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July 1, 2026 CT Project No. 232478

Ashtabula County
Department of Environmental Services
25 West Jefferson Street
Jefferson, Ohio

Geotechnical Subsurface Investigation
Kingsville I-90 Interchange Sanitary Sewers
Ashtabula County, Kingsville, Ohio

The following is the report of the geotechnical subsurface investigation performed by CT Consultants, Inc. (CT) for the referenced project. This study was performed for Ashtabula County to support design services for the Proposed Kingsville I-90 Interchange Sewers Project.

This report contains the results of our study, our engineering interpretation of the results concerning the project characteristics, design and construction recommendations for pavements, and our recommendations for installation and support of the proposed underground utilities.

Soil samples collected during this investigation will be stored at our laboratory for 90 days from the date of this report. The samples will be discarded after this time unless you request that they be saved or delivered to you.

Should you have any questions regarding this report or require additional information, please contact our office.

Sincerely,

CT Consultants, Inc. *A Verdantas Company*

Curtis E. Roupe, P.E.
Vice President

GEOTECHNICAL SUBSURFACE INVESTIGATION
KINGSVILLE I-90 INTERCHANGE SANITARY SEWERS
ASHTABULA COUNTY, KINGSVILLE, OHIO

FOR

DEPARTMENT OF ASHTABULA COUNTY
KINGSVILLE, OHIO

SUBMITTED

JULY 2, 2026
CT PROJECT NO. 232478

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1.0 INTRODUCTION

This geotechnical subsurface investigation report was performed for Ashtabula County to support design services for the Proposed Kingsville I-90 Interchange Sanitary Sewers Project. The general project area is shown on the Site Location Map (Plate 1.0). This report summarizes our understanding of the proposed construction, describes the investigative and testing procedures, presents the findings, discusses our evaluations and conclusions, and provides our design and construction recommendations for pavements, as well as provides our recommendations for installation and support of the proposed underground utilities.

The purpose of this investigation was to evaluate the subsurface conditions and laboratory data relative to the design and construction of the utilities and pavements at the referenced site. This investigation included fifteen (15) test borings, field and laboratory soil testing, and a geotechnical engineering evaluation of the test results. This report includes:

- A description of the subsurface soil and groundwater conditions encountered in the borings.
- Design recommendations related to the proposed pavements and underground utilities.
- Recommendations concerning soil- and groundwater-related construction procedures such as site preparation, earthwork, pavement subgrade preparation, and related field testing.

This investigation did not include an environmental assessment of the subsurface materials at this site.

2.0 INVESTIGATIVE PROCEDURES

This subsurface investigation included fifteen (15) test borings drilled by CT from August 12 to August 15, 2024. Borings B-1 and B-2 are 20 feet deep, B-3 is 48.6 feet, B-4 is 28.8 feet, B-5 is 48.7 feet, and B-15 is 23.7 feet. All the remaining boring were extended to 15 feet below existing grades. The test borings were located in the field by CT personnel in accordance with a proposed boring location plan submitted with the proposal for this study. The approximate locations of the borings are shown on the Test Boring Location Plan (Plates 2.0, 2.1, 2.2, and 2.3).

The test borings were performed in general accordance with geotechnical investigative procedures outlined in ASTM Standard D 1452. The test borings performed during this investigation were drilled with a truck-mounted drill rig (CME 55) utilizing 4-inch diameter solid-stem augers. The approximate ground surface elevations, termination depths' and elevations for the borings are summarized in Table 1.0 at the end of this section.

During auger advancement, soil samples were collected continuously for the first 5 feet, then at 2½-foot to a depth of 10 feet, and subsequently at 5-foot intervals thereafter. Split-spoon (SS) samples were obtained by the Standard Penetration Test (SPT) Method (ASTM D 1586), which consists of driving a 2-inch outside diameter split-barrel sampler into the soil with a 140-pound weight falling freely through a distance of 30 inches. The sampler was driven in three successive 6-inch increments with the number of blows per increment being recorded. The sum of the number of blows required to advance the sampler the second and third 6-inch increments is termed the Standard Penetration Resistance (N-value) and is presented on the Logs of Test Borings attached to this report. The samples were sealed in jars and shipped to our laboratory for further classification and testing.

The pavement and soil conditions encountered in the test borings are presented in the Logs of Test Borings, along with information related to sample data, SPT, water conditions observed in the borings, and laboratory test data. It should be noted that these logs have been prepared based on soil laboratory classification and testing as well as field logs of the encountered soils.

All recovered soil samples were visually and manually classified in accordance with the Ohio Department of Transportation (ODOT) soil classification system and Unified Soil Classification System (USCS) and were tested in our laboratory for moisture content (ASTM D 2216). Unconfined compressive strength estimates were obtained for the intact cohesive samples using a calibrated hand penetrometer. A particle size analysis (ASTM D 6913 and D 7928) and an Atterberg limits test (ASTM D 4318) were performed on representative samples on all borings except B-1, B-7, B-9, and B-13 to determine soil classification and soil index properties. The test results are presented on the Logs of Test Borings, Tabulation of Test Data sheets, Grain Size Distribution, and Atterberg Limits sheet attached to this report.

Soil conditions encountered in the test borings are presented in the Logs of Test Borings, along with information related to sample data, SPT results, water conditions observed in the borings, and laboratory test data. It should be noted that these logs have been prepared on the basis of laboratory classification and testing as well as field logs of the encountered soils.

Experience indicates that the actual subsoil conditions at a site could vary from those generalized on the basis of test borings made at specific locations. Therefore, it is essential that a geotechnical engineer be retained to provide soil engineering services during the site preparation, excavation, and foundation phases of the proposed project. This is to observe compliance with the design concepts, specifications, and recommendations, and to allow design changes in the event subsurface conditions differ from those anticipated prior to the start of construction.

As previously mentioned, test boring data is provided in the following table.

Boring Number	Boring Termination Depth (ft)	Approximate Ground Elevation (ft)	Approximate Ground Water Table Elevation (ft)
B-1	20	809	Not encountered
B-2	20	797	Not encountered
B-3	48.6	798	*763
B-4	28.8	779	Not encountered
B-5	48.7	788	Not encountered
B-6	15	783	*774
B-7	15	778	Not encountered
B-8	15	766	*756
B-9	15	774	*761
B-10	15	797	Not encountered
B-11	15	790	*780
B-12	15	789	*781
B-13	15	768	**756
B-14	15	740	Not encountered
B-15	23.7	718	*699.5

*Encountered during the drilling process.

** Measured at completion of the drilling process.

3.0 PROPOSED CONSTRUCTION

The proposed project consists of proposed sanitary sewers in Kingsville, Ohio. We understand that the proposed sanitary sewers are planned generally along South OH-193, South Ridge Road East (OH 84), and Green Road.

We also understand that these underground utilities will be installed using an open-cut excavation technique with a section installed using trenchless technologies.

Pavements are anticipated to consist of flexible (asphalt) sections. Final design grades are assumed to approximate existing roadway grades. Traffic loads and volumes were not available at the time of preparing this proposal.

4.0 GENERAL SITE AND SUBSURFACE CONDITIONS

4.1 General Site Conditions

At the time of our investigation, the project area consisted primarily of residential properties with some business facilities and a few fields in the project limit. Ground surface elevations at the boring locations ranged from Elevs. 718 to 809 feet. Evaluation of boreholes at OH-193 decreases to North until OH-193 intersects South Ridge Road East. The borehole surface elevations on South Ridge Road East rise from 774 to 790 feet and decrease to 768 feet before connecting with Green Road. Borehole surface elevations on Green Road decrease towards the North.

At the locations of Borings B-1, B-2, B-3, and B-5 surface material was crushed stone with asphalt fragments in nominal thickness ranging from 1 to 6 inches; remaining borings show topsoil at the surface with a nominal thickness of 3 to 12 inches.

4.2 General Soil and Rock Conditions

Based on the results of our soil exploration logs, and field and laboratory tests, the subsurface profile can generally be divided into two strata i.e., Stratum I with predominantly cohesive soils, Stratum II with predominantly granular soils, and miscellaneous, granular/cohesive Fill deposit. Description of fill and each stratum are given in the following paragraphs.

Fill: In Borings B-3, B-5, B-6 to B-8, and B-15, underlying the surface material, granular and cohesive fill material were encountered to depths of 1.5-feet to 9.0-feet below existing grades.

The granular fill material consisted of coarse to fine sand (A-3a) with trace amounts of asphalt fragments, crushed stones, and gravel. SPT N60-values with variable blows per foot (bpf), indicating very loose to dense compactness were recorded. Moisture contents ranged from 7 to 26 percent.

Stratum I: Stratum I consists of predominantly stiff to hard fine-grained soils with varying amounts of sand, and gravel, and when close to the surface organic matter, encountered underlying topsoil and/or fill deposits in Borings B-1 through B-5, B-9, and B-12 through B-15. Stratum I extends to a depth ranging from 2 feet to 45 feet below the current grade. Field SPT N-values ranged from 5 bpf to Split-Spoon Refusal (SSR-samples when more than 50 bpf is recorded for less than 6-inch penetration). An exception is the soil in Boring B-5 (SS-9), where a recorded SPT N-value of 3 bpf indicates soil with soft consistency. Moisture content ranged from 6 to 26 percent. The LL of 31, 25, 26, 30, 22, 19, and 26 percent, and PI of 13, 9, 9, 11, 7, 4, and 8 percent were determined in the laboratory for soil samples collected from Borings B-2 (SS-1), B-3 (SS-2), B-4 (SS-6), B-5 (SS-2, and SS-9), B-6 (SS-2) and B-15 (SS-2). The visual-manual classification along with grain-size distribution and Atterberg test results, Stratum I can be classified as Silty Clay (A-6a), Silt and Clay (A-6b), Sandy Silt (A-4a) and Silt (A-4b) in accordance with the Ohio Department of Transportation (ODOT) Soil Classification System.

Stratum II: Stratum II consists of predominantly loose to medium-dense granular soils with varying amounts of silt and clay underlying topsoil and/or fill deposits encountered in Borings B-6, B-7, B-8, B-10 to B-14 and underlying materials from Stratum I in Borings B-1, and B-9 extends to a depth ranging from 4 feet to 15 feet below the grade.

In Borings B-6 (SS-5), B-7 (SS-6), B-10 (SS-1 and SS-2), and B-11(SS-1 and SS-2) SPT N-values between 2 and 3 bpf were recorded indicating very loose soil compactness. Field SPT N-values ranged from 2 to 23 bpf. The moisture content ranged from 6 to 24 percent. Atterberg test results show the soil samples collected from Borings B-10, B-11, and B-12 were non-plastic. The visual-manual classification along with grain-size distribution and Atterberg test results, Stratum II can be classified as Coarse and Fine Snad (A-3a) and Fine Sand (A-3) in accordance with American Association of State Highway and Transportation Officials (AASHTO) Soil Classification System.

Bedrock: The severely weathered shale bedrock is encountered in Borings B-4, B-5, and B-15 at respective depths of 25 feet, 45 feet, and 14.5 feet below the grade. These three borings are terminated in this material. Split Spoon Refusal (SSR) was recorded in the weathered shale stratum with Split Spoon sampler penetration of 2 to 3 inches per 6-inch increment.

Additional descriptions of the stratigraphy encountered in the borings are presented on the Logs of Test Borings.

4.3 Groundwater Conditions

Groundwater was encountered during drilling in Borings B-3, B-6, B-8, B-9, B-11, B-12, B-13, and B-15 at respective depths of 35, 9, 10, 13, 10, 8, 8, and 18.5-feet below the current grade. Groundwater was only encountered in Boring B-13 upon completion of drilling at 12 feet below grade.

It should be noted all the boreholes were drilled and backfilled within the same day and stabilized water levels are not likely to have occurred over this limited time period. Instrumentation was installed on Boring B-15 to observe long-term groundwater levels. The additional soundings of groundwater level in the installed piezometer well in Boring B-15 were obtained on 10-31-2024, and 12-13-2024. The first site visit observed no water present in the installed well. The second site visit obtained a water level from 13.1 to 13.2 feet below the current grade based on three consecutive readings performed 30 minutes apart after the water present in the casing was bailed out.

Based on the soil characteristics and groundwater conditions encountered in the borings, and in particular, based on the water observed at completion in Boring B-13 at a depth of 12 feet, and additional observation of Boring Holes B-15 where water was detected at 13 ± feet below the grade, it is our opinion that the static, long-term groundwater table about 12 to 13 feet below grade in the area of these two borings. However, groundwater can be encountered elsewhere when it seeps from the surface through the fill and gets trapped on the top of the less permeable cohesive soils, at the delineation border between upper granular soils underlain with cohesive soils, or when it's trapped at the top of solid bedrock which is apparently the case throughout the borings drilled for this project based on the field recorded water

depths during the drilling process. Generally, groundwater elevations can fluctuate with seasonal and climatic influences. In particular, “perched” groundwater may be encountered within the pavement base materials, fill materials, and in the granular soils layered between less permeable cohesive strata. Therefore, the groundwater conditions may vary at different times of the year from those encountered during this exploration.

The contractor must be aware of the possibility that water might percolate through the layered granular material (sand and gravel materials mainly encountered at the site) and produce an unstable bottom of excavated trenches. Specifically, this precaution will apply in the areas close to the water bodies such as areas of borings B-6 and B-8 on I-90, and borings on South Ridge Road East.

5.0 DESIGN RECOMMENDATIONS

The following conclusions and recommendations are based on our understanding of the proposed construction and on the data obtained during the field investigation. If the project information or location as outlined is incorrect or should change significantly, a review of these recommendations should be made by CT. These recommendations are subject to the satisfactory completion of the recommended site and subgrade preparation and fill placement operations described in Section 6.0, "Construction Recommendations".

5.1 Pipe Support

We understand that the underground utility improvements for this project will include the installation of new sanitary sewer lines with associated manhole structures. Per the current stage of design, it is planned to be a 4-HDPE and 8-inch PVC pipe with inverts at depths ranging from 6 to 17 below existing grades. A section of the proposed 4-inch HDPE pipe, located under Interstate I-90, is proposed to be installed using trenchless technology. The remaining sections of these underground utilities will be installed using an open-cut excavation technique. Based on our project understanding, the proposed sewer lines are anticipated to be supported on the Stratum I cohesive and Stratum II granular material encountered in subsoil exploration.

Based on the subsurface exploration findings, laboratory, and field-testing results, it is our professional opinion that the soils within explored depths are capable of sufficiently supporting planned piping systems and structures (e.g., manholes, etc.). planned for the improvements

It will be critical to maintain a sufficient thickness of bedding and haunching to provide adequate support and protection for the underground utilities. Bedding and haunching materials should conform to pipe manufacturer specifications and recommendations.

We recommend that the trench excavation along the proposed underground utilities invert be inspected by a CT geotechnical engineer or qualified representative. This is to confirm that the encountered subsoils are consistent with those encountered in

the test borings and that the exposed materials are capable of supporting the proposed underground utilities.

This project is primarily going to be installed by open cut methods, therefore the report primarily addresses the soil conditions pertaining to those areas. For the potential areas installed using trenchless technologies the soil strength and variability should be evaluated when the depth of the installation is finalized. It should also be noted that while boulders or cobbles were not encountered in the borings, it is not uncommon for boulders or cobbles to be present in the geological setting of this project.

5.2 Open-Cut Installation Methods

The sides of temporary excavations for utility installation and other construction should be adequately sloped to provide stable sides and safe working conditions. Otherwise, the excavation must be properly braced against lateral movements. In any case, applicable Occupational Safety and Health Administration (OSHA) safety standards must be followed. Based on the test borings, it is likely that excavations will encounter a range of soil conditions that include the following OSHA designations:

- OSHA Type A soils (cohesive soils with unconfined compressive strengths of 3,000 pounds per square foot (psf) or greater),
- OSHA Type B soils (cohesive soils with unconfined compressive strengths greater than 1,000 psf but less than 3,000 psf), and
- OSHA Type C soils (granular soils, cohesive soils with unconfined compressive strengths of 1,000 psf or less, and water-bearing soils).

For temporary excavations in Type A, B, and C soils, side slopes should be constructed no steeper than ¾ horizontal to 1 vertical (¾H:1V), 1H:1V, and 1½H:1V, respectively. For situations where an excavation encounters a lower strength soil underlying a higher strength soil, the slope of the entire excavation is governed by the lower strength soil. In all cases, flatter slopes may be required if lower strength soils or adverse seepage conditions are encountered during construction.

For permanent excavation slopes, we recommend that grades be no steeper than 3H:1V without a more extensive geotechnical evaluation of the proposed construction plans and site conditions.

Based on the conditions encountered in the test borings, the probable method of excavation within the loose to very loose cohesionless soils is expected to consist of conventional excavation equipment such as a backhoe or track excavator and metal trench box. We highly recommend using a grading bucket for final excavation close to the designed bearing elevation (bottom of the trench) to reduce disturbance of the natural soils.

5.3 Braced Excavations

Braced excavations constructed using soldier piles with wood lagging or sheet piling may be considered in areas of restricted access or proximity to structures. Also, this method of deep excavation might be applied for sending and receiving pit excavation for trenchless drilling at the before-mentioned crossings below the Interstate Highway. The method employed will depend on the construction sequencing, required access size and area, and economic considerations.

All braced excavations should be designed to resist lateral earth pressures. Based on the encountered granular and cohesive soils in the subsoil profile, it will be provided parameters for both types of soils; parameter values for cohesive soils will be presented in parentheses. A total (wet) unit weight of 125 (130) pounds per cubic foot (pcf) should be utilized for developing lateral soil pressures. A coefficient of active lateral earth pressure (k_a) of 0.36 (0.58) may be used for the analysis of cantilevered sheet piling or similar systems that allow slight movement or yielding in the soil. However, higher lateral earth pressures may be associated with braced excavations that restrain movement and prevent development of “active” soil conditions. In the case of restrained movement an at rest coefficient (Ko) of 0.53 (0.65) should be used. The actual design of the shaft or braced excavation will depend on the size and configuration of the opening, as well as the bracing system selected by the contractor.

Additionally, lateral loading due to hydrostatic pressures below the design groundwater depth should be included in the design of below-grade walls. Depending on the design methodology, total lateral pressures would be the resultant of the hydrostatic pressures in combination with submerged (or "effective") unit weights of the soil. An effective soil unit weight of 63 (68) pcf should be used for lateral earth pressure design below the design groundwater depth.

It should be noted that the above k-parameters may be used for general design of excavation support systems associated with the project. However, certain types of braced excavations may account for method-specific earth pressure distributions, for which the above parameters should be reviewed and utilized in the proper context of the design method/system.

A passive earth pressure coefficient (k_p) of 2.7 may be utilized for the portion of temporary walls (e.g., sheet pile walls) that is below the excavation bottom. In the case of permanent structures, a k_p value of 2.7 should only be utilized below the frost depth of 3½ feet below toe grades. It should be noted that some wall movement or horizontal displacement is typically needed to mobilize the full passive pressure of the soil.

It should also be noted that the earth pressure coefficients in the preceding paragraphs are based on a level backfill condition behind the retaining wall. In areas where appreciable sloping materials are present behind the top of the wall, surcharge loading or equivalent higher earth pressure coefficients should be evaluated, based on the sloping material, backfill slope, and proximity to the wall. In general, 50 percent of the vertical surcharge load should be used for lateral loading in the design of the wall.

5.4 Construction (General)

Construction traffic and excavated material stockpiles should be kept away from the excavation a minimum distance equal to the full depth of the excavation. In all cases, pertinent OSHA requirements must be followed, and adequate protection for workers must be provided.

Where existing buildings or structures, including underground utilities, are located within a distance from the excavation equal to approximately twice its depth, an adequate system of sheet piling and/or lateral bracing may be required to prevent lateral movements that could cause settlement. Any retaining system proposed by the contractor should be reviewed by a registered professional engineer prior to approval for installation and use.

It is also suggested that a condition survey (i.e., preconstruction documentation) of any existing structures and transportation infrastructure located in the vicinity of the proposed underground utilities alignment be completed. For general below-grade underground utilities installation, we recommend the condition survey extend a distance from the proposed installation extents equal to the depth of the excavation, but not less than 50 feet. The condition survey should be extended to 100 feet from the underground utilities' alignment in areas where driving of sheet piling or H-piling, or compaction of granular material will be performed for braced excavations. The condition survey should identify existing cracks and other forms of distress to the structures before the start of construction operations. This procedure will be helpful to evaluate possible effects the construction operations may have on nearby structures and mitigate potential disputes with property owners.

The construction excavation should not be left open any longer than necessary. As soon as a section of the underground utilities is completed, the area should be backfilled to final grade. After the specified bedding material has been provided below and around the pipe, backfill material placed above the pipes should be compacted sufficiently to achieve stable backfill and avoid undesirable settlements.

Where underground utilities will be installed beneath pavement areas, future structure areas, or future pavement areas, the backfill material should be placed in uniform layers not more than 8 inches thick and compacted to 100 percent of the maximum dry density as determined by ASTM D 698 (Standard Proctor). Backfill placed in pavement areas should consist of dense-graded aggregate, such as ODOT Item 304 material. In order to achieve the desired compaction, the backfill material

should be within 3 percent of the optimum moisture content. Alternatively, flowable controlled-density fill could be used to backfill the excavated trenches.

We emphasize the need for placing the fill in lifts and compacting each lift to the specified density, especially where the trench will be directly beneath roadway pavement. The installation contractor should not be allowed to push or end-dump several feet of backfill into the trench as a single layer or lift, because the lower portion of a thick lift will not achieve proper densification from compaction equipment operating at the surface of that lift. If the backfill is not properly placed and compacted, undesirable trench backfill settlement may occur.

It is recommended that all earthwork and site preparation activities be conducted under adequate specifications and properly monitored in the field by a CT geotechnical engineer or qualified representative.

5.5 Construction Dewatering

Based on the soil characteristics and groundwater conditions encountered in the borings, it is our opinion that the static, long-term groundwater table is generally12 to 13 feet below existing ground surface. It is important to note that excavation at SR-193 connecting South Ridge Road East and the South Ridge Road East may experience unstable trench bottom (such as the areas of boring B-6 and B-8 on SR-193, and B-11 to B-13 on South Ridge Road East). To prevent this from occurring, a sufficient dewatering system may be considered, designed, and implemented in the subject areas. The water level must be lowered at least to the depth of two feet below the trench bottom to allow workability. Sometimes, due to a large water influx from the nearby body of water (depending on the permeability characteristics of the soils) this operation might be very difficult. If that is the case, a different method of trench bottom stabilization must be considered such as undercutting and replacement with 12-inch or more (depends of the severity of the situation) thick layer of coarse aggregate (#1's and #2's) wrapped in Geofabric or Geogrid (full overlap on the top). The depth of the undercut will be determined to allow installation of sufficient thickness of the coarse stone aggregate and placement of the designed pipe stone bedding.

Groundwater elevations can fluctuate with seasonal and climatic influences. In particular, “perched” groundwater may be encountered within, the pavement base and existing fill materials. Therefore, the groundwater conditions may vary at different times of the year from those encountered during this exploration.

If excavations below the groundwater table are required (e.g., site utilities, foundations, etc.), or if seasonally elevated groundwater conditions are prevalent at the time of construction, diligent dewatering using point wells will be required for groundwater management during construction. In the event excessive seepage is encountered during construction, CT may be notified to evaluate whether other dewatering methods are required. Installation of the proposed site utilities is expected to require excavation (in lower areas) below the “normal” groundwater level and groundwater seepage into excavations should be anticipated.

5.6 Subgrades

An evaluation of the subgrade soils was completed in general accordance with ODOT Geotechnical Design Manual (GDM) Section 600 “Subgrades” (July 19, 2024). As part of this evaluation, the ODOT “Subgrade Analysis” worksheet (V14.5, 11/06/2024) was completed and is attached to this report.

Final pavement grades are assumed to approximate existing grades. Based on the existing pavement cross-sections encountered in the borings, the proposed subgrade is presumed to be 1 to 12 inches below the existing top of pavement grades (represented as a 0.1 to 1 foot cut in the ODOT “Subgrade Analysis” worksheet).

Based on GDM Subsection 610, soils classified as ODOT A-4b, A-2-5, A-5, A-7-5, A-8a, A-8b, or rock have been designated as being problematic and unsuitable subgrade with respect to pavement subgrade support. None of these soil types were encountered at planned subgrade elevations in the borings performed for this exploration; however, weathered rock was encountered in boring B-13 (S. Ridge Road E.) at 5-feet below existing ground surface. Therefore, if rock material is encountered at the subgrade elevation, it is recommended to remove minimum of 1-feet of

weathered rock and replace it with well-graded granular material meeting natural filter criteria for the subgrade as direct in GDM subsection 608 Excavate and Replace (Item 204). The replacement material should be compacted to at least 100 percent of the maximum dry density as determined by ASTM D 698 (Standard Proctor).

Based on GDM Section 600 criteria, subgrade soils with moisture contents greater than 3 percent above optimum likely indicate the presence of unstable subgrade that may require some form of subgrade modification. Approximately 10 percent of the tested subgrade soil samples were greater than 3 percent above the optimum as determined using GDM Section 600 criteria. Thus, where moisture contents were wet of optimum, they were appreciably wet of optimum. These data indicate that scarification and aeration methods may not be feasible to achieve satisfactory proof rolling and stabilization of the cohesive subgrades. However, scarification and aeration methods may be utilized if construction schedule will allow such soil modification for cohesive and cohesionless materials.

The type and thickness of subgrade modification is determined by GSM Section 600 criteria based on the average, low SPT N60-value (N60L) of the subgrade soils in a particular portion of the project area, hand penetrometer value, soil type, and moisture content. Based on these criteria, subgrade modification is not anticipated.

It should be noted that GSM Section 600 analyses are used as a pre-construction tool to plan subgrade modification alternatives. Actual subgrade modification will depend on field observations of proof-rolling conditions at the time of construction. Changes in soil moisture content could create more or less favorable subgrade conditions that may result in adjustments to subgrade modification or soil stabilization requirements at the time of construction.

5.7 Flexible (Asphalt) Pavement Design

Due to the large improvement area, we attempted to evaluate the pavement soil subgrade based on the predominant soil type detected at the planned subgrade for

the new pavement by dividing the portions of the project into the areas where specific types of soils are predominant.

Based on ODOT soil classification, the project can be divided into two sections. Section A is predominantly fine-grained soils classified as A-4, A-4a, A-6a, and A-6b at 1 foot below ground surface (bgs), and explored by borings B-1 to B-5 and B-9, excluding B-3. Section B is predominantly granular soils classified as A-1-a, A-1-b, A-3, and A-3a at 1foot bgs, and explored by borings B-3, B-6 to B-15, excluding Boring B-9.

Based on the GDM Section 600 analysis, a design CBR value of 6 percent was determined for Section A. It should be noted that the CBR determination by the GDM spreadsheet is based on the average Group Index of all the evaluated 20 samples. A design CBR value of 9 percent was determined for Section B. This design CBR is determined based on the average Group Index of all evaluated 40 samples. A clear distinction between the section is not cleary defined, therefor we recommend using the more conservative CBR value of 6% for pavement design.

It should also be noted that the design CBR value is based on subgrades compacted to at least 100 percent of the maximum dry density as determined by ASTM D 698 (Standard Proctor) or verified as stable through proof-rolling.

All pavement design and paving operations should conform to ODOT specifications. The pavement and subgrade preparation procedures outlined in this report should result in a reasonably workable and satisfactory pavement. It should be recognized, however, that all pavements need repairs or overlays over time as a result of progressive yielding under repeated loading for a prolonged period.

It is recommended that proof rolling, placement of aggregate base, and placement of asphalt be performed within as short a time period as possible. Exposure of the aggregate base to rain, snow, or freezing conditions may lead to deterioration of the subgrade and/or base materials due to excessive moisture conditions and to difficulties in achieving the required compaction.

5.8 Pavement Drainage

There is potential areas such as low areas or sags in vertical curves where water may remain in the base for extended periods of time, creating localized wet, soft pockets. The presence of these pockets will increase the likelihood that pavement distress (cracking, potholes, etc.) will develop. Drainage features may include grading the subgrade surface to slope downward to the outside edge of pavements and/or providing longitudinal edge drains connected to storm sewers or other outlets. A system of "finger drains" could also be installed near catch basins within the pavement areas to collect surface water, thus reducing the potential for freeze-thaw effects on the pavement.

6.0 QUALIFICATION OF RECOMMENDATIONS

Our evaluation of geotechnical-related underground utilities installation and support conditions has been based on the data obtained during our field investigation and our understanding of the furnished site and project information. General subsurface conditions were based on interpretation of the subsurface data at specific boring locations. Regardless of the thoroughness of a subsurface investigation, there is the possibility that conditions between borings will differ from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the soil conditions. This is especially true for previously developed sites. Therefore, experienced geotechnical engineers should observe earthwork and foundation construction to confirm that the conditions anticipated in design are noted. Otherwise, CT assumes no responsibility for construction compliance with the design concepts, specifications, or recommendations.

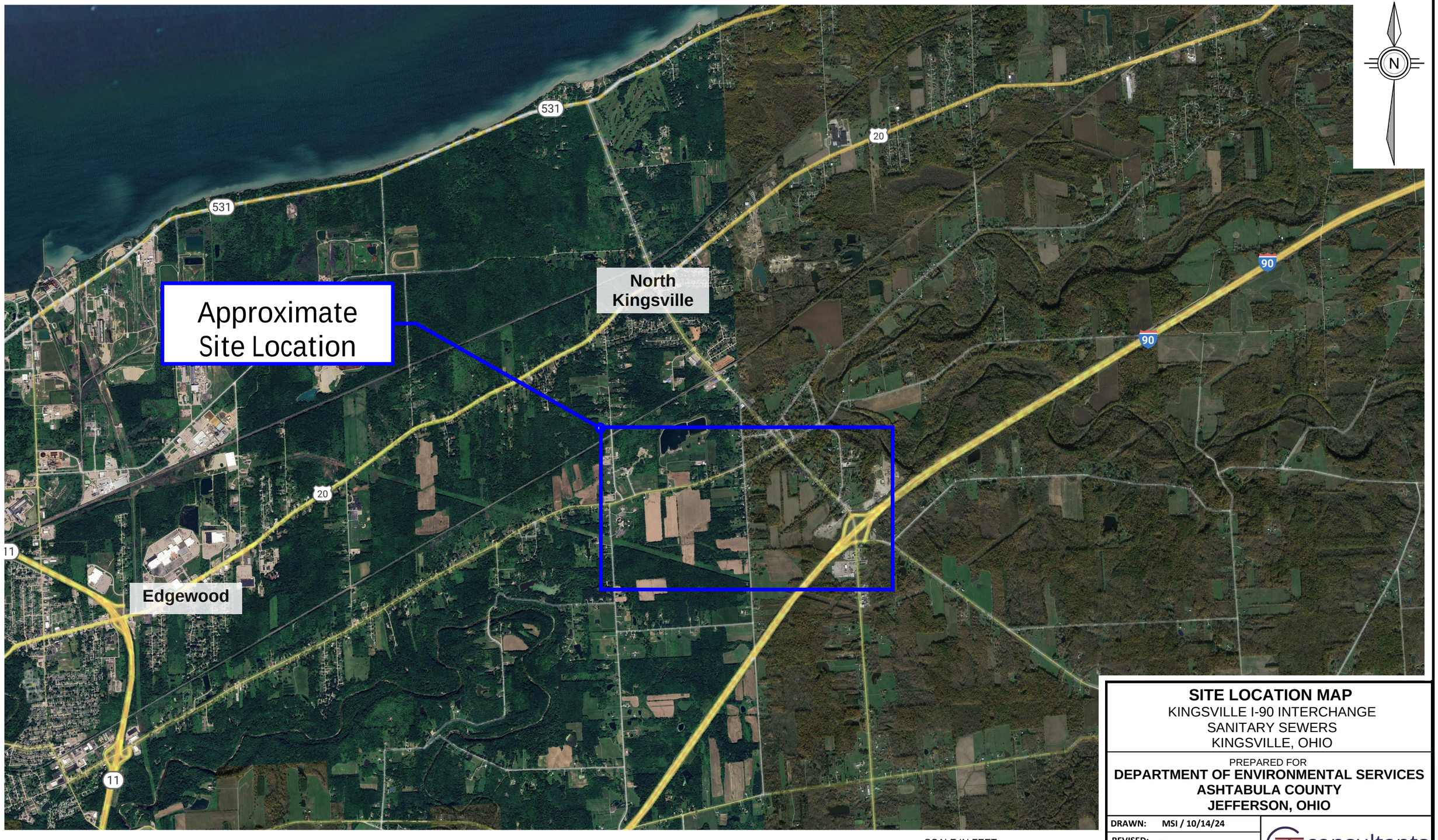
The geotechnical recommendations in this report have been developed on the basis of project characteristics described in this report and subsurface conditions encountered during the subsurface exploration program. If project criteria or locations change, a qualified geotechnical engineer should be permitted to determine whether the recommendations must be modified. The findings of such a review will be presented in a supplemental report.

The nature and extent of variations between the borings may not become evident until the course of construction. If such variations are encountered, it will be necessary to reevaluate the recommendations of this report after on-site observations of the conditions.

Our professional services have been performed, our findings derived, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied. CT is not responsible for the conclusions, opinions, or recommendations of others based on this data.

PLATES

PLATE 1.0	**SITE LOCATION MAP**
PLATE 2.0 to 2.3	**TEST BORING LOCATION PLAN**



SCALE IN FEET

0' 4,000' 8,000'

SITE LOCATION MAP

KINGSVILLE I-90 INTERCHANGE
SANITARY SEWERS
KINGSVILLE, OHIO

PREPARED FOR
DEPARTMENT OF ENVIRONMENTAL SERVICES
ASHTABULA COUNTY
JEFFERSON, OHIO

DRAWN:	MSI / 10/14/24
REVISED:	---
PROJECT No:	232478

PLATE 1.0

consultants
engineers • architects • planners
A Verdantas Company

BASE PLAN "SITE AERIAL PLAN" DATED 11/06/2021 OBTAINED FROM GOOGLE EARTH.



LEGEND:

B-1

APPROXIMATE TEST BORING LOCATION

SCALE IN FEET

0' 400' 800'

BASE PLAN "SITE AERIAL PLAN" DATED 11/06/2021 OBTAINED FROM GOOGLE EARTH.

TEST BORING LOCATION PLAN

KINGSVILLE I-90 INTERCHANGE
SANITARY SEWERS
KINGSVILLE, OHIO

PREPARED FOR
DEPARTMENT OF ENVIRONMENTAL SERVICES
ASHTABULA COUNTY
JEFFERSON, OHIO

DRAWN:	MSI / 10/14/24
REVISED:	---
PROJECT No:	232478

PLATE 2.0

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A Verdantas Company



LEGEND:

B-1

APPROXIMATE TEST BORING LOCATION

SCALE IN FEET

0' 400' 800'

BASE PLAN "SITE AERIAL PLAN" DATED 11/06/2021 OBTAINED FROM GOOGLE EARTH.

TEST BORING LOCATION PLAN

KINGSVILLE I-90 INTERCHANGE
SANITARY SEWERS
KINGSVILLE, OHIO

PREPARED FOR
DEPARTMENT OF ENVIRONMENTAL SERVICES
ASHTABULA COUNTY
JEFFERSON, OHIO

DRAWN:	MSI / 10/14/24
REVISED:	---
PROJECT No:	232478

PLATE 2.1

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LEGEND:

B-1

APPROXIMATE TEST BORING LOCATION

SCALE IN FEET

0' 400' 800'

BASE PLAN "SITE AERIAL PLAN" DATED 06/07/2021 OBTAINED FROM GOOGLE EARTH.

TEST BORING LOCATION PLAN

KINGSVILLE I-90 INTERCHANGE
SANITARY SEWERS
KINGSVILLE, OHIO

PREPARED FOR
DEPARTMENT OF ENVIRONMENTAL SERVICES
ASHTABULA COUNTY
JEFFERSON, OHIO

DRAWN:	MSI / 10/14/24
REVISED:	---
PROJECT No:	232478

PLATE 2.2

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LEGEND:

B-1

APPROXIMATE TEST BORING LOCATION

SCALE IN FEET

0' 400' 800'

BASE PLAN "SITE AERIAL PLAN" DATED 06/07//2021 OBTAINED FROM GOOGLE EARTH.

TEST BORING LOCATION PLAN

KINGSVILLE I-90 INTERCHANGE
SANITARY SEWERS
KINGSVILLE, OHIO

PREPARED FOR
DEPARTMENT OF ENVIRONMENTAL SERVICES
ASHTABULA COUNTY
JEFFERSON, OHIO

DRAWN:	MSI / 10/14/24
REVISED:	---
PROJECT No:	232478

PLATE 2.3

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APPENDIX A

LOGS OF TEST BORINGS

CT Consultants, Inc.
1915 N 12th Street
Toledo Ohio 43604
Telephone: (419)324-2222

BORING NUMBER B-1

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH
PROJECT NAME Kingsville I-90 Interchange Sanitary Sewers
PROJECT NUMBER 232478
PROJECT LOCATION Kingsville, OH
DRILLING CONTRACTOR SME JH EP
RIG NO. CME 55
GROUND ELEVATION 809 ft
DRILLING METHOD 4 in. SSA
GROUND WATER LEVELS:
DATE STARTED 8/12/24
COMPLETED 8/12/24
AT TIME OF DRILLING None
LOGGED BY KKC
CHECKED BY IEH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		CRUSHED STONE - 6 Inches						15
			0.5'	SS 1	44	9-9-7 (16)	4.50		
			Moist Very Stiff Gray/Brown SILT and CLAY (A-6a), Some Sand, Trace Gravel						18
			1.5'	SS 2	83	8-9-9 (18)	NP		
805			Moist Medium Dense Gray COARSE and FINE SAND (A-3a), Little Gravel, Little Clay, Trace Silt, Trace Organics						20
				SS 3	100	6-6-7 (13)	4.00		
	5		4.0'	SS 4	83	7-10-12 (22)	4.50		18
			Moist Stiff to Very Stiff Brown SILTY CLAY (A-6b), Little Sand, Trace Gravel						
			4.5'						
			Moist Very Stiff to Hard Brown SILT and CLAY (A-6a), Some Sand, Trace Gravel						
800				SS 5	100	9-10-18 (28)	4.50		15
	10								
795			14.5'	SS 6	100	7-15-14 (29)	4.50		12
	15		Moist Very Stiff to Hard Gray SANDY SILT (A-4a), Little Clay, Trace Gravel						
790				SS 7	100	9-12-10 (22)	4.50		13
	20		20.0'						
			Bottom of hole at 20.0 feet.						

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BORING NUMBER B-2

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH
PROJECT NAME Kingsville I-90 Interchange Sanitary Sewers
PROJECT NUMBER 232478
PROJECT LOCATION Kingsville, OH
DRILLING CONTRACTOR SME JH EP
RIG NO. CME 55
GROUND ELEVATION 797 ft
DRILLING METHOD 4 in. SSA
GROUND WATER LEVELS:
DATE STARTED 8/12/24
COMPLETED 8/12/24
AT TIME OF DRILLING None
LOGGED BY KKC
CHECKED BY IEH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		CRUSHED STONE w/Asphalt Fragments - 6 Inches	SS 1	39	9-7-7 (14)	NI		15
			0.5'						
795			Moist Very Stiff to Hard Gray SILT and CLAY, Some Sand, Trace Gravel A-6a (7)	SS 2	100	7-11-8 (19)	4.50		14
			1.5'						
			Moist Very Stiff to Hard Brown SANDY SILT (A-4a), Little Clay, Trace Gravel	SS 3	100	7-6-7 (13)	4.50		15
			3.0'						
	5		Moist Stiff to Very Stiff Brown SILTY CLAY (A-6b), Some Sand	SS 4	83	10-10-10 (20)	4.50		16
790			@4.5': Trace Gravel						
			8.0'						
			Moist Hard Gray SANDY SILT (A-4a), Little Clay, Trace Gravel	SS 5	100	12-15-21 (36)	4.50		13
	10								
785									
			13.5'						
			Moist Very Stiff to Hard Gray SANDY SILT (A-4a), Little Clay, Trace Gravel	SS 6	100	8-11-15 (26)	4.50		14
	15		15.0'						
			Moist Very Stiff to Hard Gray SILT and CLAY (A-6a), Little Sand, Trace Gravel						
780									
				SS 7	100	6-7-10 (17)	4.50		16
	20		20.0'						
			Bottom of hole at 20.0 feet.						

PL MC LL
20 40 60 80
▲ SPT N VALUE ▲
20 40 60 80

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Toledo Ohio 43604
Telephone: (419)324-2222

BORING NUMBER B-3

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH
PROJECT NAME Kingsville I-90 Interchange Sanitary Sewers
PROJECT NUMBER 232478
PROJECT LOCATION Kingsville, OH
DRILLING CONTRACTOR SME JH EP
RIG NO. CME 55
GROUND ELEVATION 798 ft
DRILLING METHOD 4 in. SSA
GROUND WATER LEVELS:
DATE STARTED 8/13/24
COMPLETED 8/13/24
AT TIME OF DRILLING 35.0 ft / Elev 763.0 ft
LOGGED BY KKC
CHECKED BY IEH
AT END OF DRILLING None
NOTES Split spoon refusal encountered at a depth of 48.6 feet.
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0	CRUSHED STONE w/Asphalt Fragments and Topsoil - 6 Inches	SS 1	67	12-5-4 (9)	NP		12
		0.5' FILL - Moist Loose Brown/Dark Brown COARSE and FINE SAND, Little Silt, Little Crushed Stone, Trace Organics	SS 2	33	4-4-3 (7)	2.00	107	16
795		2.5' FILL - Moist Medium Stiff to Stiff Brown SANDY SILT, Some Crushed Stone, Little Clay, Trace Asphalt Fragments A-4a (3)	SS 3	94	14-33-9 (42)	4.50		12
	5	4.0' FILL - Moist Very Stiff to Hard Black/Gray/Brown SILTY CLAY, "and" Crushed Stone, Little Asphalt Fragments, Little Sand	SS 4	100	9-7-14 (21)	4.50		15
790		4.5' Moist Very Stiff to Hard Brown SILT and CLAY (A-6a), Some Sand, Trace Gravel	SS 5	83	8-7-8 (15)	4.00		16
	10	@8.5': Stiff						
785		@12': Very Stiff, Gray	SS 6	78	8-9-12 (21)	3.75		16
	15							
780		@18.5': Stiff to Very Stiff	SS 7	100	4-5-10 (15)	4.50		15
	20							
775		23.5' Moist Hard Gray SANDY SILT (A-4a), Little Clay, Trace Gravel	SS 8	100	14-16-19 (35)	4.50		14
770	25	28.5' Moist Hard Gray SILT and CLAY (A-6a), Little Sand, Trace Gravel	SS 9	100	9-16-16 (32)	4.50		16
	30							

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(Continued Next Page)

CT Consultants, Inc.
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BORING NUMBER B-3

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH **PROJECT NAME** Kingsville I-90 Interchange Sanitary Sewers

PROJECT NUMBER 232478 **PROJECT LOCATION** Kingsville, OH

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / ▲ SPT N VALUE ▲ (20 40 60 80)
765									
			34.5'	SS 10	100	6-22-28 (50)	NP		6 ● ▲
	35		▽ Gray Severely WEATHERED SHALE						
760			38.5'						
			Moist Very Hard Gray SANDY SILT (A-4a), Little Shale Fragments, Little Clay	SS 11	67	21-28-40 (68)	4.50		11 ● ▲
	40								
755			43.5'						
			Moist Very Hard Gray SILT (A-4b), Little Shale Fragments, Little Clay, Little Sand	SS 12	100	50/3"	4.50		13 ● >>▲
	45								
750			48.6'						
			Bottom of hole at 48.6 feet.	SS 13	0	50/1"	NR		>>▲

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BORING NUMBER B-4

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH
PROJECT NAME Kingsville I-90 Interchange Sanitary Sewers
PROJECT NUMBER 232478
PROJECT LOCATION Kingsville, OH
DRILLING CONTRACTOR SME JH EP
RIG NO. CME 55
GROUND ELEVATION 779 ft
DRILLING METHOD 4 in. SSA
GROUND WATER LEVELS:
DATE STARTED 8/14/24
COMPLETED 8/14/24
AT TIME OF DRILLING None
LOGGED BY KKC
CHECKED BY IEH
AT END OF DRILLING None
NOTES Split spoon refusal encountered at a depth of 28.8 feet.
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		TOPSOIL - 4 Inches 0.3'	SS 1	56	5-5-5 (10)	4.50	108	13
			Moist Stiff to Very Stiff Brown SANDY SILT (A-4a), Little Clay, Trace Gravel, Trace Organics 1.5'	SS 2	89	3-3-4 (7)	4.50		13
775			Moist Medium Stiff to Stiff Brown SANDY SILT (A-4a), Little Clay, Trace Gravel 3.0'	SS 3	100	5-9-10 (19)	4.50		13
	5		Moist Very Stiff to Hard Brown SANDY SILT (A-4a), Little Clay, Trace Gravel	SS 4	100	10-10-12 (22)	4.50		15
770			@8.5': Stiff to Very Stiff	SS 5	100	3-6-8 (14)	4.50		14
	10		@12.5': Very Stiff, Gray, Some Clay, A-4a (7)						
765				SS 6	100	9-8-8 (16)	6.84	118	13
	15								
760			@18.5': Very Stiff to Hard	SS 7	100	10-14-15 (29)	4.50		
	20		23.5'						
755			Moist Very Hard Gray SILT (A-4b), Little Shale Fragments, Little Sand, Little Clay 25.0'	SS 8	100	10-22-33 (55)	4.50		
	25		Gray Severely WEATHERED SHALE						
			28.8'	SS 9	100	50/3"	NP		>>
			Bottom of hole at 28.8 feet.						

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Toledo Ohio 43604
Telephone: (419)324-2222

BORING NUMBER B-5

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH
PROJECT NAME Kingsville I-90 Interchange Sanitary Sewers
PROJECT NUMBER 232478
PROJECT LOCATION Kingsville, OH
DRILLING CONTRACTOR SME JH EP
RIG NO. CME 55
GROUND ELEVATION 788 ft
DRILLING METHOD 4 in. SSA
GROUND WATER LEVELS:
DATE STARTED 8/14/24
COMPLETED 8/14/24
AT TIME OF DRILLING None
LOGGED BY KKC
CHECKED BY IEH
AT END OF DRILLING None
NOTES Split spoon refusal encountered at a depth of 48.7 feet.
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		CRUSHED STONE - 1 Inch	SS 1	28	5-6-6 (12)	4.50		13
			0.1' FILL - Moist Stiff to Very Stiff Gray/Brown SANDY SILT, Little Crushed Stone, Little Clay	SS 2	89	4-5-6 (11)	3.87	114	16
785			1.5' Moist Stiff to Very Stiff Brown SILT and CLAY, Some Sand, Trace Gravel A-6a (7)	SS 3	100	3-4-5 (9)	4.25		14
	5		3.0' Moist Stiff to Very Stiff Gray/Brown SILTY CLAY (A-6b), Some Sand, Trace Gravel	SS 4	100	8-8-10 (18)	4.25		18
780			@6.5': Brown, Little Sand						
	10			SS 5	100	4-5-5 (10)	3.75		19
775			13.5' Moist Stiff to Very Stiff Brown SILT and CLAY (A-6a), Little Sand, Trace Gravel	SS 6	100	3-6-8 (14)	4.25		18
	15								
770			18.5' Moist Stiff to Very Stiff Gray/Brown SILTY CLAY (A-6b), Some Gravel, Little Sand	SS 7	56	3-4-6 (10)	3.50		16
	20		21.0' Moist Medium Stiff Gray/Brown SILTY CLAY (A-6b), Little Sand, Trace Gravel						
765				SS 8	50	4-2-3 (5)	3.50		16
	25		26.0' Wet Soft Stiff Gray/Brown SANDY SILT, Trace Clay, Trace Gravel A-4a (4)						
760				SS 9	89	2-2-1 (3)	0.11	95	26
	30								

(Continued Next Page)

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1915 N 12th Street
Toledo Ohio 43604
Telephone: (419)324-2222

BORING NUMBER B-5

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH **PROJECT NAME** Kingsville I-90 Interchange Sanitary Sewers

PROJECT NUMBER 232478 **PROJECT LOCATION** Kingsville, OH

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
755									
			34.0'						
	35		Moist Very Stiff to Hard Gray SILT (A-4b), Some Shale Fragments, Little Clay, Little Sand	SS 10	100	6-20-30 (50)	3.75		13 ● ▲
750									
				SS 11	100	26-50	4.50		12 ●
	40								
745									
				SS 12	100	50/4"	4.50		9 ● >>▲
	45		45.0'						
			Gray Severely WEATHERED SHALE						
740									
			48.7'						
			Bottom of hole at 48.7 feet.	SS 13	100	50/2"	NP		8 ● >>▲

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BORING NUMBER B-6

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH
PROJECT NAME Kingsville I-90 Interchange Sanitary Sewers
PROJECT NUMBER 232478
PROJECT LOCATION Kingsville, OH
DRILLING CONTRACTOR SME JH EP
RIG NO. CME 55
GROUND ELEVATION 783 ft
DRILLING METHOD 4 in. SSA
GROUND WATER LEVELS:
DATE STARTED 8/12/24
COMPLETED 8/12/24
AT TIME OF DRILLING 9.0 ft / Elev 774.0 ft
LOGGED BY KKC
CHECKED BY IEH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		TOPSOIL - 6 Inches						
			0.5'	SS 1	67	3-4-2 (6)	NP		14
			FILL - Moist Loose Brown COARSE and FINE SAND, Some Crushed Stone, Little Clay, Trace Clay, Trace Organics	SS 2	83	1-2-2 (4)	NI		14
780			1.0'	SS 3	83	3-5-3 (8)	NP		12
	5		FILL - Moist Soft Brown SANDY SILT, Trace Crushed Stone, Trace Clay A-4a (2)						
			3.0'	SS 4	67	3-4-5 (9)	NP		15
			FILL - Moist Loose Brown COARSE and FINE SAND, Some Crushed Stone, Little Silt, Trace Clay						
775									
			9.0'	SS 5	100	1-1-2 (3)	NP		24
	10		Wet Very Loose Brown FINE SAND (A-3), Trace Silt, Trace Clay						
770									
			14.5'	SS 6	56	8-11-12 (23)	NP		9
	15		Moist Medium Dense Brown FINE SAND (A-3), Some Shale Fragments, Trace Silt, Trace Clay						
			15.0'						
			Bottom of hole at 15.0 feet.						

PL MC LL
20 40 60 80
▲ SPT N VALUE ▲
20 40 60 80

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CT Consultants, Inc.
1915 N 12th Street
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Telephone: (419)324-2222

BORING NUMBER B-7

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH
PROJECT NAME Kingsville I-90 Interchange Sanitary Sewers
PROJECT NUMBER 232478
PROJECT LOCATION Kingsville, OH
DRILLING CONTRACTOR SME JH EP
RIG NO. CME 55
GROUND ELEVATION 778 ft
DRILLING METHOD 4 in. SSA
GROUND WATER LEVELS:
DATE STARTED 8/12/24
COMPLETED 8/12/24
AT TIME OF DRILLING None
LOGGED BY KKC
CHECKED BY IEH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		TOPSOIL - 4 Inches 0.3'	SS 1	67	3-2-2 (4)	NP		8
			FILL - Moist Very Loose Brown FINE SAND, Trace Crushed Stone, Trace Silt, Trace Clay, Trace Organics	SS 2	67	1-1-0 (1)	NP		13
775			@3': Loose, Some Crushed Stone 4.0'	SS 3	39	1-2-4 (6)	NP		11
	5		FILL - Moist Medium Dense Gray CRUSHED STONE, Little Sand, Trace Silt, Trace Clay	SS 4	39	5-7-7 (14)	NP		7
770			8.5'						
	10		Moist Medium Dense Gray FINE SAND (A-3), Some Shale Fragments, Trace Silt, Trace Clay	SS 5	50	7-7-8 (15)	NP		5
765			13.5'						
	15		Moist Very Loose Gray FINE SAND (A-3), Some Shale Fragments, Trace Silt, Trace Clay 15.0'	SS 6	33	3-2-1 (3)	NP		7
			Bottom of hole at 15.0 feet.						

PL MC LL
20 40 60 80
▲ SPT N VALUE ▲
20 40 60 80

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CT Consultants, Inc.
1915 N 12th Street
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Telephone: (419)324-2222

BORING NUMBER B-8

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH
PROJECT NAME Kingsville I-90 Interchange Sanitary Sewers
PROJECT NUMBER 232478
PROJECT LOCATION Kingsville, OH
DRILLING CONTRACTOR SME JH EP
RIG NO. CME 55
GROUND ELEVATION 766 ft
DRILLING METHOD 4 in. SSA
GROUND WATER LEVELS:
DATE STARTED 8/12/24
COMPLETED 8/12/24
AT TIME OF DRILLING 10.0 ft / Elev 756.0 ft
LOGGED BY KKC
CHECKED BY IEH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0								20 40 60 80
765			TOPSOIL - 3 Inches 0.3'	SS 1	50	4-3-2 (5)	NP		13
			FILL - Moist Loose Brown COARSE and FINE SAND, Some Silt, Little Crushed Stone, Trace Organics A-3a (0) 1.5'	SS 2	56	3-3-2 (5)	NP		10
			FILL - Moist Loose Brown FINE SAND, Little Crushed Stone, Trace Silt, Trace Clay	SS 3	67	4-3-2 (5)	NP		8
	5		@3': Gray						
760			@4.5': Brown	SS 4	39	4-4-4 (8)	NP		13
			8.0'						
			Moist Loose Brown FINE SAND (A-3), Some Gravel, Trace Silt, Trace Clay	SS 5	61	4-4-4 (8)	NP		9
	10		▽						
755									
			@13.5': Wet, Gray, Little Gravel, (Free Water Noted)	SS 6	56	1-2-3 (5)	NP		20
	15		15.0'						
			Bottom of hole at 15.0 feet.						

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BORING NUMBER B-9

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH
PROJECT NAME Kingsville I-90 Interchange Sanitary Sewers
PROJECT NUMBER 232478
PROJECT LOCATION Kingsville, OH
DRILLING CONTRACTOR SME JH EP
RIG NO. CME 55
GROUND ELEVATION 774 ft
DRILLING METHOD 4 in. SSA
GROUND WATER LEVELS:
DATE STARTED 8/12/24
COMPLETED 8/12/24
AT TIME OF DRILLING 13.0 ft / Elev 761.0 ft
LOGGED BY KKC
CHECKED BY IEH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		TOPSOIL - 12 Inches						11
			1.0'	SS 1	50	3-3-3 (6)	NI		
			Moist Medium Stiff Dark Brown SANDY SILT (A-4a), Little Clay, Trace Gravel, Trace Organics						20
			2.0'	SS 2	83	2-3-3 (6)	NP		
770			Moist Loose Brown COARSE and FINE SAND (A-3a), Little Silt, Trace Gravel, Trace Clay						12
			3.0'	SS 3	100	3-3-3 (6)	NP		
	5		Moist Loose Brown FINE SAND (A-3), Trace Clay, Trace Silt						14
			4.5'	SS 4	67	2-4-4 (8)	NP		
			Moist Loose Brown COARSE and FINE SAND (A-3a), Little Clay, Little Gravel, Trace Silt						
765			9.5'	SS 5	100	5-6-8 (14)	3.25		20
	10		Moist Stiff Brown SILTY CLAY (A-6b), "and" Sand						
			▽						
760			14.5'	SS 6	100	2-2-3 (5)	NP		23
	15		Wet Loose Gray FINE SAND (A-3), Trace Silt, Trace Clay, (Free Water Noted)						
			15.0'						
			Bottom of hole at 15.0 feet.						

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BORING NUMBER B-10

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH
PROJECT NAME Kingsville I-90 Interchange Sanitary Sewers
PROJECT NUMBER 232478
PROJECT LOCATION Kingsville, OH
DRILLING CONTRACTOR SME JH EP
RIG NO. CME 55
GROUND ELEVATION 797 ft
DRILLING METHOD 4 in. SSA
GROUND WATER LEVELS:
DATE STARTED 8/12/24
COMPLETED 8/12/24
AT TIME OF DRILLING None
LOGGED BY KKC
CHECKED BY IEH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		TOPSOIL - 6 Inches 0.5'	SS 1	28	1-1-1 (2)	NP		8
795			Moist Very Loose Brown COARSE and FINE SAND (A-3a), Little Silt, Trace Gravel @1.5': A-3a (0)	SS 2	67	1-1-1 (2)	NP		11
			@3': Loose	SS 3	67	2-2-3 (5)	NP		6
	5			SS 4	56	3-3-3 (6)	NP		8
790									
			@8.5': Very Loose	SS 5	78	2-2-2 (4)	NP		8
	10								
785									
			@13.5': Loose	SS 6	83	3-3-3 (6)	NP		7
	15		15.0'						
			Bottom of hole at 15.0 feet.						

PL MC LL
20 40 60 80
▲ SPT N VALUE ▲
20 40 60 80

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BORING NUMBER B-11

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH
PROJECT NAME Kingsville I-90 Interchange Sanitary Sewers
PROJECT NUMBER 232478
PROJECT LOCATION Kingsville, OH
DRILLING CONTRACTOR SME JH EP
RIG NO. CME 55
GROUND ELEVATION 790 ft
DRILLING METHOD 4 in. SSA
GROUND WATER LEVELS:
DATE STARTED 8/12/24
COMPLETED 8/12/24
AT TIME OF DRILLING 10.0 ft / Elev 780.0 ft
LOGGED BY KKC
CHECKED BY IEH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
790	0		TOPSOIL - 6 Inches 0.5'	SS 1	56	1-1-1 (2)	NP		13
			Moist Very Loose Dark Brown COARSE and FINE SAND, Little Silt, Trace Gravel, Trace Organics A-3a (0) 1.5'	SS 2	67	1-1-2 (3)	NP		9
			Moist Very Loose Brown FINE SAND (A-3), Trace Silt, Trace Clay	SS 3	61	3-3-3 (6)	NP		8
785	5		@3': Loose	SS 4	78	3-3-4 (7)	NP		6
780	10	▽	@8.5': Wet	SS 5	78	3-3-4 (7)	NP		24
775	15		15.0'	SS 6	83	3-4-4 (8)	NP		24
			Bottom of hole at 15.0 feet.						

PL 20 MC 40 LL 60 80
▲ SPT N VALUE ▲
20 40 60 80

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BORING NUMBER B-12

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH
PROJECT NAME Kingsville I-90 Interchange Sanitary Sewers
PROJECT NUMBER 232478
PROJECT LOCATION Kingsville, OH
DRILLING CONTRACTOR SME JH EP
RIG NO. CME 55
GROUND ELEVATION 789 ft
DRILLING METHOD 4 in. SSA
GROUND WATER LEVELS:
DATE STARTED 8/13/24
COMPLETED 8/13/24
AT TIME OF DRILLING 8.0 ft / Elev 781.0 ft
LOGGED BY KKC
CHECKED BY IEH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		Moist Medium Dense Brown/Black COARSE and FINE SAND (A-3a), Little Gravel, Little Silt, Little Organics, Trace Clay (Noted as Topsoil)	SS 1	78	4-5-6 (11)	NP NP		11
			0.5' Moist Medium Denseto Loose Brown FINE SAND (A-3), Little Gravel, Trace Clay, Trace Silt	SS 2	67	3-2-3 (5)	NP		15
785			2.0' Moist Loose Brown COARSE and FINE SAND, Some Silt, Trace Clay A-3a (0)	SS 3	100	5-4-5 (9)	NP		19
	5		3.0' Moist Loose Brown FINE SAND (A-3), Trace Silt, Trace Clay	SS 4	100	4-4-4 (8)	3.25		18
			5.5' ▽ Moist Medium Stiff Brown SILT and CLAY (A-6a), Little Sand, Trace Gravel						
780			8.5' Moist Stiff to Very Stiff Brown SILTY CLAY (A-6b), Little Sand, Trace Gravel	SS 5	100	4-5-5 (10)	3.50		18
	10		@10': Some Sand, Little Gravel						
775									
	15		15.0'	SS 6	100	5-6-6 (12)	3.50		16
			Bottom of hole at 15.0 feet.						

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BORING NUMBER B-13

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH
PROJECT NAME Kingsville I-90 Interchange Sanitary Sewers
PROJECT NUMBER 232478
PROJECT LOCATION Kingsville, OH
DRILLING CONTRACTOR SME EP VI
RIG NO. CME 55
GROUND ELEVATION 768 ft
DRILLING METHOD 4 in. SSA
GROUND WATER LEVELS:
DATE STARTED 8/15/24
COMPLETED 8/15/24
AT TIME OF DRILLING 8.0 ft / Elev 760.0 ft
LOGGED BY KKC
CHECKED BY IEH
AT END OF DRILLING 12.0 ft / Elev 756.0 ft
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL / SPT N VALUE
	0		TOPSOIL - 6 Inches 0.5'	SS 1	67	3-2-2 (4)	NP		18
765			Moist Very Loose Dark Brown COARSE and FINE SAND (A-3a), Little Gravel, Little Silt, Trace Clay, Trace Organics 1.5'	SS 2	100	3-3-3 (6)	1.06	116	15
	5		Moist Medium Stiff to Stiff Brown SILTY CLAY (A-6b), Some Sand, Little Gravel, Trace Organics 4.0'	SS 3	67	3-4-4 (8)	3.75		20
			Moist Stiff to Very Stiff Dark Brown/Brown SILT and CLAY (A-6a), Some Sand, Trace Gravel 5.0'	SS 4	67	12-5-5 (10)	NP		12
760			Moist Loose Gray/Brown WEATHERED SHALE, Little Sand, Little Silt, Little Clay 8.5'						
	10		Wet Loose Gray FINE SAND (A-3), Little Gravel, Trace Silt, Trace Clay	SS 5	78	3-3-3 (6)	NP		16
755			13.0'						
	15		Wet Stiff to Very Stiff Gray SILT and CLAY (A-6a), "and" Sand, Trace Gravel (Free Water Noted) 15.0'	SS 6	78	6-6-7 (13)	2.00		15
			Bottom of hole at 15.0 feet.						

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BORING NUMBER B-14

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH
PROJECT NAME Kingsville I-90 Interchange Sanitary Sewers
PROJECT NUMBER 232478
PROJECT LOCATION Kingsville, OH
DRILLING CONTRACTOR SME JH EP
RIG NO. CME 55
GROUND ELEVATION 740 ft
DRILLING METHOD 4 in. SSA
GROUND WATER LEVELS:
DATE STARTED 8/13/24
COMPLETED 8/13/24
AT TIME OF DRILLING None
LOGGED BY KKC
CHECKED BY IEH
AT END OF DRILLING None
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	SPT N VALUE
740	0	TOPSOIL - 6 Inches (0.5')	SS 1	33	2-2-3 (5)	NP		5
		CRUSHED STONE - 6 Inches (1.0')	SS 2	100	3-4-5 (9)	NP		13
		FILL - Moist Loose Gray/Dark Brown CONCRETE FRAGMENTS with SAND, Some Silt, Trace Asphalt Fragments, Trace Organics A-1-b (0) (2.5')	SS 3	83	6-8-9 (17)	4.50		14
735	5	Moist Loose Brown FINE SAND (A-3), Trace Gravel, Trace Clay, Trace Silt (3.0')	SS 4	88	16-30-50/5"	NI		11
		Moist Very Stiff to Hard Brown SANDY SILT (A-4a), Little Gravel, Little Clay (4.5')						
730	10	Moist Very Hard Brown SANDY SILT (A-4a), Little Gravel, Little Clay (8.0')	SS 5	100	28-18-30 (48)	NP		9
		Gray Severely WEATHERED SHALE (13.5')						
725	15	Moist Very Stiff to Hard Gray SANDY SILT (A-4a), Little Clay (15.0')	SS 6	100	10-15-9 (24)	4.50		10
		Bottom of hole at 15.0 feet.						

PL MC LL
20 40 60 80
▲ SPT N VALUE ▲
20 40 60 80

>>▲

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BORING NUMBER B-15

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH
PROJECT NAME Kingsville I-90 Interchange Sanitary Sewers
PROJECT NUMBER 232478
PROJECT LOCATION Kingsville, OH
DRILLING CONTRACTOR SME JH EP
RIG NO. CME 55
GROUND ELEVATION 718 ft
DRILLING METHOD 4 in. SSA
GROUND WATER LEVELS:
DATE STARTED 8/13/24
COMPLETED 8/13/24
AT TIME OF DRILLING 18.5 ft / Elev 699.5 ft
LOGGED BY KKC
CHECKED BY IEH
AT END OF DRILLING None
NOTES Split spoon refusal encountered at a depth of 23.7 feet.
0hrs AFTER DRILLING Backfilled w/Cuttings and Bentonite Chips

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL / MC / LL; SPT N VALUE
	0	TOPSOIL - 3 Inches 0.3'	SS 1	17	1-1-1 (2)	NI		13
		FILL - Moist Very Soft Dark Brown SANDY SILT, Some Crushed Stone, Little Clay, Trace Organics 2.0'	SS 2	28	3-4-3 (7)	NP		21
715		FILL - Moist Loose Dark Brown COARSE and FINE SAND, Some Silt, Little Crushed Stone, Trace Clay, Trace Organics A-3a (0) 3.0'	SS 3	28	5-5-7 (12)	3.50		18
	5	Moist Stiff to Very Stiff Gray SILTY CLAY (A-6b), Little Sand, Trace Gravel 7.0'	SS 4	56	7-7-7 (14)	1.00		18
710		Moist Very Stiff to Hard Gray SANDY SILT (A-4a), Little Shale Fragments, Little Clay	SS 5	100	12-12-14 (26)	4.50		10
	10							
705								
		14.5'	SS 6	100	21-30-50/3"	NP		7 >>
	15	Gray Severely WEATHERED SHALE						
700		▽	SS 7	100	50/2"	NP		7 >>
	20							
695		23.7'	SS 8	100	50/2"	NP		4 >>
		Bottom of hole at 23.7 feet.						

PL MC LL
20 40 60 80
▲ SPT N VALUE ▲
20 40 60 80

APPENDIX B

LEGEND KEY

LEGEND KEY

Ohio Department of Transportation Soil Symbols


A-1-a - Gravel and/or Stone Fragments


A-1-b - Gravel and/or Stone Fragments with Sand


A-2-4,A-2-5 - Gravel and/or Stone Fragments with Sand and Silt


A-2-6,A-2-7 - Gravel and/or Stone Fragments with Sand, Silt and Clay


A-3 - Fine Sand


A-3a - Coarse and Fine Sand


A-4a - Sandy Silt


A-4b - Silt


A-5 - Elastic Silt and Clay


A-6a - Silt and Clay


A-6b - Silty Clay


A-7-5 - Elastic Clay


A-7-6 - Clay


A-8a - Organic Silt


A-8b - Organic Clay


Asphalt


Sod and/or Topsoil


Concrete


Random Fill


Peat


Dolomite


Weathered Dolomite


Limestone


Weathered Limestone


Sandstone


Weathered Sandstone


Shale


Weathered Shale

Sample Symbols


SS - Split Spoon


ST - Shelby Tube


RC - Rock Core


GS - Geoprobe Sleeve


AU - Auger Cuttings


GB - Grab

Notes:

1. Exploratory borings were drilled during the period from August 12 and 13, 2024, using 4-inch diameter solid-stem augers.

2. These logs are subject to the limitations, conclusions, and recommendations in the report and should not be interpreted separate from the report.

3. The borings were located in the field by CT in accordance with the Proposed Boring Location Plan, attached to the proposal.

4. Latitude, Longitude, ground surface elevation, stationing and offsets for all borings were provided by Fishbeck based on field survey.

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APPENDIX C

TABULATION OF LABORATORY TEST DATA

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SUMMARY OF LABORATORY RESULTS

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH **PROJECT NAME** Kingsville I-90 Interchange Sanitary Sewers

PROJECT NUMBER 232478 **PROJECT LOCATION** Kingsville, OH

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
B-1	0.0							15.3			
B-1	1.5							17.7			
B-1	3.0							19.8			
B-1	4.5							17.7			
B-1	8.5							15.0			
B-1	13.5							12.2			
B-1	18.5							13.0			
B-2	0.0	31	18	13	9.5	64	CL	14.6			
B-2	1.5							13.8			
B-2	3.0							15.4			
B-2	4.5							15.6			
B-2	8.5							13.5			
B-2	13.5							14.2			
B-2	18.5							16.1			
B-3	0.0							11.6			
B-3	1.5	25	16	9	25	51	CL	15.8	107.1		
B-3	3.0							12.3			
B-3	4.5							15.0			
B-3	8.5							16.4			
B-3	13.5							16.0			
B-3	18.5							14.9			
B-3	23.5							13.8			
B-3	28.5							16.3			
B-3	33.5							6.3			
B-3	38.5							10.5			
B-3	43.5							13.3			
B-4	0.0							13.3	108.1		
B-4	1.5							13.4			
B-4	3.0							13.2			
B-4	4.5							15.3			
B-4	8.5							14.2			
B-4	13.5	26	17	9	12.5	68	CL	12.8	118.0		
B-5	0.0							13.2			
B-5	1.5	30	19	11	19	68	CL	15.5	113.6		
B-5	3.0							14.3			
B-5	4.5							18.2			
B-5	8.5							19.0			
B-5	13.5							18.5			
B-5	18.5							16.0			
B-5	23.5							16.2			
B-5	28.5	22	15	7	9.5	53	CL-ML	25.9	94.8		
B-5	33.5							13.2			
B-5	38.5							11.7			

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SUMMARY OF LABORATORY RESULTS

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH **PROJECT NAME** Kingsville I-90 Interchange Sanitary Sewers

PROJECT NUMBER 232478 **PROJECT LOCATION** Kingsville, OH

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
B-5	43.5							9.2			
B-5	48.5							7.7			
B-6	0.0							13.8			
B-6	1.5	19	15	4	12.5	46	SC-SM	13.7			
B-6	3.0							11.6			
B-6	4.5							14.7			
B-6	8.5							24.5			
B-6	13.5							9.1			
B-7	0.0							7.6			
B-7	1.5							13.2			
B-7	3.0							10.8			
B-7	4.5							6.8			
B-7	8.5							4.9			
B-7	13.5							7.1			
B-8	0.0	NP	NP	NP	19	32	SM	12.8			
B-8	1.5							10.3			
B-8	3.0							8.1			
B-8	4.5							13.2			
B-8	8.5							9.3			
B-8	13.5							19.5			
B-9	0.0							10.6			
B-9	1.5							19.8			
B-9	3.0							11.8			
B-9	4.5							14.1			
B-9	8.5							19.6			
B-9	13.5							23.3			
B-10	0.0							8.4			
B-10	1.5	NP	NP	NP	9.5	19	SM	10.9			
B-10	3.0							6.5			
B-10	4.5							7.9			
B-10	8.5							7.5			
B-10	13.5							6.9			
B-11	0.0	NP	NP	NP	9.5	18	SM	12.7			
B-11	1.5							9.0			
B-11	3.0							7.7			
B-11	4.5							6.5			
B-11	8.5							23.8			
B-11	13.5							23.6			
B-12	0.3							12.4			
B-12	1.0							10.5			
B-12	1.5	NP	NP	NP	2	34	SM	15.3			
B-12	3.0							18.9			
B-12	4.5							18.2			

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SUMMARY OF LABORATORY RESULTS

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH **PROJECT NAME** Kingsville I-90 Interchange Sanitary Sewers

PROJECT NUMBER 232478 **PROJECT LOCATION** Kingsville, OH

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
B-12	8.5							17.7			
B-12	13.5							16.4			
B-13	0.0							18.0			
B-13	1.5							15.4	115.7		
B-13	3.0							19.9			
B-13	4.5							12.2			
B-13	8.5							16.4			
B-13	13.5							14.9			
B-14	0.0	NP	NP	NP	25	22	SM	5.4			
B-14	1.5							12.5			
B-14	3.0							14.4			
B-14	4.5							11.0			
B-14	8.5							8.9			
B-14	13.5							10.2			
B-15	0.0							13.5			
B-15	1.5	26	18	8	19	34	SC	21.0			
B-15	3.0							18.3			
B-15	4.5							18.4			
B-15	8.5							9.8			
B-15	13.5							7.2			
B-15	18.5							6.7			
B-15	23.5							4.1			

232478 Kingsville I-90 Interchange Sanitary Sewer, Kingsville, Ohio

Boring	Sample	Interval	SPT N	Water Content (%)	Dry Density (pcf)	UCS (psf)	Gravel >4.75	CSand >2.00	MSand >.425	FSand >.075	Silt >.005	Clay	Liquid Limit	Plastic Limit	PI	USCS Class	OHDOT Class	OHDOT Group	Total Density (pcf)	SPT Blows
B-1	SS-1	0.0 - 1.5	16	15.3		9000														9-9-7
B-1	SS-2	1.5 - 3.0	18	17.7		NP														8-9-9
B-1	SS-3	3.0 - 4.5	13	19.8		8000														6-6-7
B-1	SS-4	4.5 - 6.0	22	17.7		9000														7-10-12
B-1	SS-5	8.5 - 10.0	28	15		9000														9-10-18
B-1	SS-6	13.5 - 15.0	29	12.2		9000														7-15-14
B-1	SS-7	18.5 - 20.0	22	13		9000														9-12-10
B-2	SS-1	0.0 - 1.5	14	14.6		NI	3	4	10	19	25	39	31	18	13	CL	A-6a	7		9-7-7
B-2	SS-2	1.5 - 3.0	19	13.8		9000														7-11-8
B-2	SS-3	3.0 - 4.5	13	15.4		9000														7-6-7
B-2	SS-4	4.5 - 6.0	20	15.6		9000														10-10-10
B-2	SS-5	8.5 - 10.0	36	13.5		9000														12-15-21
B-2	SS-6	13.5 - 15.0	26	14.2		9000														8-11-15
B-2	SS-7	18.5 - 20.0	17	16.1		9000														6-7-10
B-3	SS-1	0.0 - 1.5	9	11.6		NP														12-5-4
B-3	SS-2	1.5 - 3.0	7	15.8	107.1	4000	19	5	14	11	33	18	25	16	9	CL	A-4a	3	124	4-4-3
B-3	SS-3	3.0 - 4.5	42	12.3		9000														14-33-9
B-3	SS-4	4.5 - 6.0	21	15		9000														9-7-14
B-3	SS-5	8.5 - 10.0	15	16.4		8000														8-7-8
B-3	SS-6	13.5 - 15.0	21	16		7500														8-9-12
B-3	SS-7	18.5 - 20.0	15	14.9		9000														4-5-10
B-3	SS-8	23.5 - 25.0	35	13.8		9000														14-16-19
B-3	SS-9	28.5 - 30.0	32	16.3		9000														9-16-16
B-3	SS-10	33.5 - 35.0	50	6.3		NP														6-22-28
B-3	SS-11	38.5 - 40.0	68	10.5		9000														21-28-40
B-3	SS-12	43.5 - 43.8		13.3		9000														50/3"
B-3	SS-13	48.5 - 48.6				NR														50/1"
B-4	SS-1	0.0 - 1.5	10	13.3	108.1	9000													122.5	5-5-5
B-4	SS-2	1.5 - 3.0	7	13.4		9000														3-3-4
B-4	SS-3	3.0 - 4.5	19	13.2		9000														5-9-10
B-4	SS-4	4.5 - 6.0	22	15.3		9000														10-10-12
B-4	SS-5	8.5 - 10.0	14	14.2		9000														3-6-8
B-4	SS-6	13.5 - 15.0	16	12.8	118	13679	3	2	9	18	43	25	26	17	9	CL	A-4a	7	133.1	9-8-8
B-4	SS-7	18.5 - 20.0	29			9000														10-14-15
B-4	SS-8	23.5 - 25.0	55			9000														10-22-33
B-4	SS-9	28.5 - 28.8				NP														50/3"
B-5	SS-1	0.0 - 1.5	12	13.2		9000														5-6-6
B-5	SS-2	1.5 - 3.0	11	15.5	113.6	7741	5	2	8	17	24	44	30	19	11	CL	A-6a	7	131.3	4-5-6
B-5	SS-3	3.0 - 4.5	9	14.3		8500														3-4-5
B-5	SS-4	4.5 - 6.0	18	18.2		8500														8-8-10

B-5	SS-5	8.5 - 10.0	10	19		7500													4-5-5
B-5	SS-6	13.5 - 15.0	14	18.5		8500													3-6-8
B-5	SS-7	18.5 - 20.0	10	16		7000													3-4-6
B-5	SS-8	23.5 - 25.0	5	16.2		7000													4-2-3
B-5	SS-9	28.5 - 30.0	3	25.9	94.8	219	1	3	24	19	44	9	22	15	7	CL-ML	A-4a	4	119.4	2-2-1
B-5	SS-10	33.5 - 35.0	50	13.2		7500														6-20-30
B-5	SS-11	38.5 - 39.5		11.7		9000														26-50
B-5	SS-12	43.5 - 43.8		9.2		9000														50/4"
B-5	SS-13	48.5 - 48.7		7.7		NP														50/2"
B-6	SS-1	0.0 - 1.5	6	13.8		NP														3-4-2
B-6	SS-2	1.5 - 3.0	4	13.7		NI	4	2	28	19	43	4	19	15	4	SC-SM	A-4a	2		1-2-2
B-6	SS-3	3.0 - 4.5	8	11.6		NP														3-5-3
B-6	SS-4	4.5 - 6.0	9	14.7		NP														3-4-5
B-6	SS-5	8.5 - 10.0	3	24.5		NP														1-1-2
B-6	SS-6	13.5 - 15.0	23	9.1		NP														8-11-12
B-7	SS-1	0.0 - 1.5	4	7.6		NP														3-2-2
B-7	SS-2	1.5 - 3.0	1	13.2		NP														1-1-0
B-7	SS-3	3.0 - 4.5	6	10.8		NP														1-2-4
B-7	SS-4	4.5 - 6.0	14	6.8		NP														5-7-7
B-7	SS-5	8.5 - 10.0	15	4.9		NP														7-7-8
B-7	SS-6	13.5 - 15.0	3	7.1		NP														3-2-1
B-8	SS-1	0.0 - 1.5	5	12.8		NP	6	5	22	35	32	0	NP	NP	NP	SM	A-3a	0		4-3-2
B-8	SS-2	1.5 - 3.0	5	10.3		NP														3-3-2
B-8	SS-3	3.0 - 4.5	5	8.1		NP														4-3-2
B-8	SS-4	4.5 - 6.0	8	13.2		NP														4-4-4
B-8	SS-5	8.5 - 10.0	8	9.3		NP														4-4-4
B-8	SS-6	13.5 - 15.0	5	19.5		NP														1-2-3
B-9	SS-1	0.0 - 1.5	6	10.6		NI														3-3-3
B-9	SS-2	1.5 - 3.0	6	19.8		NP														2-3-3
B-9	SS-3	3.0 - 4.5	6	11.8		NP														3-3-3
B-9	SS-4	4.5 - 6.0	8	14.1		NP														2-4-4
B-9	SS-5	8.5 - 10.0	14	19.6		6500														5-6-8
B-9	SS-6	13.5 - 15.0	5	23.3		NP														2-2-3
B-10	SS-1	0.0 - 1.5	2	8.4		NP														1-1-1
B-10	SS-2	1.5 - 3.0	2	10.9		NP	0	0	28	53	19	0	NP	NP	NP	SM	A-3a	0		1-1-1
B-10	SS-3	3.0 - 4.5	5	6.5		NP														2-2-3
B-10	SS-4	4.5 - 6.0	6	7.9		NP														3-3-3
B-10	SS-5	8.5 - 10.0	4	7.5		NP														2-2-2
B-10	SS-6	13.5 - 15.0	6	6.9		NP														3-3-3
B-11	SS-1	0.0 - 1.5	2	12.7		NP	0	0	25	56	18	0	NP	NP	NP	SM	A-3a	0		1-1-1
B-11	SS-2	1.5 - 3.0	3	9		NP														1-1-2
B-11	SS-3	3.0 - 4.5	6	7.7		NP														3-3-3
B-11	SS-4	4.5 - 6.0	7	6.5		NP														3-3-4
B-11	SS-5	8.5 - 10.0	7	23.8		NP														3-3-4

B-11	SS-6	13.5 - 15.0	8	23.6		NP													3-4-4
B-12	SS-1	0.0 - 1.5	11																4-5-6
B-12	-	0.3 -		12.4		NP													
B-12	-	1.0 -		10.5		NP													
B-12	SS-2	1.5 - 3.0	5	15.3		NP	0	0	16	50	33	1	NP	NP	NP	SM	A-3a	0		3-2-3
B-12	SS-3	3.0 - 4.5	9	18.9		NP														5-4-5
B-12	SS-4	4.5 - 6.0	8	18.2		6500														4-4-4
B-12	SS-5	8.5 - 10.0	10	17.7		7000														4-5-5
B-12	SS-6	13.5 - 15.0	12	16.4		7000														5-6-6
B-13	SS-1	0.0 - 1.5	4	18		NP														3-2-2
B-13	SS-2	1.5 - 3.0	6	15.4	115.7	2125													133.5	3-3-3
B-13	SS-3	3.0 - 4.5	8	19.9		7500														3-4-4
B-13	SS-4	4.5 - 6.0	10	12.2		NP														12-5-5
B-13	SS-5	8.5 - 10.0	6	16.4		NP														3-3-3
B-13	SS-6	13.5 - 15.0	13	14.9		4000														6-6-7
B-14	SS-1	0.0 - 1.5	5	5.4		NP	29	7	26	16	22	0	NP	NP	NP	SM	A-1-b	0		2-2-3
B-14	SS-2	1.5 - 3.0	9	12.5		NP														3-4-5
B-14	SS-3	3.0 - 4.5	17	14.4		9000														6-8-9
B-14	SS-4	4.5 - 5.9	80	11		NI														16-30-50/5"
B-14	SS-5	8.5 - 10.0	48	8.9		NP														28-18-30
B-14	SS-6	13.5 - 15.0	24	10.2		9000														10-15-9
B-15	SS-1	0.0 - 1.5	2	13.5		NI														1-1-1
B-15	SS-2	1.5 - 3.0	7	21		NP	9	1	27	29	34	0	26	18	8	SC	A-2-4	0		3-4-3
B-15	SS-3	3.0 - 4.5	12	18.3		7000														5-5-7
B-15	SS-4	4.5 - 6.0	14	18.4		2000														7-7-7
B-15	SS-5	8.5 - 10.0	26	9.8		9000														12-12-14
B-15	SS-6	13.5 - 14.8	80	7.2		NP														21-30-50/3"
B-15	SS-7	18.5 - 18.7		6.7		NP														50/2"

APPENDIX D

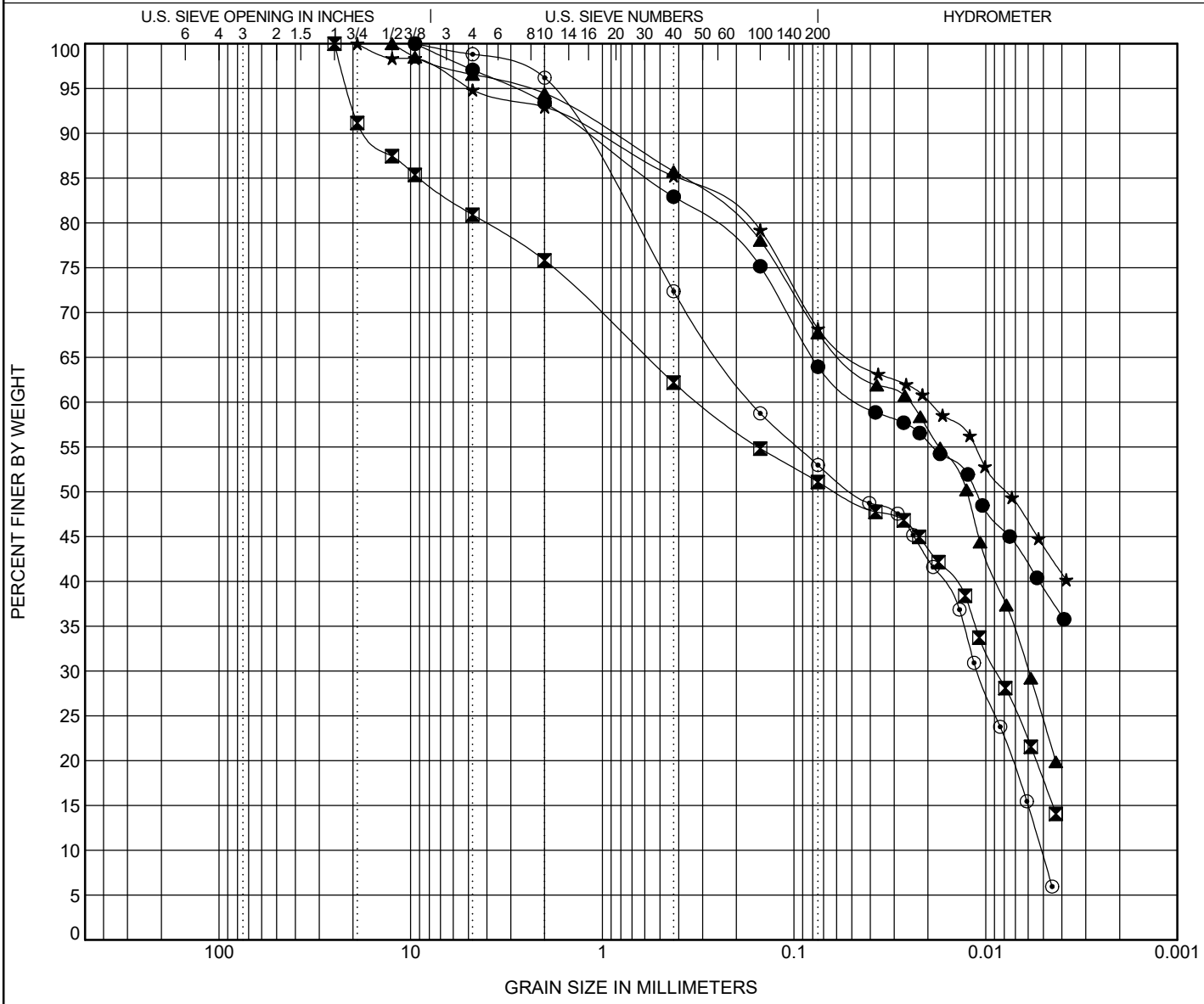
LABORATORY TEST RESULTS

GRAIN SIZE DISTRIBUTION

CT Consultants, Inc.
1915 N 12th Street
Toledo Ohio 43604
Telephone: (419)324-2222

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH **PROJECT NAME** Kingsville I-90 Interchange Sanitary Sewers

PROJECT NUMBER 232478 **PROJECT LOCATION** Kingsville, OH



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		USCS Classification	LL	PL	PI	Cc	Cu
●	B-2	0.0	SILT and CLAY, Some Sand, Trace Gravel A-6a (7)	31	18	13		
⊠	B-3	1.5	SANDY SILT, Some Gravel, Little Clay A-4a (3)	25	16	9		
▲	B-4	13.5	SANDY SILT, Some Clay, Trace Gravel A-4a (7)	26	17	9		
★	B-5	1.5	SILT and CLAY, Some Sand, Trace Gravel A-6a (7)	30	19	11		
⊙	B-5	28.5	SANDY SILT, Trace Clay, Trace Gravel A-4a (4)	22	15	7	0.1	32.2

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-2	0.0	9.5	0.044			2.9	33.1	24.6	39.3
⊠	B-3	1.5	25	0.312	0.009		19.1	29.8	33.3	17.8
▲	B-4	13.5	12.5	0.025	0.006		3.4	28.8	43.2	24.6
★	B-5	1.5	19	0.02			5.2	26.6	24.2	44.0
⊙	B-5	28.5	9.5	0.165	0.011	0.005	1.2	45.8	43.7	9.2

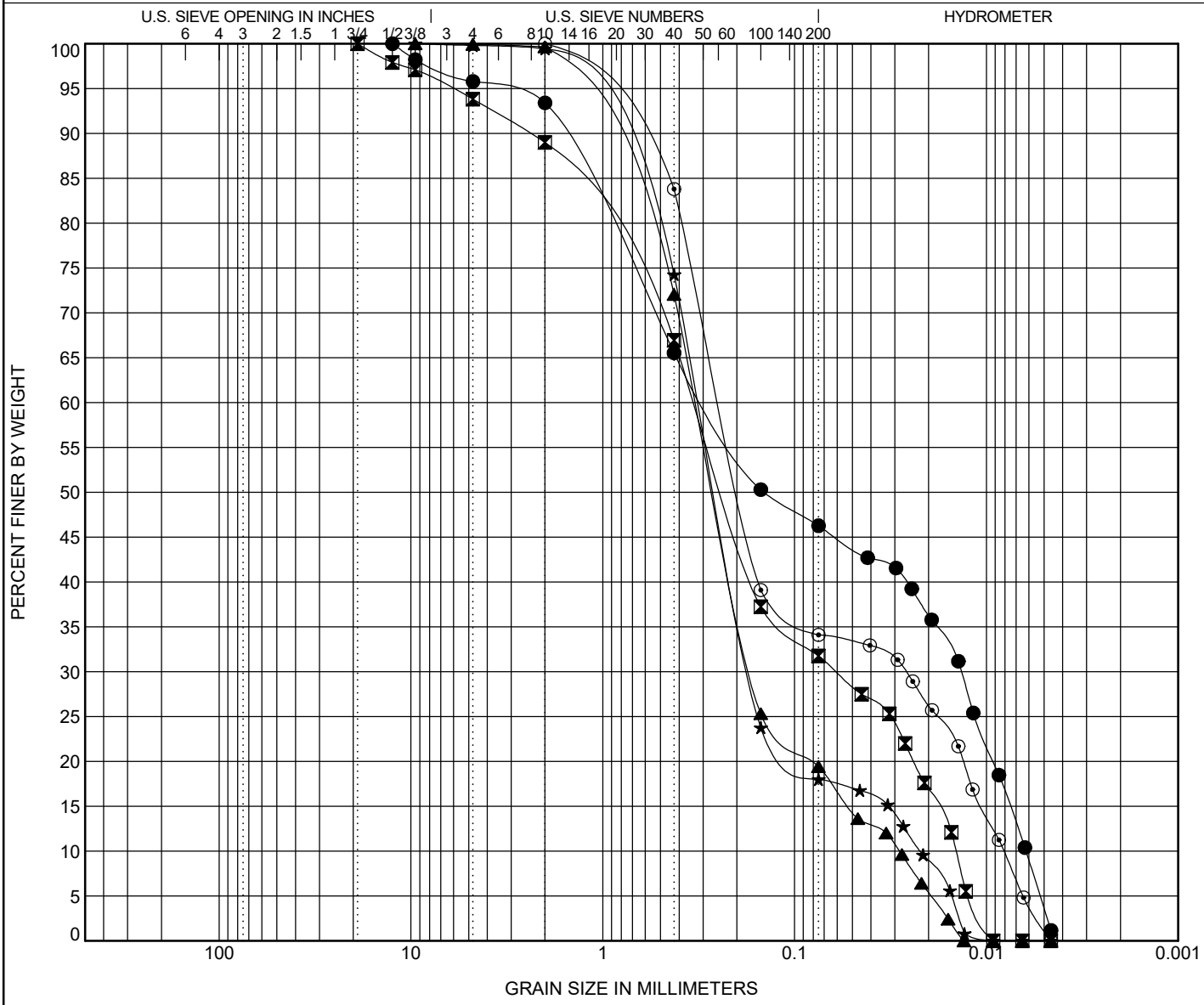
GRAIN SIZE 232478.GPJ GINT US LAB.GDT 1/27/25

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GRAIN SIZE DISTRIBUTION

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH **PROJECT NAME** Kingsville I-90 Interchange Sanitary Sewers

PROJECT NUMBER 232478 **PROJECT LOCATION** Kingsville, OH



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		USCS Classification	LL	PL	PI	Cc	Cu
●	B-6	1.5	SANDY SILT, Trace Gravel, Trace Clay A-4a (2)	19	15	4	0.1	46.9
⊠	B-8	0.0	COARSE and FINE SAND, Some Silt, Little Gravel A-3a (0)	NP	NP	NP	0.8	23.2
▲	B-10	1.5	COARSE and FINE SAND, Little Silt, Trace Gravel A-3a (0)	NP	NP	NP	3.0	11.4
★	B-11	0.0	COARSE and FINE SAND, Little Silt, Trace Gravel A-3a (0)	NP	NP	NP	4.2	14.3
⊙	B-12	1.5	COARSE and FINE SAND, Some Silt, Trace Clay A-3a (0)	NP	NP	NP	0.3	30.1

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-6	1.5	12.5	0.291	0.014	0.006	4.2	49.5	42.7	3.6
⊠	B-8	0.0	19	0.333	0.061	0.014	6.2	62.1	31.8	0.0
▲	B-10	1.5	9.5	0.325	0.167	0.028	0.1	80.5	19.4	0.0
★	B-11	0.0	9.5	0.317	0.171	0.022	0.2	81.8	18.0	0.0
⊙	B-12	1.5	2	0.244	0.026	0.008	0.0	65.9	32.9	1.2

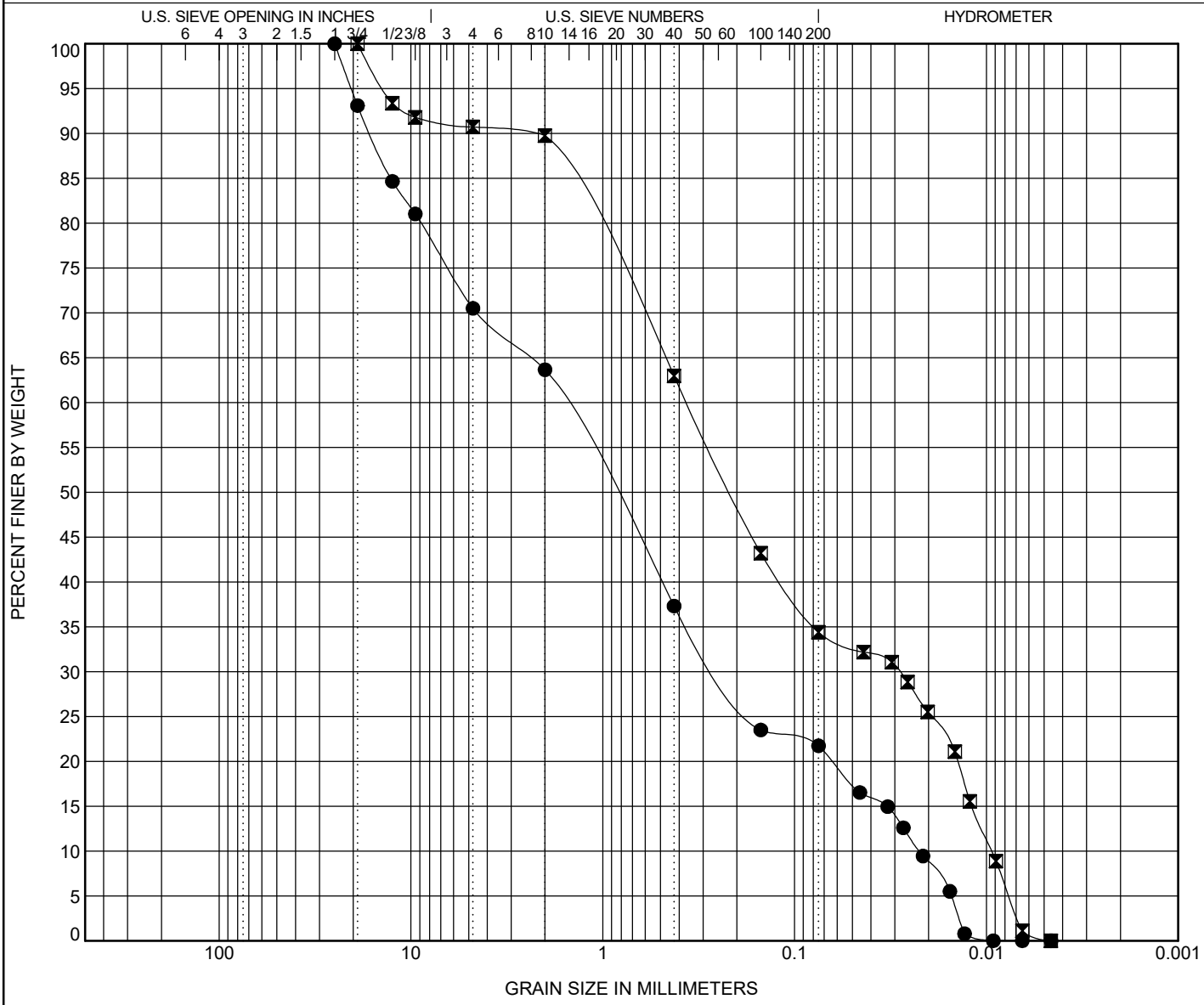
GRAIN SIZE 232478.GPJ GINT US LAB.GDT 1/27/25

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GRAIN SIZE DISTRIBUTION

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PROJECT NUMBER 232478 **PROJECT LOCATION** Kingsville, OH



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		USCS Classification	LL	PL	PI	Cc	Cu
●	B-14	0.0	GRAVEL with SAND, Some Silt A-1-b (0)	NP	NP	NP	1.7	72.3
⊠	B-15	1.5	COARSE and FINE SAND, Some Silt, Little Gravel, Trace Clay A-3a (0)	26	18	8	0.2	38.7

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-14	0.0	25	1.613	0.245	0.022	29.5	48.8	21.7	0.0
⊠	B-15	1.5	19	0.363	0.028	0.009	9.3	56.3	34.1	0.3

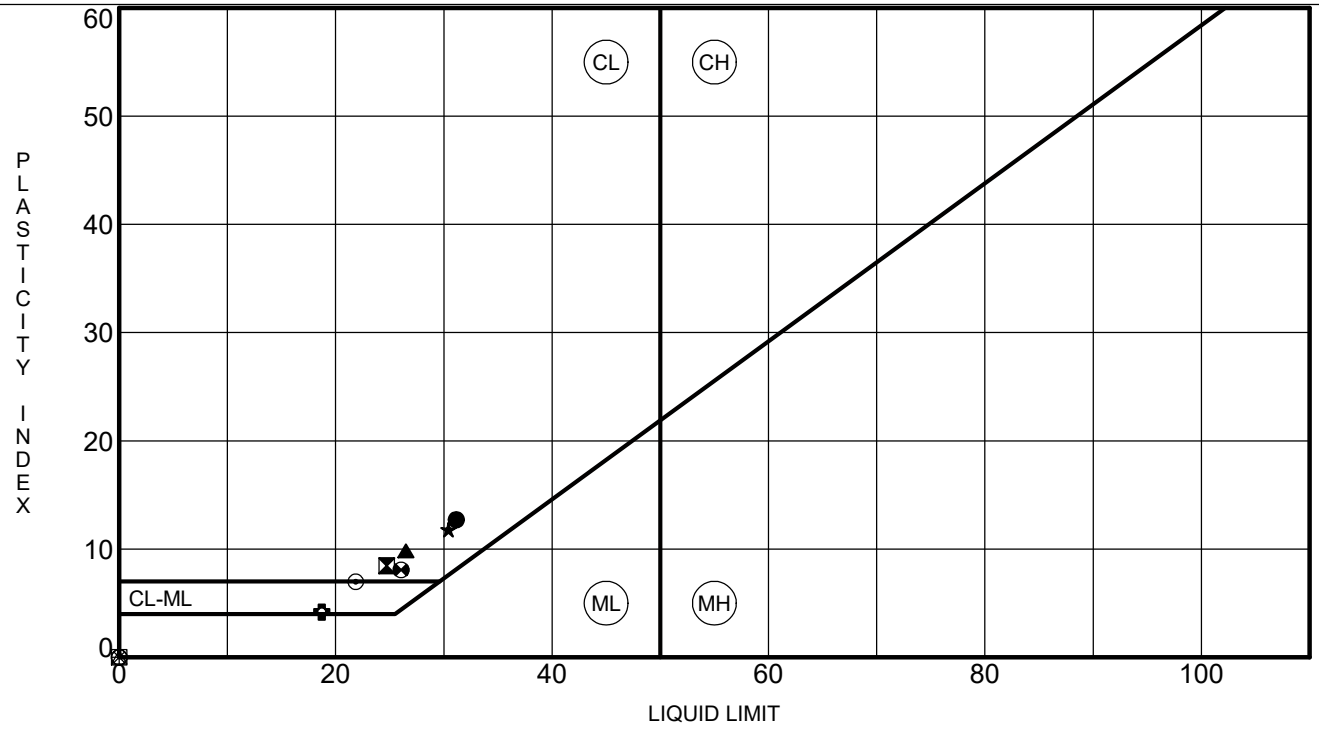
GRAIN SIZE 232478.GPJ GINT US LAB.GDT 1/27/25

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ATTERBERG LIMITS' RESULTS

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH **PROJECT NAME** Kingsville I-90 Interchange Sanitary Sewers

PROJECT NUMBER 232478 **PROJECT LOCATION** Kingsville, OH



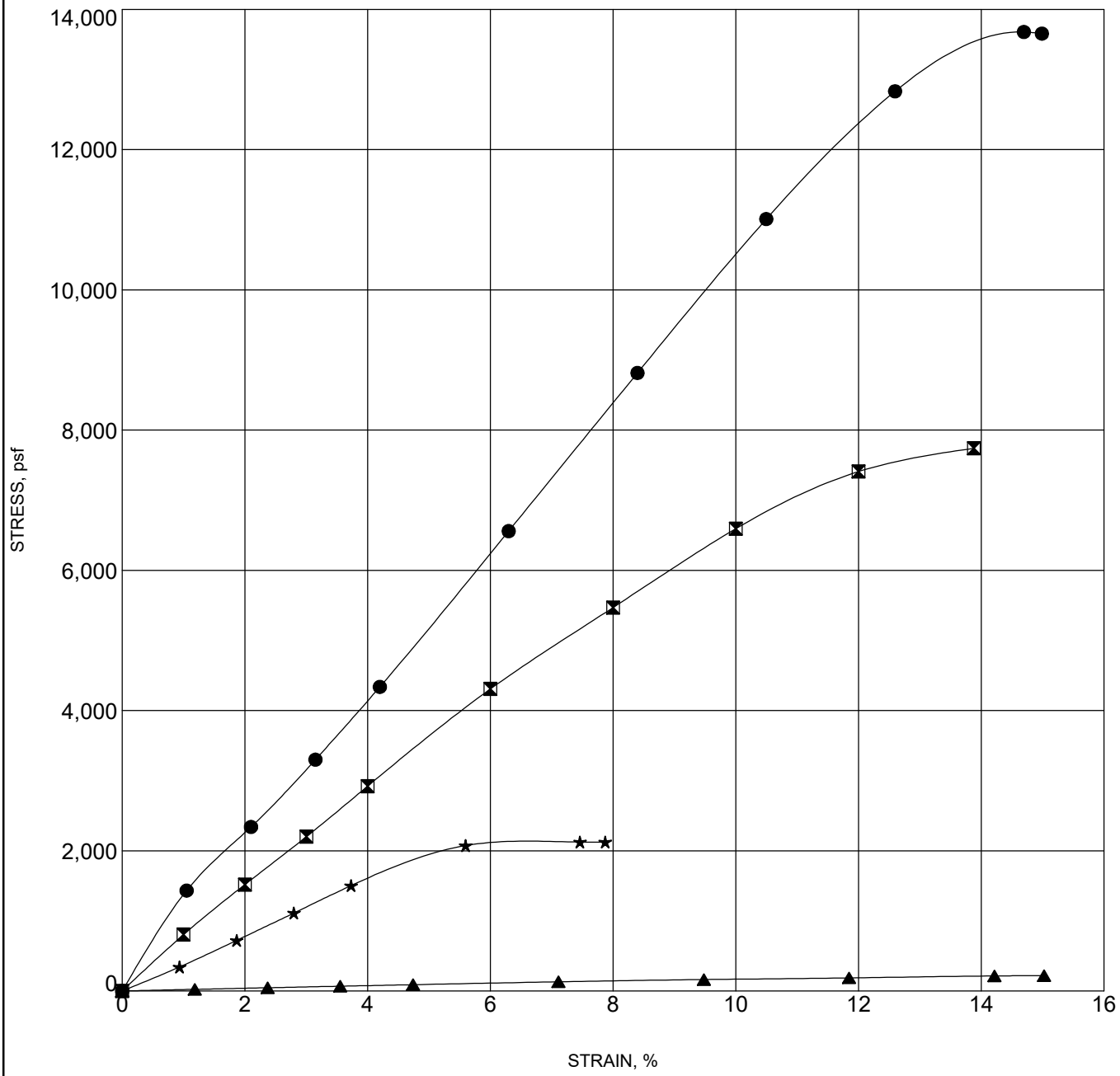
	Specimen Identification		LL	PL	PI	Fines	Classification
●	B-2	0.0	31	18	13	64	SILT and CLAY, Some Sand, Trace Gravel A-6a (7)
⧓	B-3	1.5	25	16	9	51	SANDY SILT, Some Gravel, Little Clay A-4a (3)
▲	B-4	13.5	26	17	9	68	SANDY SILT, Some Clay, Trace Gravel A-4a (7)
★	B-5	1.5	30	19	11	68	SILT and CLAY, Some Sand, Trace Gravel A-6a (7)
⊙	B-5	28.5	22	15	7	53	SANDY SILT, Trace Clay, Trace Gravel A-4a (4)
✿	B-6	1.5	19	15	4	46	SANDY SILT, Trace Gravel, Trace Clay A-4a (2)
○	B-8	0.0	NP	NP	NP	32	COARSE and FINE SAND, Some Silt, Little Gravel A-3a (0)
△	B-10	1.5	NP	NP	NP	19	COARSE and FINE SAND, Little Silt, Trace Gravel A-3a (0)
⊗	B-11	0.0	NP	NP	NP	18	COARSE and FINE SAND, Little Silt, Trace Gravel A-3a (0)
⊕	B-12	1.5	NP	NP	NP	34	COARSE and FINE SAND, Some Silt, Trace Clay A-3a (0)
□	B-14	0.0	NP	NP	NP	22	GRAVEL with SAND, Some Silt A-1-b (0)
⊠	B-15	1.5	26	18	8	34	COARSE and FINE SAND, Some Silt, Little Gravel, Trace Clay A-3a (0)

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UNCONFINED COMPRESSION TEST

CLIENT Department of Enviro. Serv., Ashtabula County, Jefferson, OH **PROJECT NAME** Kingsville I-90 Interchange Sanitary Sewers

PROJECT NUMBER 232478 **PROJECT LOCATION** Kingsville, OH



Specimen Identification			Classification	γ_d	MC%
●	B-4	13.5	SANDY SILT, Some Clay, Trace Gravel A-4a (7)	118	13
⊠	B-5	1.5	SILT and CLAY, Some Sand, Trace Gravel A-6a (7)	114	16
▲	B-5	28.5	SANDY SILT, Trace Clay, Trace Gravel A-4a (4)	95	26
★	B-13	1.5		116	15