATION

PROPOSED PUMP STATIONS
JAMESTOWN WASTEWATER TREATMENT PLANT
LIBERTY STREET AND MAIN STREET
JAMESTOWN, MERCER COUNTY, PENNSYLVANIA

Prepared For:

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ACA Project #Y15024x10
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1.0 INTRODUCTION

1.1 Authority

This report has been prepared in accordance with the objective and scope of investigation outlined by ACA Engineering, Inc. (ACA) in its technical proposal which was presented to Mr. Ian Garfoli, P.E., CT Consultants, Inc. for the Jamestown Wastewater Treatment Plant Improvements, Jamestown, Pennsylvania, on February 12, 2015. The acceptance of this proposal was provided by Mr. William Douglas McElhaney, Jamestown Borough Council President, on June 3rd, 2015.

1.2 Project Objective

Based on information provided to us by CT Consultants, Inc. the overall objective of the project is to construct two new pump stations, one triplex station at Main Street and one duplex station at Liberty Street, for the Jamestown Wastewater Treatment Plant in Jamestown, Pennsylvania. Therefore, the test borings were located accordingly.

1.3 Scope of Geotechnical Investigation

In order to achieve the above objective, the investigation program consisted of the following tasks:

- Conduct field reconnaissance.
- Prepare and perform an exploration program to delineate and characterize the subsurface materials by drilling test borings.
- Engineering involvement during all phases of the investigation and analysis of all data acquired.
- Provide inspection during the drilling of test borings to supervise the drilling operation and to log the test borings.
- Formulate and perform a laboratory testing program on soils and to determine material parameters needed for subsequent analyses.
- Prepare a geotechnical engineering report that documents the data and analyses performed as well as presents the discussions and evaluation of the subsurface conditions, the conclusions regarding the geotechnical engineering behavior of the subsurface materials under the anticipated stresses, and a set of recommendations for the following design aspects:

    - New pump stations design considerations

2.0 SUBSURFACE EXPLORATION PROGRAM

As requested by CT Consultants, Inc., Two (2) test borings with soil sampling were conducted at the proposed sites on June 16, 2015, to determine the subsurface conditions. Test boring B-1 was drilled behind Dollar General Store at 104 Liberty Street, and B-2 was drilled at the Water Pollution Control Plant, Main Street, Jamestown, PA. The approximate locations are shown on the Boring Location Plan in Appendix C.

2.1 Soil sampling

The soil sampling program consisted of obtaining split spoon samples. The spoon samples were obtained by conducting Standard Penetration Test (SPT) by driving a 2-inch O.D. Split Spoon Sampler (ASTM D-1586). The sampler was driven 18 inches into the soil with blows from a 140-pound hammer falling a distance of 30 inches, and the number of blows required to drive the sampler for each 6-inch interval was recorded. The cumulative number of blows for the last two 6 inch intervals (blows/foot) is termed as Standard Penetration Resistance, which can be correlated with relative density of granular soils or consistence of fine-grained soils and, in turn, their shear strength and compressibility characteristics.

2.2 Groundwater readings

Efforts were made to measure the depth to groundwater during drilling, and immediately upon completion of the boring, provided the holes did not cave. Groundwater was originally encountered in both test borings B-1 and B-2 at approximately five and one half (5.5) feet and six (6) feet below existing surface respectively. However, it should be noted that the groundwater level at the site might fluctuate in response to precipitation, run-off volumes and during the flooding periods.

Based on the soil conservation service information and the test boring logs groundwater is expected to be within excavation depth during the summer season and high water seasons. Measures should be taken to dewater the site with sump/pump pits during construction

3.0 LABORATORY TESTING PROGRAM

In order to determine the soil parameters, ACA performed laboratory testing to evaluate the on site soil conditions. The test results are included in Appendix E. A brief description of testing methodology is presented below.

Natural Moisture Content Tests (ASTM D2216)

This test was performed on selected representative soil samples to determine the water content of in-place soils at the time of drilling. In general, the soil samples were moist to very moist, based on an empirical scale of dry, moist, very moist, and wet. These conditions, however, would vary depending upon the seasonal and local precipitation.

Gradation Tests (ASTM D422)

Gradation tests consisting of sieve analysis test and material finer than #200 Wash test were conducted on the same soil samples on which moisture content tests have been conducted. The data from these tests are tabulated in Appendix E. These data were used to classify the soils according to the Unified Soil Classification System (ASTM D 2487). The test results indicate that the soils tested have a composition of silty clay and sandy silt.

Atterberg Limits Tests (ASTM D 4318)

Liquid and Plastic Limit tests were performed on selected samples. The data from these tests are included in Appendix E. In general, the soils tested were low to medium plasticity silt and clay. The results obtained from the classification tests are plotted in Appendix E.

The following table summarizes the laboratory test results:

Test Boring No.	Depth (ft below existing surface)	Natural Moisture (%)	Liquid Limit	Plastic Limit	Plasticity Index	Passing #200 Sieve (%)	Group (USCS, AASHTO)
B-1	3.5-5.0	26.9	31	22	9	99.5	CL, A-4(9)
B-2	8.5-10.0	21.6	25	22	3	86.5	ML, A-4(1)

4.0 GENERAL SITE CONDITIONS

This section of the report presents the project location, general surface and subsurface conditions of the proposed site.

4.1 Project Location

There are two locations to the proposed development; the first is located behind Dollar General Store at 104 Liberty Street, and the second is located at the water pollution control plant at Main Street, in the Borough of Jamestown, Mercer County, Pennsylvania. For site location, see U.S.G.S. Topographic Map in Appendix A. The proposed improvements consist of a new duplex pump station on Liberty Street, and a new triplex pump station on Main Street. The site at Liberty Street is bordered by wooded and residential areas to the north, Shenango River to the west, and the Dollar General Retail Store to the south and east. The site at Main Street is bordered by the water pollution control plant to the south, wooded areas to the east, gravel access road and wooded areas to the north, and Shenango River to the west.

4.2 Surface Conditions

The existing ground surface of the first location, at Liberty Street, is covered with grass and generally level to moderately sloping down in a southwesterly direction. A steep slope exists at the eastern border along Dollar General building. The existing ground surface of the second location, at Main Street, is generally level to moderately sloping down in a northeasterly direction and is covered with grass and trees. Active utilities were observed on site at the time of the site investigation, such as water drainage pipes, catch basins, electric overhead wires, concrete culvert and a fire hydrant.

4.3 Subsurface Conditions

A total of two (2) test borings were drilled at the site to determine and characterize the subsurface materials (see Boring Logs in Appendix D). Test boring B-1 was drilled behind Dollar General Store at 104 Liberty Street for the proposed duplex pump station, and B-2 was drilled at the Water Pollution Control Plant for the proposed triplex pump station, on Main Street, Jamestown, PA.

- Topsoil was encountered in both test borings B-1 and B-2. The thickness of the topsoil was approximately six (6) inches in B-1 and twelve (12) inches in B-2.

- Below the topsoil in both test borings, fill soils were encountered. The thickness of the fill was approximately five (5) feet and consisted of brown and gray silty clay some rock fragments and roots.

- Below the fill materials, natural soils were encountered in both test borings B-1 and B-2 at depths ranging from five and one half (5.5) feet to six (6) feet below existing surface. The natural soils consisted of very loose to loose brown fine sand trace sandstone fragments, very loose brown clayey sand trace rock fragments, medium dense brown silty sand, very stiff brown sandy clay trace rock fragments, loose gray clayey sand and gravel, firm to very stiff gray sandy silt trace gravel, and firm to stiff gray silty clay.

- Efforts were made to measure the depth to groundwater during drilling, and immediately upon completion of the boring, provided the holes did not cave. Groundwater was originally encountered in both test borings B-1 and B-2 at approximately five and one half (5.5) feet and six (6) feet below existing surface respectively. Upon drilling completion the water depth was approximately six (6) feet below existing surface in B-1 and at ground level in B-2. It should be noted that the groundwater level at the site might fluctuate in response to precipitation, run-off volumes and during the flooding periods.

Water is expected to be a problem during construction of the proposed pump stations. A dewatering system using a sump pump should be implemented to divert the ground water away from the proposed site. Due to the presence of saturated sandy materials within the proposed excavation areas at both sites, temporary shoring of the excavated pump stations areas is also recommended to prevent the walls of the excavated trench from caving in.

The following table represents the groundwater level in each test boring:

Test Boring No.	Depth of Water During Drilling (ft)	Depth of Water Upon Completion of Drilling (ft)
B-1	5.5 and 18.5	6.0
B-2	6.0	Ground Level

4.4 Soil Conditions

According to the Soil Survey of Mercer County, Pennsylvania (see map in Appendix B), the soil in the project area is classified as:

►**Wayland silt loam, coarse variant** (Wa): 0 to 5 percent slopes.

It should be noted that the U.S.D.A. classifies the soils onsite as "Poorly Drained" with a flooding frequency of "Frequent". In addition the U.S.D.A. soil survey map shows a symbol for "Wet Spot" in the vicinity of the site and Shenango River borders the site from the west.

For a more detailed description, see the USDA Soil Survey Map in Appendix B.

5.0 RECOMMENDATIONS

The analysis and recommendations presented in this report are based on the subsurface conditions disclosed by the site reconnaissance, field exploration, laboratory testing, and office research programs. Due to the large distances between the test borings performed, the possibility exists that conditions other than those revealed during our investigation may be present at the site.

If substantial variations in the site conditions do exist or are revealed during construction operations, the recommendations given in this section may either become invalid or need to be modified. With this in mind, the following engineering recommendations are presented concerning site preparation and design considerations.

As previously mentioned, water is expected to be a problem during construction of the proposed pump stations. If sufficient dewatering cannot be achieved through the installation of the storm sewers, excavation instability may be encountered in the form of bottom and sidewall seepage. Localized dewatering using sump/pumps may need to be completed prior to and during fill construction. The number and location of the sump/pumps will need to be determined in the field based on the volume and direction of groundwater flow. It is highly recommended that the contractor excavate several test pits outside the proposed pumps prior to start the construction to further evaluate groundwater conditions.

5.1 Duplex Pump Station Design Considerations

5.1.1 Based on information provided to us by CT Consultants, Inc., the depth of the proposed duplex pump station will be approximately (20) feet below existing surface. Based on test boring B-1, and the standard penetration testing (SPT) results, the natural soils encountered within the proposed pump area are suitable to support the proposed pump station and should be designed for a net, allowable bearing pressure of 1,500 pounds per square foot.

5.1.2 A minimum of twelve (12) inches of aggregate material such as AASHTO No. 57 limestone is recommended underneath the pre-cast concrete.

5.1.3 All bearing surfaces should be free of water or contamination prior to aggregate placement. Furthermore, aggregate should not be placed on frozen soil.

5.2 Triplex Pump Station Design Considerations

5.2.1 Based on information provided to us by CT Consultants, Inc., the depth of proposed triplex pump station will be approximately twenty five (25) feet below existing surface. Based on test boring B-2, and the standard penetration testing (SPT) results, the natural soils encountered are suitable to support the proposed pump station and should be designed for a net, allowable bearing pressure of 1,500 pounds per square foot.

5.2.2 A minimum of twelve (12) inches of aggregate material such as AASHTO No. 57 limestone is recommended underneath the pre-cast concrete.

5.2.3 All bearing surfaces should be free of water or contamination prior to aggregate placement. Furthermore, aggregate should not be placed on frozen soil.

5.3 Site Preparation

5.3.1 Strip the entire proposed construction areas of all vegetation, topsoil, soils contaminated with more than five (5) percent organics by weight, and any other unsuitable soils or materials. The existing fill materials and natural soils onsite are suitable to be reused as fill provided that they are dried, backfilled and compacted as per the "General Fill Construction" section of this report. Also, remove or relocate all of the utilities as necessary to accommodate the proposed construction.

5.3.2 Remove remaining soils, where necessary, to proposed subgrade elevations.

5.3.3 All areas, which will receive backfill, should be filled in with suitable materials, from on site or hauled in from off site.

5.3.4 Stabilization of isolated unstable subsurface materials may be possible using crushed stone, which is "bridged" or "choked" into the yielding materials. An alternate method of subgrade stabilization in the case of soft, moist soils would be to scarify, dry out, and then recompact the moist areas.

5.3.5 All proofrolled areas should be inspected by an ACA geotechnical engineer to ensure that all unsuitable materials have been removed.

5.3.6 Upon subgrade approval, fill the site to grade where necessary as per the "GENERAL FILL CONSTRUCTION" section of this report.

5.4 General Fill Construction

5.4.1 The soil used for fill construction should be uncontaminated, clean, on-site or off-site material approved by ACA and meeting the requirements set forth in this report. The existing fill and natural soils on the site are suitable to be re-used in the proposed pump station areas as long as they are properly dried, backfilled, and compacted.

5.4.2 In the areas, which are to receive fill either as part of an undercut and replacement process or for, grade rising, the subgrade should first be properly prepared and scarified.

5.4.3 The first lift of material should be only approximately four (4) inches thick in the loose state. Each lift of soil thereafter should be placed in a maximum eight (8) inch loose thickness and should be within plus or minus two (2) percent of optimum moisture content as determined by the Standard Proctor Test (ASTM D-698).

5.4.4 All fill should be compacted to a minimum density of 98% of maximum dry density as determined by the Standard Proctor Test (ASTM D-698). Based on the high moisture content and relatively wet condition of the near surface soils, we anticipate a decrease in moisture content will be necessary to bring the density to within 98% of minimum based on the standard proctor test.

5.4.5 During fill construction and/or subgrade preparation, the contractor should maintain good site drainage. Exposed surfaces should be positively sloped to cause runoff to flow away from the site. If water does pond in any sectors, those areas should be drained and all mud zones or softened soils should be aerated and recompacted before further construction takes place.

5.4.6 Silty and clayey soils were encountered on site and are susceptible to breakdown by pumping under traffic loads. When silt pockets are encountered during construction and if pumping is initiated, construction traffic should be rerouted and the area should then be restabilized either by drying and recompacting or by adding drainage and then drying and recompacting. Areas allowed to break down will gradually worsen and spread.

5.4.7 All fill densities should be evaluated by ACA inspectors using nuclear densometers or other approved methods. At least one (1) test per every 2,000 square feet on each lift should be conducted.

5.4.8 The above recommendations encompass essential aspects of fill construction. They are not, however, intended to be a complete set of earthwork specifications.

5.5 Grading and Drainage Considerations

Site grading should take into consideration that areas with more fill placement would experience greater settlements over time than areas with lesser or no fill placement. Therefore, for the situation of maintaining proper drainage, grading should allow for the above condition or should slope drainage pathways or piping from areas of lesser fill placement down towards areas of more fill placement, so that the effects of fill consolidation will not hinder drainage in the future. Subgrade soils softened or otherwise disturbed during construction should be disked and dried in-place and recompacted to the specified density. Where stability cannot be achieved by moisture conditioning and compaction, the unstable subgrade soils should be undercut and replaced.

6.0 GENERAL CONSIDERATIONS

This report has been prepared to present our recommendations with regard to geotechnical aspects of the proposed construction to the owner and the designer of the Jamestown Wastewater Treatment Plant Improvements, Borough of Jamestown, Mercer County, Pennsylvania. The scope of our services is limited to the specific project and location described herein and described herein and the description of the project represents ACA's understanding of the significant aspects relevant to soil, groundwater, and foundation characteristics. As a check, we request that we be authorized to review the project plans and specifications to confirm that the recommendations contained in this report have been interpreted and implemented in accordance with our intent. ACA would welcome the opportunity to provide further assistance with regard to the foundation designs, if required.

It is recommended that all construction operations dealing with earthworks and foundation construction be reviewed by an experienced geotechnical engineer who can evaluate the conditions encountered and make decisions regarding whether the intent of the recommendations is fulfilled in the actual construction. If requested, ACA would welcome the opportunity to provide field-monitoring services during construction.

The analyses and recommendations presented herein are based upon data obtained from borings at the locations indicated on the plan and from any other information discussed in the report. Information presented regarding subsurface conditions between borings is based on the engineering judgment of ACA and could be interpreted differently by others. In the performance of subsurface explorations, specific information is obtained at specific locations at specific times. However, it should be recognized that variations might exist between boring locations and, also, that such situations as groundwater levels vary from time to time. The nature and extent of variations may not become evident until construction is initiated or even completed. If variations become evident during construction, it will be necessary to reevaluate the recommendations presented herein after performing on site observations during the construction period.

In preparing this report, the professional services of ACA have been performed, findings obtained, and recommendations prepared in accordance with generally accepted engineering principles and practices. This statement is in lieu of all warranties, either expressed or implied.

If you require additional information or clarification of the foundation recommendations, please contact our office.

ACA ENGINEERING, INC.

Nick Chammas,
Geotechnical Engineer

Reviewed by:

Tony Chammas, P.E.
Director of Engineering

APPENDICES

APPENDIX A

U.S.G.S. TOPOGRAPHIC MAP

U.S.G.S. TOPOGRAPHIC MAP

Source: USGS Greenville West Quadrangle
Mercer County, PA
7.5 Minute Series (Topographic)
Scale 1: 24,000

Project: Proposed Pump Stations
Jamestown WWTP
Jamestown, PA 16134

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APPENDIX B

U.S.D.A. SOIL SURVEY MAP
&
SYMBOLS

Soil Map—Mercer County, Pennsylvania
(Jamestown Wastewater Treatment Plant & Pump Station)

Map Scale: 1:3,270 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 45 90 180 270

Feet
0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mercer County, Pennsylvania
Survey Area Data: Version 8, Sep 19, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 7, 2011—Oct 8, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Mercer County, Pennsylvania

Wa—Wayland silt loam, coarse variant

Map Unit Setting

National map unit symbol: 9y8x
Elevation: 200 to 1,500 feet
Mean annual precipitation: 30 to 46 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 187 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Wayland, variant, and similar soils: 50 percent
Wayland, variant, swpd, and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wayland, Variant

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Recent alluvium

Typical profile

Ap - 0 to 4 inches: silt loam
Bg - 4 to 18 inches: silt loam
C - 18 to 60 inches: stratified gravelly fine sandy loam to silt loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D

Description of Wayland, Variant, Swpd

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Recent alluvium

Typical profile

Ap - 0 to 4 inches: silt loam
Bg - 4 to 18 inches: silt loam
C - 18 to 60 inches: stratified gravelly fine sandy loam to silt loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 2 to 8 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D

Minor Components

Papakating

Percent of map unit: 10 percent
Landform: Depressions on flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave

Chenango, flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear

Red hook, flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope

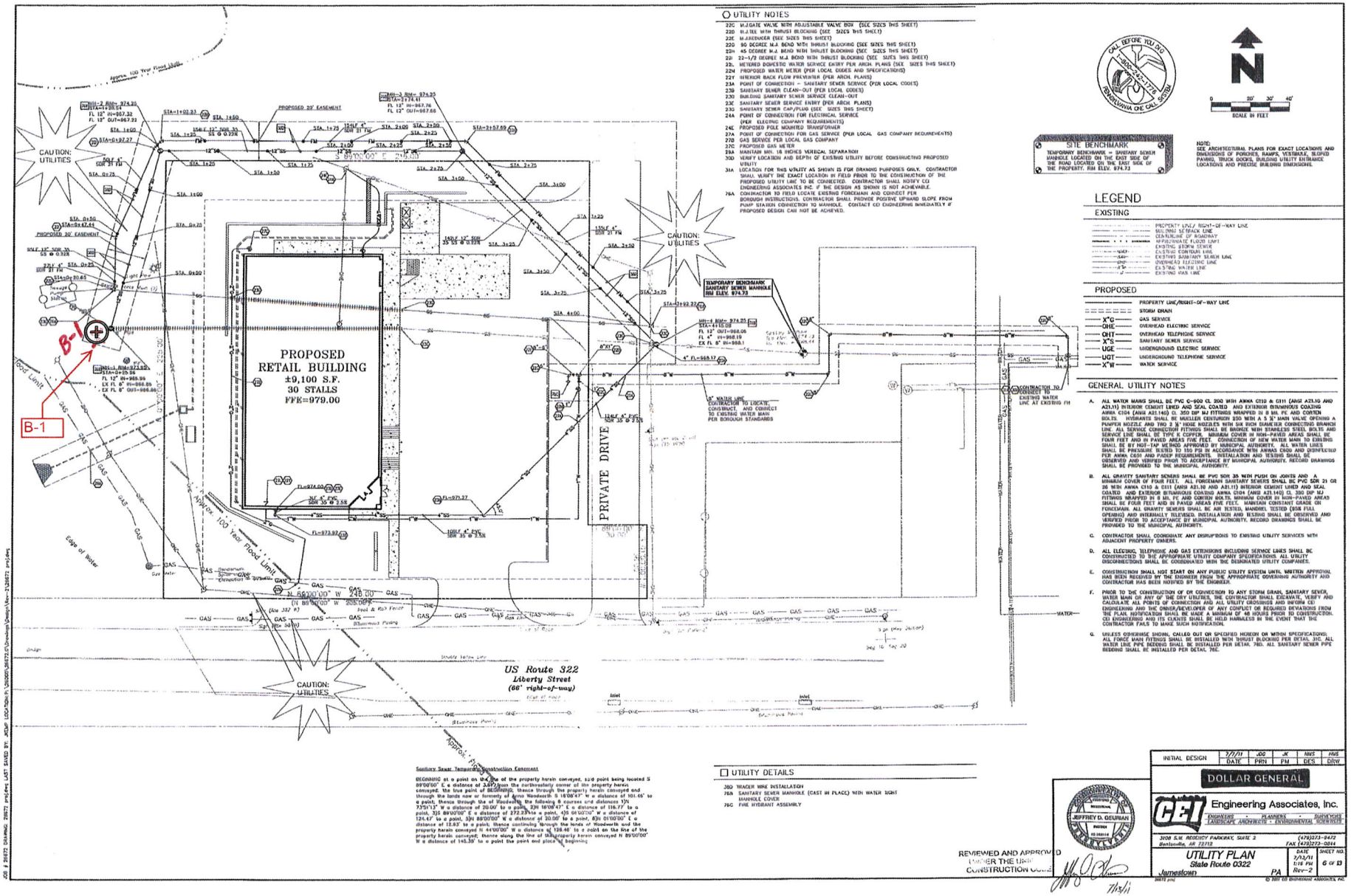
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear

Data Source Information

Soil Survey Area: Mercer County, Pennsylvania
Survey Area Data: Version 8, Sep 19, 2014

APPENDIX C

BORING LOCATION PLAN



UTILITY NOTES

22C M.J.GATE VALVE WITH ADJUSTABLE VALVE BOX (SEE SIZES THIS SHEET)
22D M.J.TEE WITH THRUST BLOCKING (SEE SIZES THIS SHEET)
22E M.J.REDUCER (SEE SIZES THIS SHEET)
22G 90 DEGREE M.J. BEND WITH THRUST BLOCKING (SEE SIZES THIS SHEET)
22H 45 DEGREE M.J. BEND WITH THRUST BLOCKING (SEE SIZES THIS SHEET)
22I 22-1/2 DEGREE M.J. BEND WITH THRUST BLOCKING (SEE SIZES THIS SHEET)
22L METERED DOMESTIC WATER SERVICE ENTRY PER ARCH. PLANS (SEE SIZES THIS SHEET)
22M PROPOSED WATER METER (PER LOCAL CODES AND SPECIFICATIONS)
22Y INTERIOR BACK FLOW PREVENTER (PER ARCH. PLANS)
23A POINT OF CONNECTION – SANITARY SEWER SERVICE (PER LOCAL CODES)
23B SANITARY SEWER CLEAN-OUT (PER LOCAL CODES)
23D BUILDING SANITARY SEWER CLEAN-OUT
23E SANITARY SEWER SERVICE ENTRY (PER ARCH. PLANS)
23G SANITARY SEWER CAP/PLUG (SEE SIZES THIS SHEET)
24A POINT OF CONNECTION FOR ELECTRICAL SERVICE (PER ELECTRIC COMPANY REQUIREMENTS)
24E PROPOSED POLE MOUNTED TRANSFORMER
27A POINT OF CONNECTION FOR GAS SERVICE (PER LOCAL GAS COMPANY REQUIREMENTS)
27D GAS SERVICE PER LOCAL GAS COMPANY
27C PROPOSED GAS METER
28A MAINTAIN MIN. 18 INCHES VERTICAL SEPARATION
30D VERIFY LOCATION AND DEPTH OF EXISTING UTILITY BEFORE CONSTRUCTING PROPOSED UTILITY
31A LOCATION FOR THIS UTILITY AS SHOWN IS FOR DRAWING PURPOSES ONLY. CONTRACTOR SHALL VERIFY THE EXACT LOCATION IN FIELD PRIOR TO THE CONSTRUCTION OF THE PROPOSED UTILITY LINE TO BE CONNECTED. CONTRACTOR SHALL NOTIFY CO ENGINEERING ASSOCIATES INC. IF THE DESIGN AS SHOWN IS NOT ACHIEVABLE.
76A CONTRACTOR TO FIELD LOCATE EXISTING FORCEMAIN AND CONNECT PER BOROUGH INSTRUCTIONS. CONTRACTOR SHALL PROVIDE POSITIVE UPWARD SLOPE FROM PUMP STATION CONNECTION TO MANHOLE. CONTACT CO ENGINEERING IMMEDIATELY IF PROPOSED DESIGN CAN NOT BE ACHIEVED.

UTILITY DETAILS

35D TRACER WIRE INSTALLATION
76A SANITARY SEWER MANHOLE (CAST IN PLACE) WITH WATER TIGHT MANHOLE COVER
76C FIRE HYDRANT ASSEMBLY

CALL BEFORE YOU DIG 1-800-242-1776 PENNSYLVANIA ONE CALL SYSTEM

SCALE IN FEET

SITE BENCHMARK
TEMPORARY BENCHMARK = SANITARY SEWER MANHOLE LOCATED ON THE EAST SIDE OF THE ROAD LOCATED ON THE EAST SIDE OF THE PROPERTY. RIM ELEV. 974.73

NOTE:
SEE ARCHITECTURAL PLANS FOR EXACT LOCATIONS AND DIMENSIONS OF PORCHES, RAMPS, VESTIBULE, SLOPED PAVING, TRUCK DOORS, BUILDING UTILITY ENTRANCE LOCATIONS AND PRECISE BUILDING DIMENSIONS.

LEGEND

EXISTING

PROPERTY LINE/ RIGHT-OF-WAY LINE
BUILDING SETBACK LINE
CENTERLINE OF ROADWAY
APPROXIMATE FLOOD LIMIT
EXISTING STORM SEWER
EXISTING CONTOUR LINE
EXISTING SANITARY SEWER LINE
OVERHEAD ELECTRIC LINE
EXISTING WATER LINE
EXISTING GAS LINE

PROPOSED

PROPERTY LINE/RIGHT-OF-WAY LINE
STORM DRAIN
X"G GAS SERVICE
OHE OVERHEAD ELECTRIC SERVICE
OHT OVERHEAD TELEPHONE SERVICE
X"S SANITARY SEWER SERVICE
UGE UNDERGROUND ELECTRIC SERVICE
UGT UNDERGROUND TELEPHONE SERVICE
X"W WATER SERVICE

GENERAL UTILITY NOTES

A. ALL WATER MAINS SHALL BE PVC C-900 CL 350 WITH AWWA C110 & C111 (ANSI A21.10 AND A21.11) INTERIOR CEMENT LINED AND SEAL COATED AND EXTERIOR DENSHIELD COATING AWWA C104 (ANSI A21.14G) CL 350 DIP MJ FITTINGS WRAPPED IN 8 MIL PE AND CORTEN BOLTS. HYDRANTS SHALL BE MUELLER CENTURION 250 WITH A 5 ¼" MAIN VALVE OPENING A PUMPER NOZZLE AND TWO 2 ½" HOSE NOZZLES WITH SIX RICH DIAMETER CONNECTING BRANCH LINE. ALL SERVICE CONNECTION FITTINGS SHALL BE BRONZE WITH STAINLESS STEEL BOLTS AND SERVICE LINE SHALL BE TYPE K COPPER. MINIMUM COVER IN NON-PAVED AREAS SHALL BE FOUR FEET AND IN PAVED AREAS FIVE FEET. CONNECTION OF NEW WATER MAIN TO EXISTING SHALL BE BY HOT-TAP METHOD APPROVED BY MUNICIPAL AUTHORITY. ALL WATER LINES SHALL BE PRESSURE TESTED TO 150 PSI IN ACCORDANCE WITH AWWA C600 AND DISINFECTED PER AWWA C651 AND PADEP REQUIREMENTS. INSTALLATION AND TESTING SHALL BE OBSERVED AND VERIFIED PRIOR TO ACCEPTANCE BY MUNICIPAL AUTHORITY. RECORD DRAWINGS SHALL BE PROVIDED TO THE MUNICIPAL AUTHORITY.

B. ALL GRAVITY SANITARY SEWERS SHALL BE PVC SDR 35 WITH PUSH ON JOINTS AND A MINIMUM COVER OF FOUR FEET. ALL FORCEMAIN SANITARY SEWERS SHALL BE PVC SDR 21 OR 26 WITH AWWA C110 & C111 (ANSI A21.10 AND A21.11) INTERIOR CEMENT LINED AND SEAL COATED AND EXTERIOR DENSHIELD COATING AWWA C104 (ANSI A21.14G) CL 350 DIP MJ FITTINGS WRAPPED IN 8 MIL PE AND CORTEN BOLTS. MINIMUM COVER IN NON-PAVED AREAS SHALL BE FOUR FEET AND IN PAVED AREAS FIVE FEET. MAINTAIN CONSTANT GRADE ON FORCEMAIN. ALL GRAVITY SEWERS SHALL BE AIR TESTED, MANDREL TESTED (80% FULL OPENING) AND INTERNALLY TELEVISED. INSTALLATION AND TESTING SHALL BE OBSERVED AND VERIFIED PRIOR TO ACCEPTANCE BY MUNICIPAL AUTHORITY. RECORD DRAWINGS SHALL BE PROVIDED TO THE MUNICIPAL AUTHORITY.

C. CONTRACTOR SHALL COORDINATE ANY DISRUPTIONS TO EXISTING UTILITY SERVICES WITH ADJACENT PROPERTY OWNERS.

D. ALL ELECTRIC, TELEPHONE AND GAS EXTENSIONS INCLUDING SERVICE LINES SHALL BE CONSTRUCTED TO THE APPROPRIATE UTILITY COMPANY SPECIFICATIONS. ALL UTILITY DISCONNECTIONS SHALL BE COORDINATED WITH THE DESIGNATED UTILITY COMPANIES.

E. CONSTRUCTION SHALL NOT START ON ANY PUBLIC UTILITY SYSTEM UNTIL WRITTEN APPROVAL HAS BEEN RECEIVED BY THE ENGINEER FROM THE APPROPRIATE GOVERNING AUTHORITY AND CONTRACTOR HAS BEEN NOTIFIED BY THE ENGINEER.

F. PRIOR TO THE CONSTRUCTION OF OR CONNECTION TO ANY STORM DRAIN, SANITARY SEWER, WATER MAIN OR ANY OF THE GREY UTILITIES, THE CONTRACTOR SHALL EXCAVATE, VERIFY AND CALCULATE ALL POINTS OF CONNECTION AND ALL UTILITY CROSSINGS AND INFORM CEI ENGINEERING AND THE OWNER/DEVELOPER OF ANY CONFLICT OR REQUIRED DEVIATIONS FROM THE PLAN. NOTIFICATION SHALL BE MADE A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION. CEI ENGINEERING AND ITS CLIENTS SHALL BE HELD HARMLESS IN THE EVENT THAT THE CONTRACTOR FAILS TO MAKE SUCH NOTIFICATION.

G. UNLESS OTHERWISE SHOWN, CALLED OUT OR SPECIFIED HEREON OR WITHIN SPECIFICATIONS; ALL FORCE MAIN FITTINGS SHALL BE INSTALLED WITH THRUST BLOCKING PER DETAIL 31C. ALL WATER LINE PIPE BEDDING SHALL BE INSTALLED PER DETAIL 76D. ALL SANITARY SEWER PIPE BEDDING SHALL BE INSTALLED PER DETAIL 76C.

REVIEWED AND APPROVED UNDER THE UNIFORM CONSTRUCTION CODE

JEFFREY D. GEURIAN — PROFESSIONAL ENGINEER — COMMONWEALTH OF PENNSYLVANIA

INITIAL DESIGN	7/7/11	JDG	JK	NMS	NMS
	DATE	PRN	PM	DES.	DRW.

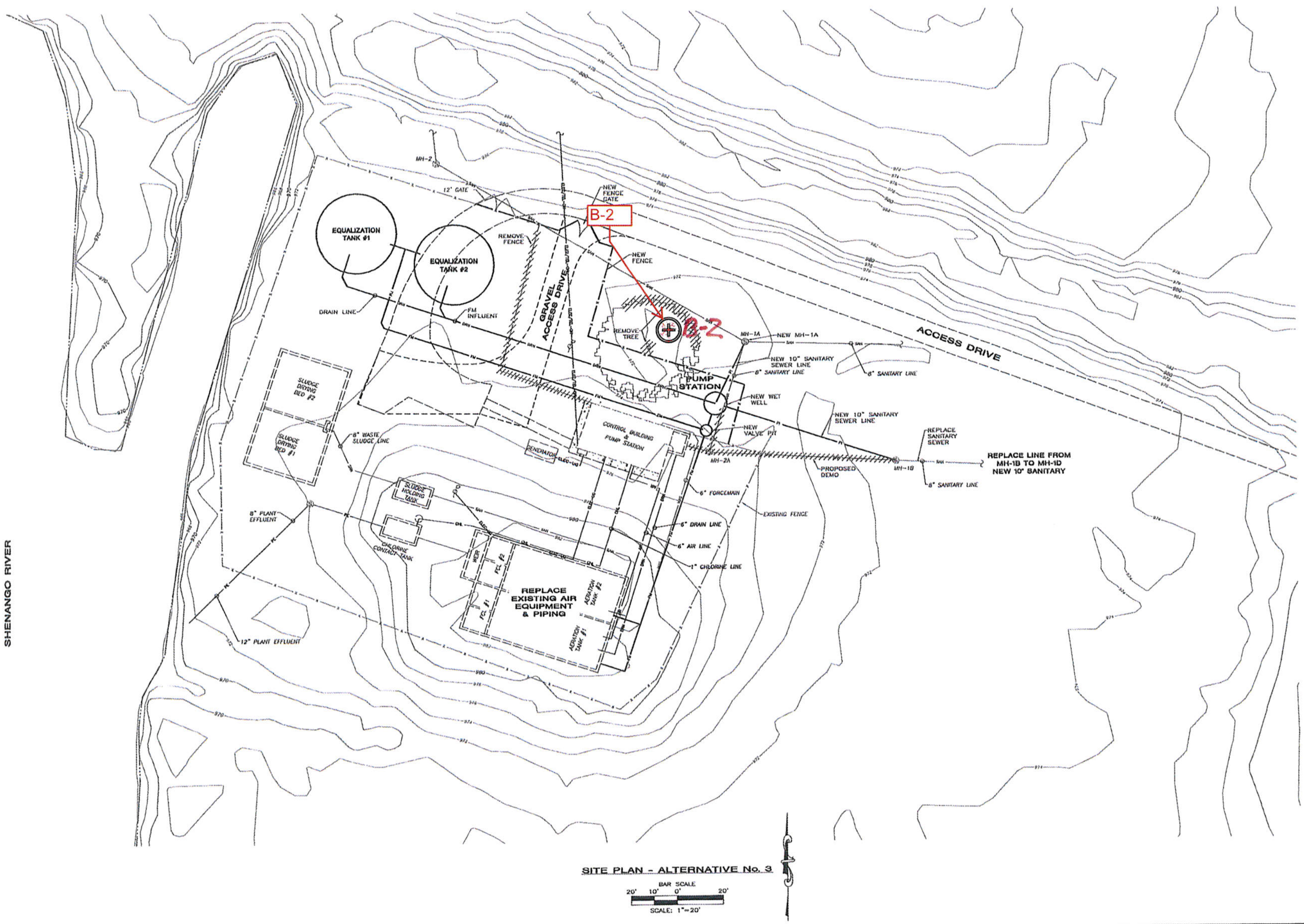
DOLLAR GENERAL

CEI Engineering Associates, Inc.
ENGINEERS - PLANNERS - SURVEYORS
LANDSCAPE ARCHITECTS - ENVIRONMENTAL SCIENTISTS
3108 S.W. REGENCY PARKWAY, SUITE 2
Bentonville, AR 72712
(479)273-0472
FAX (479)273-0844

UTILITY PLAN
State Route 0322
Jamestown PA

DATE 7/13/11
SHEET NO. 6 OF 13
CAD File Rev-2

JOB # 26872 DRAWING: 26872_proj.dwg LAST SAVED BY: JDGUP LOCATION: P:\2600\26872\Drawings\Design\Rev-2\26872_proj.dwg



CONCEPTUAL 1/13/15

CT Consultants
engineers | architects | planners

PROJECT NO:	P14628
SCALE:	AS SHOWN
DATE:	1/13/15
DESIGN:	IAG
DRAWN:	SAS
CHECK:	CMK

NO.	REVISION	DATE

BOROUGH OF JAMESTOWN
WATER POLLUTION CONTROL PLANT IMPROVEMENTS PROJECT
BOROUGH OF JAMESTOWN, PENNSYLVANIA

SITE PLAN - ALTERNATIVE No. 3

DRAWING NAME: PL-3

SHEET 5 OF 6

APPENDIX D

TEST BORING LOGS
&
SOIL CLASSIFICATION CHART

Project No: Y15024x10

Project: Jamestown Pump Stations

Client: CT Consultants, Inc.

Location: Jamestown, PA

ACA Engineering, Inc.

Borehole #: B-1

Elevation:

Engineer/Geologist: Nick Chammas

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth/Elev.	Number	Type	Sample Depth (ft)	Blows/ft	Recovery	Shear Strength blows/ft 20 40 60	Water Level	Remarks
0		Ground Surface	0								
		6" Topsoil									
1		Brown and gray Silty CLAY, some rock fragments. (FILL)									
2				S-1	SS	1.0-2.5	4 6 4				Very moist
3			3								
4		Brown Silty CLAY, trace rock fragments. (FILL) Water at 5.5'									
				S-2	SS	3.5-5.0	3 2 3				Moist
5			5.5							▼	
6		Very loose to loose brown saturated fine SAND, trace sandstone fragments. (SP)									
7				S-3	SS	6.0-7.5	woh woh 4				Wet
8											
9							4				
				S-4	SS	8.5-10.0	5 6				Wet
10											
11											
12											
13											
14			14				2				
				S-5	SS	13.5-15.0	1 1				Very moist
15		Very loose brown Clayey SAND, trace rock fragments. (SC)									
16											
17											
18			18.5				5				
				S-6	SS	18.5-20.0	6 5				Wet
19											
20											

Drilled By: Shallenberger Construction

Drill Method: Hollow Stem Auger

Drill Date: 6-16-15

ACA ENGINEERING, INC.
741 McCLurg Road, Suite A
Boardman, Oh 44512
Phone: 330-729-1222 FAX: 330-729-9222

Hole Size: 7"

Weather: Cloudy

Project No: Y15024x10

Project: Jamestown Pump Stations

Client: CT Consultants, Inc.

Location: Jamestown, PA

ACA Engineering, Inc.

Borehole #: B-1

Elevation:

Engineer/Geologist: Nick Chammas

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth/Elev.	Number	Type	Sample Depth (ft)	Blows/ft	Recovery	Shear Strength blows/ft 20 40 60	Water Level	Remarks
21		Medium dense brown saturated Silty SAND. (SM) Water at 18.5'									
22											
23											
24			24								
24		Very stiff brown Sandy CLAY, trace rock fragments. (CL)	25	S-7	SS	23.5-25.0	13 14 13				Very moist
25		End of test boring at 25'									
26		Water @ completion: 6'									
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											

Drilled By: Shallenberger Construction

Drill Method: Hollow Stem Auger

Drill Date: 6-16-15

ACA ENGINEERING, INC.
741 McCLurg Road, Suite A
Boardman, Oh 44512
Phone: 330-729-1222 FAX: 330-729-9222

Hole Size: 7"

Weather: Cloudy

Project No: Y15024x10

Project: Jamestown Pump Stations

Client: CT Consultants, Inc.

Location: Jamestown, PA

ACA Engineering, Inc.

Borehole #: B-2

Elevation:

Engineer/Geologist: Nick Chammas

SUBSURFACE PROFILE				SAMPLE					Shear Strength blows/ft 20 40 60	Water Level	Remarks
Depth	Symbol	Description	Depth/Elev.	Number	Type	Sample Depth (ft)	Blows/ft	Recovery			
0		Ground Surface	0								
1		12" Topsoil	1								
2		Gray Silty CLAY, trace sand and roots. (FILL)		S-1	SS	1.0-2.5	1 1 2				Moist
4				S-2	SS	3.5-5.0	2 3 3				Very moist
6		Water at 6'	6							▼	
7		Loose gray Clayey Sand and Gravel. (SC)		S-3	SS	6.0-7.5	3 2 4				Wet
8			8.5								
9		Firm gray Sandy SILT, trace gravel. (ML)		S-4	SS	8.5-10.0	3 2 3				Very moist
14				S-5	SS	13.5-15.0	3 4 4				Very moist
18			18								
19		Firm to stiff gray Silty CLAY. (CL)		S-6	SS	18.5-20.0	4 3 3				Very moist
24				S-7	SS	23.5-25.0	4 6 7				Very moist
26			26								
27											
28											

Drilled By: Shallenberger Construction

Drill Method: Hollow Stem Auger

Drill Date: 6-16-15

ACA ENGINEERING, INC.
741 McCLurg Road, Suite A
Boardman, Oh 44512
Phone: 330-729-1222 FAX: 330-729-9222

Hole Size: 7"

Weather: Cloudy

Project No: Y15024x10

Project: Jamestown Pump Stations

Client: CT Consultants, Inc.

Location: Jamestown, PA

Engineering, Inc.

Borehole #: B-2

Elevation:

Engineer/Geologist: Nick Chammas

SUBSURFACE PROFILE				SAMPLE							
Depth	Symbol	Description	Depth/Elev.	Number	Type	Sample Depth (ft)	Blows/ft	Recovery	Shear Strength blows/ft 20 40 60	Water Level	Remarks
29		Very stiff gray Sandy SILT, trace gravel. (ML)	30	S-8	SS	28.5-30.0	6 12 8				Very moist
30		End of test boring at 30' Water @ completion: Ground level									
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
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47											
48											
49											
50											
51											
52											
53											
54											
55											
56											

Drilled By: Shallenberger Construction

Drill Method: Hollow Stem Auger

Drill Date: 6-16-15

ACA ENGINEERING, INC.
741 McCLurg Road, Suite A
Boardman, Oh 44512
Phone: 330-729-1222 FAX: 330-729-9222

Hole Size: 7"

Weather: Cloudy

SOIL CLASSIFICATION CHART - **ASTM D2487**

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE-GRAINED SOILS More than 50% retained on the No. 200 sieve	GRAVEL More than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS Less than 5% fines	GW	Well graded gravel.
			GP	Poorly graded gravel.
		GRAVELS WITH FINES More than 12% fines	GM	Silty gravel.
			GC	Clayey gravel.
	SANDS 50% or more of coarse fraction passes No. 4 sieve	CLEAN SANDS Less than 5% fines	SW	Well graded sand.
			SP	Poorly graded sand.
		SAND WITH FINES More than 12% fines	SM	Silty sand.
			SC	Clayey sand.
FINE-GRAINED SOILS 50% or more passes the No. 200 sieve	SILTS AND CLAYS Liquid Limit < 50	Inorganic	ML	Silt.
			CL	Lean clay.
		Organic	OL	Organic silt and organic clay of low plasticity.
	SILTS AND CLAYS Liquid Limit > 50	Inorganic	MH	Elastic silt.
			CH	Fat clay.
		Organic	OH	Organic silt and organic clay of high plasticity.
HIGHLY ORGANIC SOILS		Primarily organic matter, dark in color, and organic odor.	PT	Peat.

COMPONENT		**SIZE**
BOULDERS		Larger than 12"
COBBLES		12" to 3"
GRAVEL	COARSE	3" to 3/4"
	FINE	3/4" to 4.75MM (3/4" to #4 sieve)
SAND	COARSE	4.75MM to 2.0MM (#4 to #10 sieve)
	MEDIUM	2.0MM to 0.425MM (#10 to #40 sieve)
	FINE	0.425MM to 0.075 MM (#40 to #200 sieve)
SILT (inorganic silt) (rock flour)		0.075MM to 0.005MM (#200 to 0.005MM) Material passing the #200 (75-µm) U.S. standard sieve that is not plastic or very slightly plastic and that exhibits little or no strength when air-dry.
CLAY (clay soil)		Smaller than 0.005MM Fine-grained soil or the fine-grained portion of soil that can be made to exhibit plasticity (putty-like properties) within a range of water contents, and that exhibits considerable strength when air-dry.

TERMS	**RANGE**
Trace	0 - 10%
Little	10 - 20%
Some	20 - 35%
And	35 - 50%

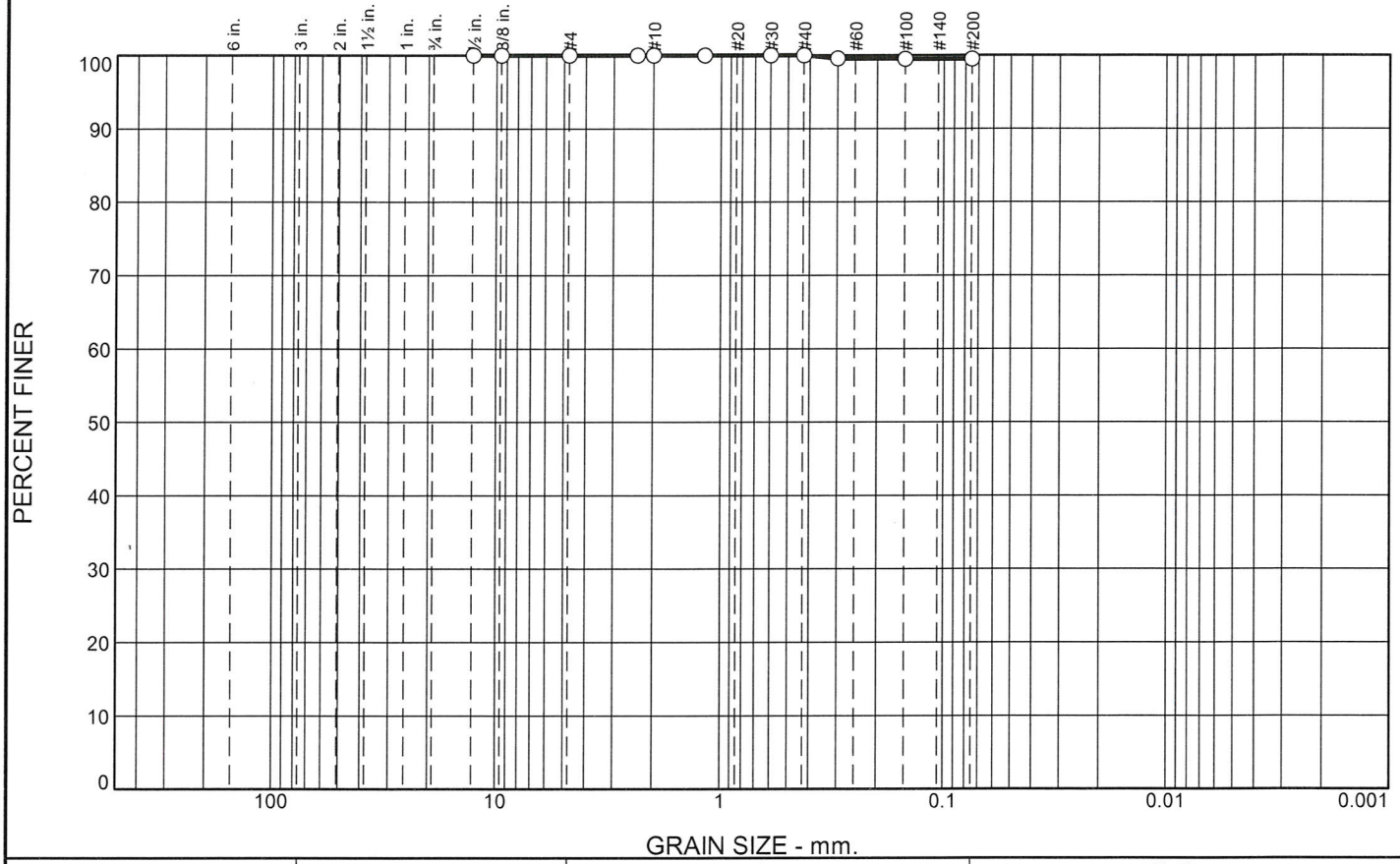
Criteria for Describing Moisture Condition

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

APPENDIX E

LABORATORY TESTING RESULTS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	0.5	99.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#30	100.0		
#40	100.0		
#50	99.6		
#100	99.5		
#200	99.5		

* (no specification provided)

Soil Description

Brown Silty CLAY.

Atterberg Limits

PL= 22 LL= 31 PI= 9

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-4(9)

Remarks

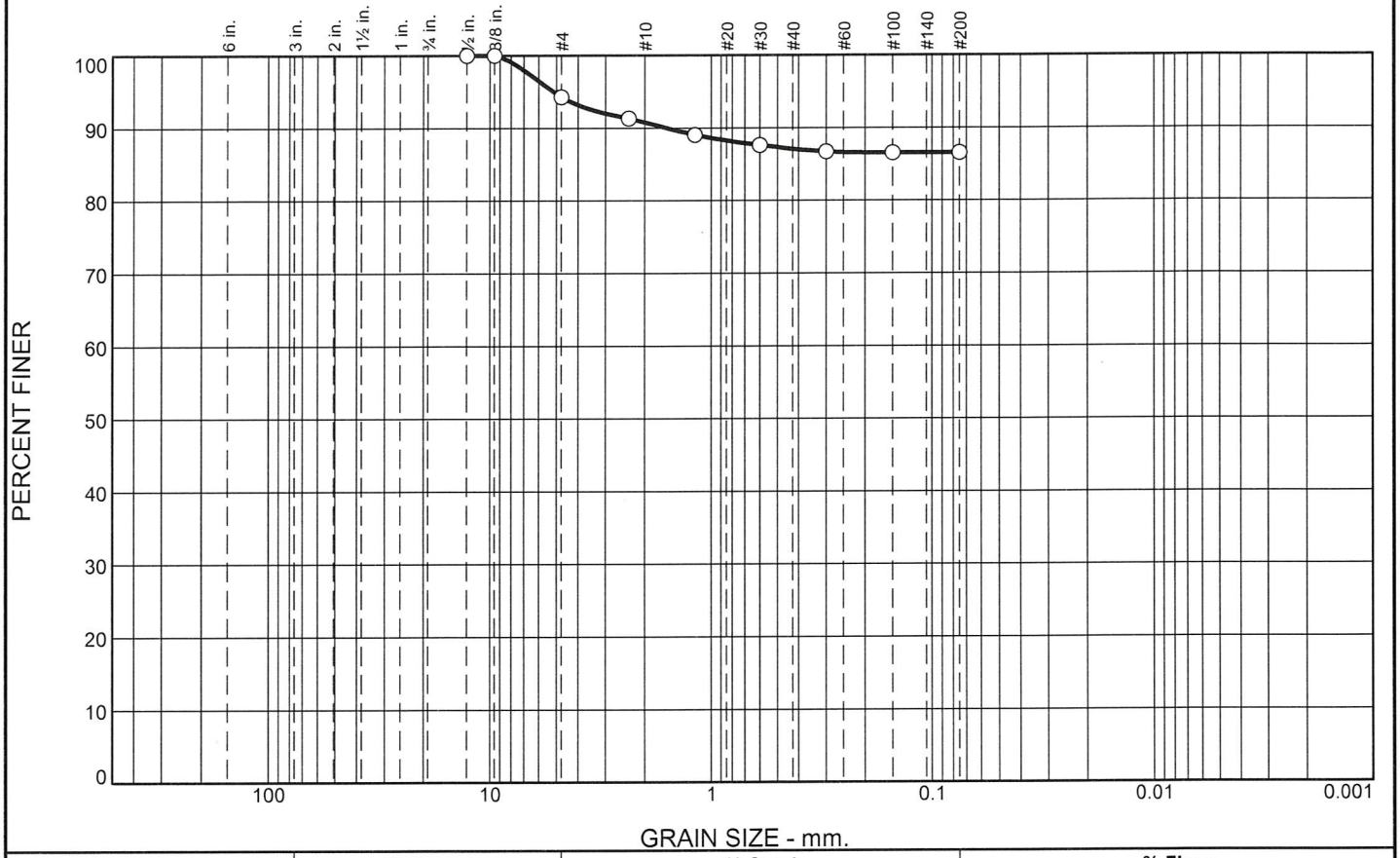
Location: Jamestown, PA
Sample Number: B-1 **Depth:** 3.5'-5.0' **Date:** 6-17-15

ACA ENGINEERING, INC.

Client: CT Consultants, Inc.
Project: Proposed Pump Stations
Jamestown WWTP
Project No: Y15024x10 **Figure** SA1

Tested By: George Chammas **Checked By:** Nick Chammas

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.7	3.5	3.7	0.6	86.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	100.0		
#4	94.3		
#8	91.3		
#16	89.1		
#30	87.6		
#50	86.7		
#100	86.6		
#200	86.5		

* (no specification provided)

Soil Description

Gray Sandy SILT, trace gravel

Atterberg Limits

PL= 22 LL= 25 PI= 3

Coefficients

D_{90}= 1.5855 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(1)

Remarks

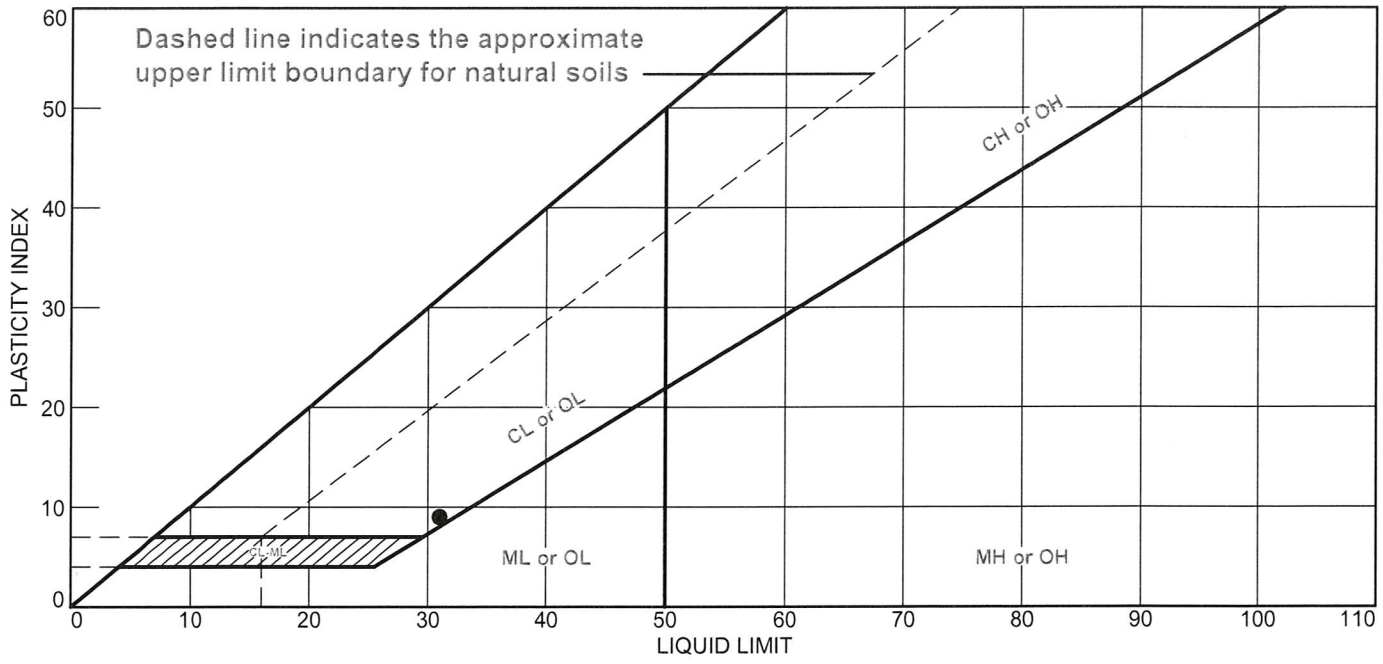
Location: Jamestown, PA
Sample Number: B-2 **Depth:** 8.5'-10.0' **Date:** 6-18-15

ACA ENGINEERING, INC.

Client: CT Consultants, Inc.
Project: Proposed Pump Stations
Jamestown WWTP
Project No: Y15024x10 **Figure** SA2

Tested By: George Chammas **Checked By:** Nick Chammas

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Silty CLAY.	31	22	9	100.0	99.5	CL

Project No. Y15024x10 **Client:** CT Consultants, Inc.

Project: Proposed Pump Stations
Jamestown WWTP

Location: Jamestown, PA

Sample Number: B-1 **Depth:** 3.5'-5.0'

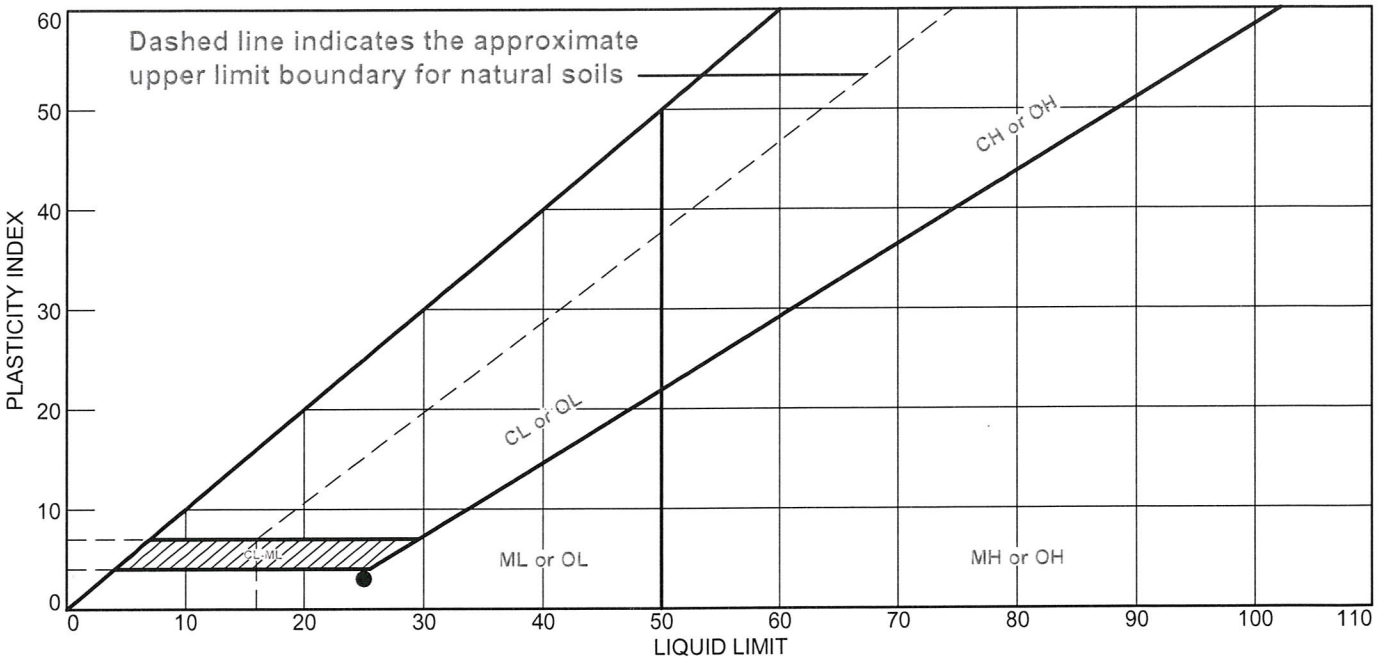
ACA ENGINEERING, INC.

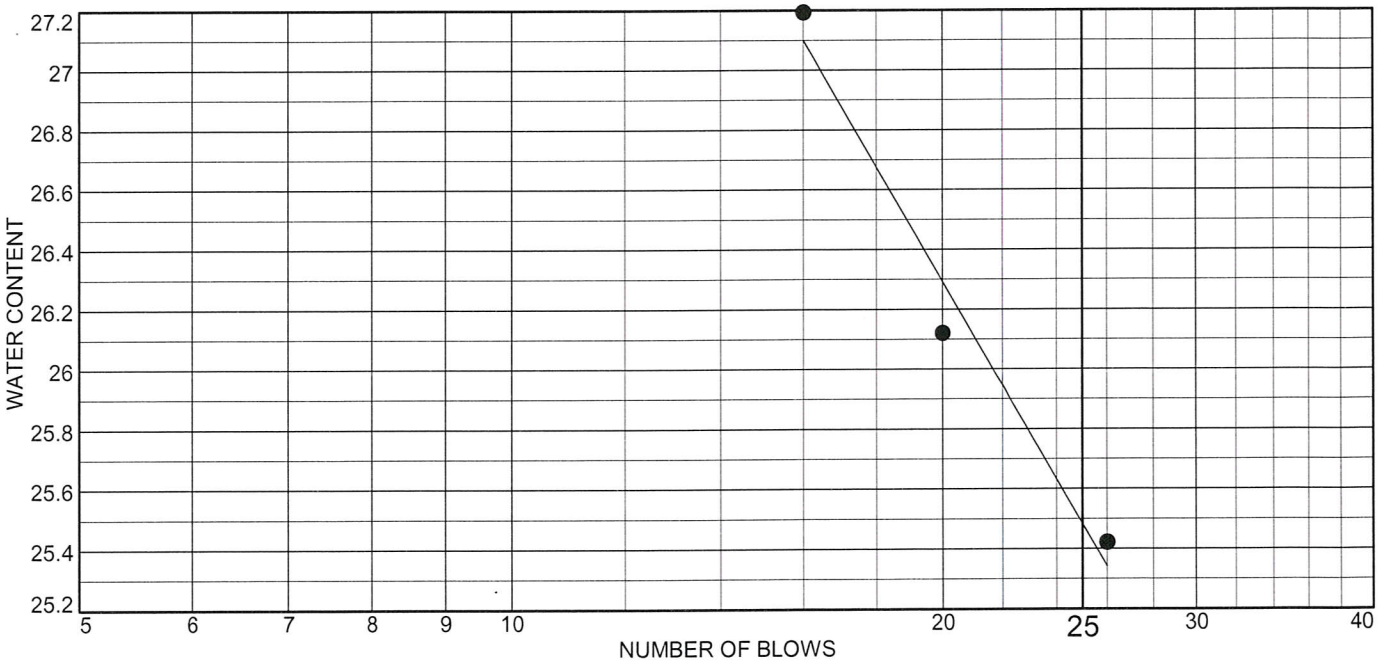
Remarks:

Figure ATT1

Tested By: James Harrison **Checked By:** Nick Chammas

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray Sandy SILT, trace gravel	25	22	3	87.1	86.5	ML

Project No. Y15024x10 **Client:** CT Consultants, Inc.

Project: Proposed Pump Stations

Jamestown WWTP

Location: Jamestown, PA

Sample Number: B-2 **Depth:** 8.5'-10.0'

Remarks:

ACA ENGINEERING, INC.

Figure ATT2

Tested By: George Chammas **Checked By:** Nick Chammas

ACA ENGINEERING, INC.
741 McClurg Road, Suite A
Boardman, Ohio 44512
P: (330) 729-1222 F: (330) 729-9222
info@acaohio.com

MOISTURE CONTENT REPORT

PROJECT: Proposed Pump Stations, Jamestown WWTP
CLIENT: CT Consultants, Inc.
PROJECT NO: Y15024x10
DATE: 6/17/2015

BORING NO.	SAMPLE DEPTH (ft)	MOISTURE CONTENT (%)
B-1	3.5-5.0	26.9
B-1	6.0-7.5	20.6
B-1	8.5-10.0	11.2
B-1	13.5-15.0	20.0
B-2	3.5-5.0	13.7
B-2	8.5-10.0	21.6
B-2	13.5-15.0	23.1
B-2	18.5-20.0	27.6

APPENDIX F

PHOTOGRAPHS

Photo 1	Photo 2
	
[View looking southeast at the proposed Pump Station Area]	[View looking west at the proposed Site]
Photo 3	**Photo 4**
	
[View looking northeast at the proposed Pump Station area]	[View looking southeast at the proposed Pump Station area]