

Geotechnical Subsurface Investigation for Little Walnut Creek Interceptor (Phase 2) Sewer Project

PREPARED FOR

The City of Sunbury

9 East Granville Street, Sunbury, Ohio

ISSUED: April 7, 2025



April 7, 2025

CT Project No. 22000715

Ms. Dana Steffan
Director of Finance
9 East Granville Street
Sunbury, Ohio 43074

**Geotechnical Subsurface Investigation
Little Walnut Creek Interceptor (Ph 2) Sewer Project
Sunbury, Ohio**

Dear Ms. Steffan:

The following is the report of the geotechnical subsurface investigation performed by CT Consultants, Inc. (CT) for the referenced project. This study was performed in general accordance with Task Order Proposal dated June 28, 2024 and authorized September 8, 2024

This report contains the results of our study, our engineering interpretation of the results with respect to the project characteristics, and our engineering design recommendations for underground utilities and pavements.

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.

Handwritten signature of Imad El Hajjar in blue ink.

Imad El Hajjar, EI
Geotechnical Project Manager

Handwritten signature of Curtis E. Roupe in blue ink.

Curtis E. Roupe, P.E.
Vice President

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**GEOTECHNICAL SUBSURFACE INVESTIGATION
LITTLE WALNUT CREEK INTERCEPTOR (PHASE 2) SEWER PROJECT
SUNBURY, OHIO**

FOR

**THE CITY OF SUNBURY
9 EAST GRANVILLE STREET
SUNBURY, OHIO 43074
SUBMITTED**

APRIL 7, 2025

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1.0 INTRODUCTION

This geotechnical subsurface investigation report has been prepared for the proposed Little Walnut Creek Interceptor Sewer Project proposed along Cheshire Road in Sunbury, Ohio. The project also includes a small sewer section along Domigan Road. 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.

This study was performed in general accordance with Task Order Proposal dated June 28, 2024 and authorized around September 8, 2024.

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 eleven (11) 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, rock and groundwater related construction procedures such as site preparation, earthwork, pavement subgrade preparation, and related field testing.

2.0 INVESTIGATIVE PROCEDURES

This subsurface investigation included eleven (11) test borings, designated as Borings B-1 through B-11, performed by A Drilling Company, LLC under CT’s direction on September 6th, 16th, and 17th, 2024. Test boring locations were located in the field utilizing a handheld GPS device and their approximate locations of the borings are shown on the Test Boring Location Plan (Plate 2.0).

The test borings were performed in general accordance with geotechnical investigative procedures outlined in Standard D 1586, ASTM D 1452, or ASTM D 6151. The test borings performed during this investigation were drilled with a CME 550x ATV-mounted drilling rig utilizing 3¼-inch inside diameter hollow-stem augers. The depths of the Borings can be seen in Table 2.0.

Table 2.0 Test Boring Data				
Boring Number	Ground Surface Elevation (Ft)	Boring Termination Depth (Ft)	Invert Depth (Ft)	Approximate Boring Termination Elevation (Ft)
B-1*	915	25	19.5	890
B-2	912	20	16.5	892
B-3*	911	20	14.5	891
B-4	919	30	23.5	889
B-5*	924	30	27.5	894
B-6	919	25	22.5	894
B-7*	921	21 ¹	24	900
B-8	923	30	25.5	893
B-9	930	40	33	890
B-10*	935	40	38	895
B-11	930	40	33	890

1: Boring B-7 was terminated at 21 feet below existing grades upon encountering auger refusal.

*: Includes a Pavement Core.

During auger advancement, auger advancement, soil samples were collected at 2½-foot intervals to a depth of 10 feet and 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 number of blows per increment was recorded at each depth interval, and these data are presented under the “SPT” column on the Logs of Test Borings attached to this report. 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, or N-value, and is typically reported in blows per foot

(bpf). The N-values were corrected to an equivalent rod energy ratio of 60 percent, N_{60} . The calibrated hammer/rod energy ratio for the CME 550X ATV-mounted drill rig utilized in this project was 85 percent, based on calibration on April 28, 2023. The N_{60} -values are presented on the attached Logs of Test Borings.

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.

All samples of the subsoils were visually or manually classified using the Ohio Department of Transportation (ODOT) Soil Classification System 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. Atterberg limits tests (ASTM D 4318) and particle size analyses (ASTM D 422) were performed on a selected sample from each boring, to determine soil classification and index properties. These test results are presented on the Logs of Test Borings attached to this report.

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 for underground utilities, and pavement construction 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.

3.0 PROPOSED CONSTRUCTION

We understand the proposed project involves installation of underground utility lines and construction of pavements along Cheshire and Domigan Road in Sunbury, Ohio.

We understand that the installation of these underground utilities will be carried out using an open-cut excavation technique. The proposed sewer lines are expected to consist of pipes with diameters of 12 inches and/or 36 inches, with inverts ranging from 14.5 feet to 38 feet below the existing grades. The proposed improvements are shown in the location plan in Figure 1.

Final design grades are expected to approximate existing roadway grades. Traffic loads and volumes were not available at the time of preparing this report.

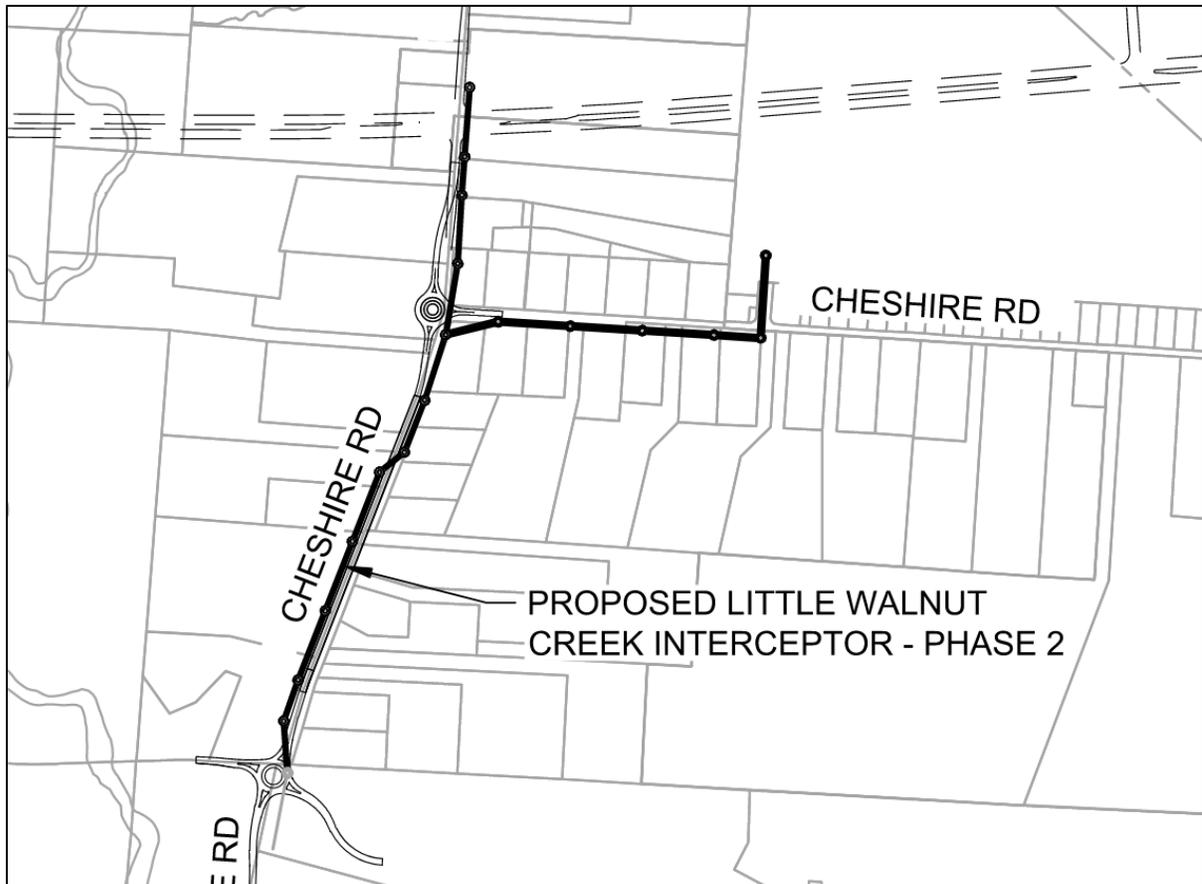


Figure 1: Site Location Map

4.0 GENERAL SITE AND SUBSURFACE CONDITIONS

4.1 General Site Conditions

At the time of our investigation, the project area consisted of asphalt pavements, with primarily residential properties on either side. Ground surface elevations at the boring locations ranged from Elevs. 911 to 935 feet.

During the boring activity, 3 to 4 inches of topsoil was encountered in Borings B-1 and B-11. The remaining borings encountered a layer of asphalt underlain by a layer of crushed stone aggregates. The pavement thicknesses and stone base details are summarized in the following table. It should be noted that pavement thicknesses were generally measured to nearest ¼ inch.

Table 4.1 – Pavement Thickness (inch)		
Boring Number	Asphalt	Crushed Stone Aggregates
B-1	NE*	NE*
B-2	12	6
B-3	4½	25
B-4	12	18
B-5	2	28
B-6	2¼	2
B-7	3	27
B-8	6	24
B-9	9	1
B-10	9½	20

*NE: Not encountered. Boring B-1 was offset 20 feet to the right of the street centerline. Three inches of topsoil was encountered in B-1.

4.2 General Site Geology

Published geologic maps from the Ohio Department of Natural Resources (ODNR) indicate that the project site is located within the glaciated portion of Ohio and covered with end moraine and ground moraine deposits. These deposits are remnants of glacial activity during the last Ice Age. End moraines are formed at the edges of glaciers and consist of unsorted glacial till, which includes a mix of clay, silt, sand, gravel, and boulders. Ground moraines, on the other hand, are formed beneath the glacier and typically consist of more uniformly distributed till. These soils are generally over-consolidated and have lower permeability compared to end moraines. Seams of granular soils were encountered in a some of the borings at the site, indicating localized zones of higher permeability and potential

variability in soil strength. This heterogeneous composition can result in variable geotechnical properties.

Bedrock at the site consists of the Upper Devonian Shale of the Ohio Shale Formation. This group also includes interbedded layers of siltstone, and very fine-grained sandstone. Weathered Bedrock was encountered in approximately half of the borings performed at depths ranging from 18½ to 38½ feet (Elevation 907± to 891±).

4.3 General Soil Conditions

Based on the results of our field and laboratory tests, the subsoils underlying the pavement materials predominantly consist of over-consolidated cohesive till soils, underlain by weathered shale bedrock. Seams of granular soils were identified within the upper subsurface profile. Further details on the encountered conditions are provided in the subsequent paragraphs.

The cohesive soils consisted of silt and clay (A-6a), mixed with varying portions of sand and gravel. Trace rock fragments were noted for the samples nearing the bedrock interface. The majority of the cohesive till soils exhibited a generally stiff to very stiff consistency, with some areas showing a hard consistency. SPT N_{60} -values generally varied from 10 to 62 blows per foot (bpf). Unconfined compressive strengths generally ranged from 2,500 to greater than 4,500 pounds per square foot (psf) (the highest obtainable value using a hand penetrometer). Moisture contents ranged from 10 to 28 percent.

Zones of cohesive soils exhibiting medium stiff consistency were encountered within the subsurface profile as follows:

- In Boring B-3 from 13½ to 20 feet with SPT N_{60} -values ranging from 4 to 6 bpf and unconfined compressive strengths ranging from 500 to 1,000 psf.
- In Boring B-7 from 13½ to 18½ feet with SPT N_{60} -value of 33 bpf and unconfined compressive strength of 1,000 psf.
- In Boring B-8 from 18½ to 20 feet with SPT N_{60} -value of 9 bpf and unconfined compressive strength of 1,000 psf.

As previously mentioned, seams of granular soils were encountered in the upper soil profile in nearly half of the borings. These seams were identified in Borings B-1, B-2, B-4, B-7, B-8 and B-9, with thicknesses ranging from 2 to 5 feet. Notably, in Boring B-1, the seam of granular soils extended from approximately 6 feet to the planned termination depth of 25 feet.

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

4.4 General Bedrock Conditions

Bedrock consisting of sandstone and/or shale was encountered in Borings B-4, B-5, B-7, B-9, B-10 and B-11. Weathered rock that was able to be penetrated with the augers was encountered in all but three of the borings at depths generally ranging from 18½ to 38½ feet (approximate Elevs. 907 to 891). In most test borings, the upper 1 to 2 feet of the bedrock was severely weathered and decomposed such that it was augerable. Within the weathered rock, the SPT generally resulted in split-spoon refusal (SSR, 50 or more blows over 6 inches or less penetration). Moisture contents ranged from 8 to 15 percent for the recovered samples. The depths of encountered rock are summarized in the following table.

Table 4.2. Summary of Rock Information					
Boring	Ground Elevation (Feet)	Depth ¹ to top of Weathered Rock (feet)	Top of Weathered Rock Elevation ¹ (Feet)	Depth ¹ to top of Competent Rock ² (feet)	Top of Competent Rock ² Elevation ¹ (Feet)
B-1	915	-	-	-	-
B-2	912	-	-	-	-
B-3	911	-	-	-	-
B-4	919	28½	890½	-	-
B-5	924	18½	905½	-	-
B-6	919	-	-	-	-
B-7	921	-	-	21	900
B-8	923	-	-	-	-
B-9	930	38½	891½	-	-
B-10	935	28½	906½	-	-
B-11	930	33½	896½	-	-

1: The depth and elevations shown in the table above are approximate.

2: Inferred from drilling observations (i.e., Auger Refusal).

4.5 Groundwater Conditions

Groundwater was encountered both during and upon completion of the drilling operations in all the borings except Boring B-6. Approximate depths and elevations are provided in Table 4.3.

Table 4.3. Summary of Ground Water during and after Drilling Operation*					
Boring	Ground Elevation (Feet)	Ground Water Depth (During Drilling)	Ground Water Elevation (During Drilling)	Ground Water Depth (After Drilling)	Ground Water Elevation (After Drilling)
B-1	915	17½	891½	16	899
B-2	912	18	894	10	902
B-3	911	17½	893½	9	902
B-4	919	27	892	24	895
B-5	924	27	897	19	905
B-6	919	NE**	NE**	NE**	NE**
B-7	921	16	905	14½	906½
B-8	923	21½	901½	19	904
B-9	930	18	912	15	915
B-10	935	18	917	22	913
B-11	930	15	915	20	910

*The depths and elevations shown are approximate and measured in feet.

**NE: Not Encountered.

It should be noted that each boring was drilled and backfilled within the same day and instrumentation was not installed to observe long-term groundwater levels. As such, stabilized water levels may not have occurred in the predominately clayey subsurface profile over this limited time period. Instrumentation was not installed to observe long-term groundwater levels.

Based on the limited data available, such as the soil characteristics and the moisture conditions encountered in the borings, it is our opinion that the “normal” groundwater level may be generally encountered approximately 16 to 18 feet below existing grades. However, this investigation did not include research of possible hydrological influences at the project site. It should be noted that groundwater elevations can fluctuate with seasonal and climatic influences. In particular, “perched” water may be encountered in the surface crushed stone layer that is underlain by relatively impermeable cohesive soils, or trapped within the interbedded seams of granular soils. Therefore, the groundwater conditions may vary at different times of the year from those encountered during this investigation.

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 sewer lines consisting of pipes with diameters of 12 inches and/or 36 inches, with inverts ranging from 14.5 feet to 38 feet below the existing grades. These utilities will be installed using an open-cut excavation technique. Final design grades are expected to approximate existing roadway grades.

Based on the results of the field and laboratory testing for the borings performed during this exploration, the soils encountered at the anticipated invert elevation are expected to consist of the aforementioned cohesive or granular soils, with the exception of Borings B-7, B-10, and B-11. In Borings B-10 and B-11, the pipes are expected to be supported on weathered bedrock. In Boring B-7, the pipes are expected to be supported on a more competent layer of bedrock. It should be noted that Boring B-7 was terminated upon encountering auger refusal on what appeared to be sound bedrock at 21 feet below the existing grade, while the pipe invert is expected to be at 24 feet.

All of these subsoils and rock are considered generally suitable for support of the proposed water line. According to the findings from Boring B-3, there is a possibility of encountering **soft** to medium stiff cohesive soils at the proposed invert elevation. **The soft cohesive soils may necessitate over-excavation. As a minimum, unsuitable soils should be undercut to a depth of one pipe diameter below invert, or 12 inches, whichever is greater. The undercut zones should be replaced with engineered fill, properly placed and compacted as outlined in Section 6.0 of this report prior to placement of the bedding and haunching material.**

In any case, 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. In the absence of specific criteria for bedding and haunching materials, we recommend the use of dense graded aggregate meeting Ohio Department of Transportation (ODOT) Item 304 specifications, or alternately, ODOT 703 coarse aggregate meeting No. 57 or No. 6 gradations.

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.

5.2 Open-Cut Installation Methods

The sides of the temporary excavations for underground utilities installation should be adequately sloped to provide stable sides and safe working conditions. If the proposed underground utilities alignment requires working in close proximity to existing underground utilities or other structures, this may not be possible. Where sloped excavations will not be used, the excavation must be properly braced against lateral movements. In any case, applicable OSHA safety standards must be followed. It is the responsibility of the installation contractor to develop appropriate installation methods and equipment prior to commencement of work, and to obtain the services of a geotechnical engineer to design or approve sloped or benched excavations and/or lateral bracing systems as required by OSHA criteria. The excavations greater than 20 feet deep should be evaluated by a registered professional engineer.

If the excavation is to be performed with sloped banks, adequate stable slopes must be provided. Based on the borings drilled for this investigation, soils encountered in trench excavations may include one or more of the following:

- Stable Rock (rock that can be excavated with vertical sides and remain intact while exposed),
- 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 dry rock), and
- OSHA Type C soils (granular soils and fill materials).

Vertical side slopes are acceptable for temporary excavations in stable rock. Based on the weathering condition of the bedrock and that it was penetrated with hollow stem augers, we recommend that temporary excavations in bedrock be considered borderline material and treated as Type B materials unless test excavations are performed to substantiate use of the Stable Rock designation.

For temporary excavations in Type A, B and C soils, side slopes must be no steeper than $\frac{3}{4}$ horizontal to 1 vertical ($\frac{3}{4}H:1V$), $1H:1V$, and $1\frac{1}{2}H:1V$, respectively. For situations where a higher strength soil is underlain by a lower strength soil and the excavation extends into the lower strength soil (including excavation through cohesive soils that are underlain by granular soils or bedrock), the slope of the entire excavation is governed by that required for 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 excavations and 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 “weathered shale and/or sandstone” zone which was penetrable with augers is expected to consist of

conventional excavation equipment such as a backhoe or track excavator, with some assistance from pneumatic chippers, jackhammers, or hydraulic wedging equipment. However, excavation into the more intact bedrock beyond the depth of auger refusal is expected to be unproductive and uneconomical with conventional excavation equipment. Excavations that must extend into this zone will likely require use of hard rock removal methods. Based on the limited rock data available, it is anticipated that equipment including pneumatic chippers, jackhammers, or hydraulic wedging equipment will be sufficient to rip and dig the rock. However, there may be some areas (notably in the vicinity of Boring B-7) beyond the depth of auger refusal that require drilling and use of expansive chemicals to fracture and loosen the rock.

5.3 Braced Excavations

Braced excavations constructed using soldier piles with wood lagging or sheetpiling may be considered in areas of restricted access or proximity to structures. The method employed will depend on the construction sequencing, required access size and area, and economic considerations. Difficult driving or refusal would be anticipated with piles extending to the underlying weathered rock. This may limit embedment of piling.

The sides of temporary excavations for installation of the proposed underground utilities should be adequately sloped to provide stable sides and safe working conditions. Otherwise, the excavations must be properly braced against lateral movements.

Design of the temporary support of excavation should be the responsibility of the contractor, since their installation and performance are integrally tied to the contractor's means and methods of construction. In any case, applicable Occupational Safety and Health Administration (OSHA) standards must be followed. **It is the responsibility of the installation contractor to develop appropriate installation methods and equipment specifications prior to commencement of work, and to obtain the services of a qualified engineer to design or approve sloped or benched excavations and/or lateral bracing systems as required by OSHA criteria.** In addition, OSHA requires that excavations with open-cut slopes higher than 20 feet, or braced excavation support systems be reviewed and designed by a registered professional engineer.

All braced excavations should be designed to resist lateral earth pressures. Based on the encountered predominantly cohesive soil profile, a total (wet) unit weight of 130 pounds per cubic foot (pcf) should be utilized for developing lateral soil pressures. A coefficient of active lateral earth pressure (k_a) of 0.35 may be used for analysis of cantilevered sheetpiling 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. 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 as selected by the contractor.

Additionally, lateral loading due to hydrostatic pressures below the design groundwater depth should be included in 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 unit weight of 70 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 the 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 3.0 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 3.0 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.

5.4 Construction Dewatering

The “normal” groundwater level may be present on the order of Elevs. 915± to 912±, corresponding to depths ranging from 15 to 18 feet below existing grades at the boring locations performed in this area. Excavation for the installation of proposed underground utilities at the site is generally expected to extend below the groundwater level and intercept granular soil seams with possible perched water conditions. As such, we anticipate encountering perched groundwater and/or groundwater seepage as the trenches are excavated. **It is likely that the bottom of the excavation could become unstable due to groundwater. A sufficient dewatering system should be anticipated.** It is our experience that localized areas of groundwater seepage typically “dry up” soon after the cut slope is completed as the water stored within permeable areas drains. The groundwater seepage should be collected and conveyed away from areas of work.

It is possible that areas of wet soil will persist and continue to seep. In that case, 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 rain or snow (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 bedding.

Furthermore, management of groundwater is generally anticipated to be feasible by pumping from prepared sumps. In any case, it is our experience that adequate control of groundwater seepage or

surface water run-off into shallow excavations that do not extend more than a couple feet below the water level in predominantly clay profiles should be achievable by minor dewatering systems, such as pumping from prepared sumps.

Where excavations extend below ambient groundwater conditions, there is potential for clayey soils to become soft when saturated and/or exposed to seepage pressures. If diligence and care is taken to maintain a stable subgrade upon excavation, significant modification of the bearing surface is not likely to be required for short-term excavations. However, for excavations that will remain open for a period of time prior to installation of foundations, a mud mat should be placed at the base of the excavation to maintain a suitable working surface. If seepage and surface runoff result in an unstable excavation bottom, the subgrade will need to be undercut and replaced with granular fill to provide a firm stratum on which to construct the structure foundations and slabs. It is our experience that the undercut will need to be a minimum of 12 inches to provide a stable bridging layer of granular material. This granular material will also help facilitate dewatering from sumps and pumps.

Groundwater elevations can fluctuate with seasonal and climatic influences. In particular, “perched” groundwater may be encountered within, the pavement base materials, trapped along the soils/rock interface as well as within the granular soils. 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 to remain open for a long time, 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 below the “normal” groundwater level and groundwater seepage into excavations should be anticipated.

5.5 Subgrades and Pavements

5.5.1 Subgrades Evaluation

An evaluation of the subgrade soils was completed in general accordance with ODOT Geotechnical Design Manual (GDM) Section 600 (July 21, 2023). As part of this evaluation, the ODOT “Subgrade Analysis” worksheet (V14.7, 11/6/2024) 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 4 to 30 inches below the existing top of pavement grades (represented as a 0.3 to 2.5 feet cut in the ODOT “Subgrade Analysis” worksheet).

Based on the GDM , 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 with respect to pavement subgrade support. None of these soil types were encountered at planned subgrade elevations in the borings performed for this exploration.

Based on the GDM 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 50 percent of the tested subgrade soil samples were greater than 3 percent above the optimum as determined using the GDM criteria. Approximately 50 percent of the samples with moisture contents greater than 3 percent above optimum had moisture contents greater than or equal to 5 percent above optimum. 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 predominantly cohesive subgrades. However, scarification and aeration methods may be utilized if construction schedule will allow such soil modification.

The type and thickness of subgrade modification is determined by the GDM criteria based on the average, low SPT N_{60} -value (N_{60L}) 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 except in the vicinity of Boring B-3, located along Cheshire Road near STA 0+08.

The type and thickness of subgrade modification is determined by GDM criteria based on the average, low SPT N_{60} -value (N_{60L}) of the subgrade soils in a particular portion of the project area, hand penetrometer value, soil type, and moisture content. Based on these criteria, 1 of the 11 roadway subgrade borings ($<10\pm$ percent) contained subgrade soils which indicated subgrade modification is likely to be required. The GDM Recommended Depth of Undercut and Replacement with Granular Engineered Fill was roughly 6 -inches.

It should be noted that GDM subgrade 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.

Due to the limited extent of the required subgrade stabilization, Chemical stabilization is deemed uneconomical.

5.5.2 Flexible (Asphalt) Pavement Design

Based on the GB-1 analysis, a design CBR value of 6 percent was determined for the project. It should be noted that the CBR determination by the GB-1 spreadsheet is based on the average Group Index of all the evaluated samples, which was 9. Group indices for the tested samples ranged from 0 to 9, which would correlate with a CBR value of 6 to 13 percent. Cohesive subgrade soils classified as ODOT A-6a were predominantly present within the upper 3 feet of the subgrade elevation in all borings. The average group index for these samples was 8. Based on the average design value calculations from GB-1, it does not appear to be unconservative to use the GB-1 design CBR value of 6 percent for new pavement sections throughout the project area.

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 in accordance with Section 6.1 of this report.

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.

5.6 Pavement Drainage

Based on the poorly-drained nature of the majority of the cohesive subgrade soils, it is anticipated that surface water infiltration may collect in the aggregate base course. Without adequate drainage, water will 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 CONSTRUCTION RECOMMENDATIONS

6.1 Site and Subgrade Preparation

Prior to proceeding with construction operations, all structures, pavements, existing stockpiles, vegetation, topsoil, root mat, and other deleterious non-soil materials should be removed from the proposed construction areas. Suitable topsoil may be stockpiled for later use in landscaped areas. Topsoil and pavement thicknesses may vary across the site, and from the thickness indicated at the boring locations. The topsoil and pavement thicknesses presented in the borings are not intended as a basis for project quantity estimates or bid purposes.

Dark soils having the appearance of topsoil, but exhibiting only root “hairs” or trace organics less than approximately five percent, may not require stripping for the full depth of the darkly colored zone, provided the subgrade can be satisfactorily proof rolled as described below. The actual amount of required stripping should be determined in the field by a geotechnical engineer or qualified representative.

Upon completion of stripping and clearing, the areas intended to support pavements, and new fill should be carefully inspected by a geotechnical engineer. At that time, the engineer should observe proof rolling of the cohesive subgrade soils using a minimum 20-ton loaded truck or other pneumatic-tired vehicle of similar size and weight. The truck should make a minimum of two passes covering the proposed development area, with additional passes as necessary to achieve required compaction and/or subgrade stabilization. The engineer should observe proof rolling/compaction of the granular subgrades using a vibratory, smooth- drum roller. The roller should make a minimum of two passes covering the proposed development area, with additional passes as necessary to achieve required compaction and/or subgrade stabilization.

The purpose of proof rolling the cohesive soil subgrades is to locate any weak, soft, or excessively wet materials that may be present at the time of construction. The purpose of vibratory compaction for the granular soils is to densify zones of loose materials that are encountered in the upper portion of the soil profile, thereby providing more uniform subgrade support. A roller with a minimum dead weight on the drums of 8 tons, vibrating at 30 Hz or greater, and traveling at speeds not exceeding approximately 4 feet per second (about 3 miles per hour) should be utilized for compaction. These operational criteria should provide sufficient dynamic compaction energy to alleviate loose soil conditions within the zone of influence for subgrade support. If perched water is present in the granular subgrade soils, additional compaction with the equipment in static mode (without vibration) or dewatering may be required for suitable compaction.

Any unsuitable materials observed during the inspection and proof-rolling operations should be undercut and replaced with compacted fill or stabilized in place utilizing conventional remedial measures such as discing, aeration, and recompaction. Once the site has been proof rolled, inspected,

and stabilized, the proof-rolled or inspected subgrades should not be exposed to wet conditions. It should be recognized that during periods of wet weather, the silty and clayey soils that will be exposed at design subgrades will tend to pond water for short periods of time, with the potential to deteriorate the prepared subgrade.

The results of the inspection and proof-rolling operations will be partially dependent on construction operations, the moisture content of the soil, and the weather conditions prevalent at the time. If pumping or rutting is encountered and difficulty is experienced in the operation of construction equipment, CT should be notified in order to determine which method of subgrade modification may be best suited for the conditions encountered. Should such conditions be experienced, we may recommend that a small test area be used to determine the necessary depth of undercutting and stone replacement or other remedial action necessary to achieve a stable subgrade condition.

6.2 Fill

Material for engineered fill or backfill required to achieve design grades may consist of any non-organic soils having a maximum dry density as determined by the Standard Proctor (ASTM D 698) greater than 90 pounds per cubic foot (pcf), and exhibiting a liquid limit of less than 50 percent. On-site soils may be used as engineered fill materials provided that they are free of organic matter, high concentration of gypsum, debris, excessive moisture, and rock or stone fragments larger than 3 inches in diameter and exhibit a liquid limit of less than 50 percent.

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 granular soils, such as ODOT Item 203 granular material that conforms to 703.16.C. 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.

Based on the boring investigation, the upper soil profile at the site consists of native cohesive soils. The contractor should be prepared to use a sheepsfoot roller to provide effective compaction of the cohesive soils. For new granular engineered fill, compaction of these materials should be performed using a vibratory, smooth-drum roller. In narrow utility or footing excavations, the on-site cohesive soils may be difficult to compact; therefore, a clean granular material may be required in these areas.

Scarified subgrade soils and all fill material should be within 3 percent of the optimum moisture content to facilitate compaction. Furthermore, fill material should not be frozen or placed on a frozen base. It is recommended that all earthwork and site preparation activities be conducted under adequate specifications and properly monitored in the field by a qualified geotechnical testing firm.

7.0 QUALIFICATION OF RECOMMENDATIONS

Our evaluation of geotechnical-related pavement subgrade and 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. The general subsurface conditions were based on interpretation of the subsurface data at specific boring locations. When the final structure locations become available, additional geotechnical exploration in the area of the proposed development should be performed. The findings of such an investigation will be presented in a supplemental report. Based on the results of final design investigation, the recommendations of this report will be reviewed and modified, as necessary.

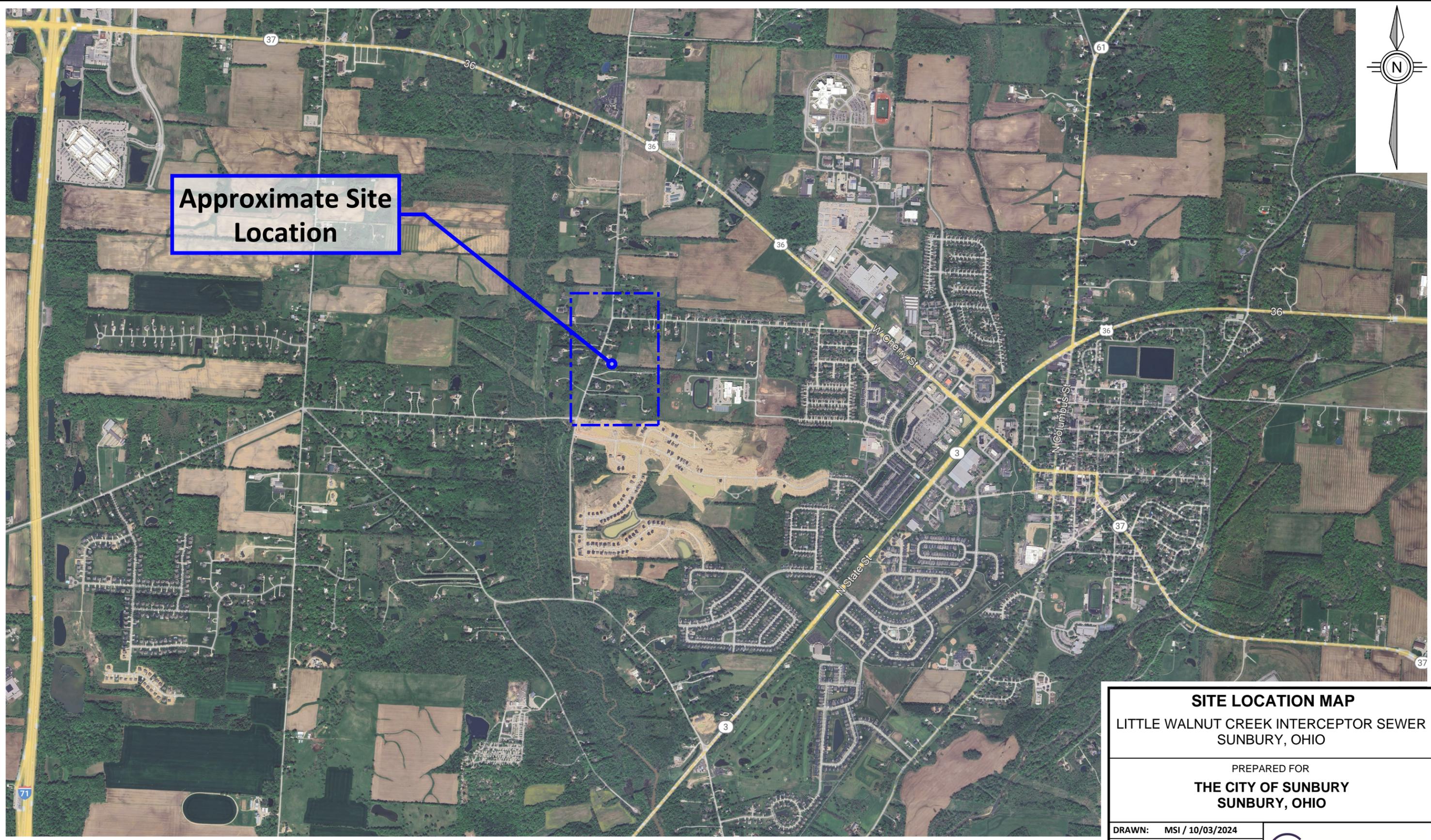
Regardless of the thoroughness of a subsurface investigation, there is the possibility that conditions between borings will differ from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the soil conditions. Therefore, 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 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 and the final geotechnical subsurface investigation report after on-site observations of the conditions.

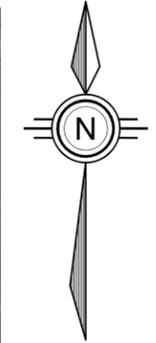
Our professional services have been performed, our findings derived, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied. CT is not responsible for the conclusions,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

PLATES

PLATE 1.0	SITE LOCATION MAP
PLATE 2.0	TEST BORING LOCAITON PLAN



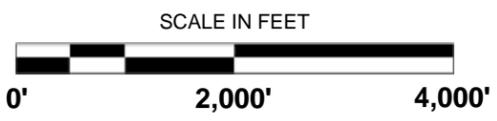
Approximate Site Location



SITE LOCATION MAP
 LITTLE WALNUT CREEK INTERCEPTOR SEWER
 SUNBURY, OHIO

PREPARED FOR
THE CITY OF SUNBURY
 SUNBURY, OHIO

DRAWN: MSI / 10/03/2024
 REVISED: ---
 PROJECT No: 22000715

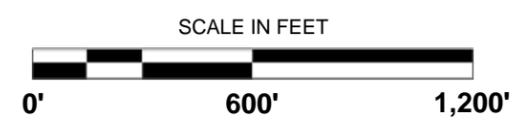




LEGEND:

B-1

 APPROXIMATE TEST BORING LOCATION



BASE PLAN "SITE AERIAL PLAN" DATED 05/09/2023 OBTAINED FROM GOOGLE EARTH.

TEST BORING LOCATION PLAN	
LITTLE WALNUT CREEK INTERCEPTOR SEWER SUNBURY, OHIO	
PREPARED FOR THE CITY OF SUNBURY SUNBURY, OHIO	
DRAWN: MSI / 10/03/2024	 A Verdantas Company
REVISED: ---	
PROJECT No: 22000715	
PLATE 2.0	

APPENDIX A

LOGS OF TEST BORINGS

PROJECT: <u>LITTLE WALNUT CREEK</u>	DRILLING FIRM / OPERATOR: <u>ADC / TIM</u>	DRILL RIG: <u>ADC CME 550X</u>	STATION / OFFSET: <u>0+00</u>	EXPLORATION ID
TYPE: <u>UNDERGROUND UTILITY</u>	SAMPLING FIRM / LOGGER: <u>ADC / KKC</u>	HAMMER: <u>AUTOMATIC HAMMER</u>	ALIGNMENT: _____	B-1
PID: _____ SFN: _____	DRILLING METHOD: <u>HSA</u>	CALIBRATION DATE: <u>4/28/23</u>	ELEVATION: <u>915.0 (NAVD88)</u>	EOB: <u>25.0 ft.</u>
START: <u>9/17/24</u> END: <u>9/17/24</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>85</u>	COORD: <u>Not Recorded</u>	PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
TOPSOIL - 3 INCHES	915.0																		
VERY STIFF, BROWN, SILT AND CLAY, SOME SAND, LITTLE GRAVEL, MOIST	914.7	1	9																
		2	10	31	94	SS-1	3.25	15	8	13	18	46	30	18	12	11	A-6a (7)	150	
		3	12																
@3.5': HARD, TRACE GRAVEL, TRACE CALCITE STAIN SEAM		4	3																
		5	9	28	78	SS-2	>4.5	8	7	15	23	47	31	19	12	14	A-6a (8)	150	
		6	11																
DENSE, BROWN, COARSE AND FINE SAND, LITTLE SILT, LITTLE CLAY, TRACE GRAVEL, MOIST	909.0	7	3																
		8	9	35	72	SS-3	NP	-	-	-	-	-	-	-	-	7	A-3a (V)	-	
		9	16																
@8.5': LITTLE GRAVEL		10	7																
		11	14	45	78	SS-4	NP	-	-	-	-	-	-	-	-	9	A-3a (V)	-	
		12	18																
		13																	
@13.5': LITTLE GRAVEL		14	10																
		15	8	20	17	SS-5	NP	-	-	-	-	-	-	-	-	10	A-3a (V)	-	
		16	6																
		17																	
		18																	
MEDIUM DENSE, GRAY, GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT, TRACE CLAY, MOIST	896.5	19	7																
		20	8	23	56	SS-6	NP	-	-	-	-	-	-	-	-	10	A-2-4 (V)	-	
		21	8																
		22																	
		23																	
MEDIUM DENSE, GRAY, COARSE AND FINE SAND, LITTLE SILT, TRACE GRAVEL, TRACE CLAY, MOIST	891.5	24	2																
	890.0	25	8	26	72	SS-7	NP	-	-	-	-	-	-	-	-	13	A-3a (V)	-	
		25	10																

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 11/20/24 15:20 - X:\PROJECTS\22000715.GPJ

NOTES: PAVEMENT CORE TAKEN AND AGGREGATE BASE MEASURED IN OFFSET BORING. 9.5" ASPHALT, 4" AGGREGATE BASE
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH 1 BAG BENTONITE CHIPS

PROJECT: <u>LITTLE WALNUT CREEK</u>	DRILLING FIRM / OPERATOR: <u>ADC / TIM</u>	DRILL RIG: <u>ADC CME 550X</u>	STATION / OFFSET: <u>0+04</u>	EXPLORATION ID
TYPE: <u>UNDERGROUND UTILITY</u>	SAMPLING FIRM / LOGGER: <u>ADC / KKC</u>	HAMMER: <u>AUTOMATIC HAMMER</u>	ALIGNMENT: _____	B-2
PID: _____ SFN: _____	DRILLING METHOD: <u>HSA</u>	CALIBRATION DATE: <u>4/28/23</u>	ELEVATION: <u>912.0 (NAVD88)</u>	EOB: <u>20.0 ft.</u>
START: <u>9/17/24</u> END: <u>9/17/24</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>85</u>	COORD: <u>Not Recorded</u>	PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
ASPHALT - 12 INCHES	912.0																		
AGGREGATE BASE - 6 INCHES	911.0	1	16																
MEDIUM DENSE, BROWN, COARSE AND FINE SAND , LITTLE SILT, TRACE GRAVEL, TRACE CLAY, MOIST	910.5	2	6	14	61	SS-1	NP	-	-	-	-	-	-	-	7	A-3a (V)	-		
VERY STIFF, BROWN, SILT AND CLAY , LITTLE SAND, TRACE GRAVEL, MOIST	908.5	3	6																
@6': VERY STIFF		4	3	13	67	SS-2	4.00	-	-	-	-	-	-	-	20	A-6a (V)	-		
		5	6																
		6	2	6	78	SS-3	3.50	-	-	-	-	-	-	-	18	A-6a (V)	-		
		7	2	2															
@13.5': STIFF, GRAY/BROWN, SOME SAND		8	2																
		9	3	7	33	SS-4	1.75	-	-	-	-	-	-	18	A-6a (V)	-			
		10	2																
		11																	
		12																	
		13																	
		14	5	10	33	SS-5	1.25	-	-	-	-	-	-	22	A-6a (V)	-			
		15	3	4															
		16																	
		17																	
		18																	
	893.5	18																	
LOOSE, BROWN/GRAY, COARSE AND FINE SAND , LITTLE SILT, TRACE GRAVEL, TRACE CLAY, MOIST	892.0	19	1	4	44	SS-6	NP	-	-	-	-	-	-	18	A-3a (V)	-			
		20	2																

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 11/20/24 15:22 - X:\PROJECTS\22000715.GPJ

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH 1 BAG BENTONITE CHIPS

PROJECT: <u>LITTLE WALNUT CREEK</u>	DRILLING FIRM / OPERATOR: <u>ADC / TIM</u>	DRILL RIG: <u>ADC CME 550X</u>	STATION / OFFSET: <u>0+08</u>	EXPLORATION ID B-3
TYPE: <u>UNDERGROUND UTILITY</u>	SAMPLING FIRM / LOGGER: <u>ADC / KKC</u>	HAMMER: <u>AUTOMATIC HAMMER</u>	ALIGNMENT: _____	PAGE 1 OF 1
PID: _____ SFN: _____	DRILLING METHOD: <u>HSA</u>	CALIBRATION DATE: <u>4/28/23</u>	ELEVATION: <u>911.0 (NAVD88)</u> EOB: <u>20.0 ft.</u>	
START: <u>9/17/24</u> END: <u>9/17/24</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>85</u>	COORD: <u>Not Recorded</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
ASPHALT - 4.4 INCHES	911.0																		
CRUSHED STONES / AGGREGATE - 25 INCHES	910.6	1	19																
		2	22	47	72	SS-1	NP	-	-	-	-	-	-	-	-	-	5	A-1-a (V)	-
	908.5	3	11																
HARD, GRAY/BROWN, SILT AND CLAY, LITTLE SAND, TRACE GRAVEL, MOIST		4	2	6	50	SS-2	>4.5	-	-	-	-	-	-	-	-	-	17	A-6a (V)	-
		5	2																
@6': VERY STIFF, BROWN		6	2																
		7	3	11	72	SS-3	3.75	-	-	-	-	-	-	-	-	-	21	A-6a (V)	-
		8	5																
@8.5': STIFF, BROWN/GRAY		9	2																
		10	6	17	33	SS-4	2.00	-	-	-	-	-	-	-	-	-	14	A-6a (V)	-
		11	6																
		12																	
@13.5': SOFT TO MEDIUM STIFF		13																	
		14	2	6	39	SS-5	0.25	-	-	-	-	-	-	-	-	-	28	A-6a (V)	-
		15	2																
		16																	
		17																	
@18.5': GRAY		18																	
		19	4	4	33	SS-6	0.50	-	-	-	-	-	-	-	-	-	22	A-6a (V)	-
	891.0	20	2	1															

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 11/20/24 15:23 - X:\PROJECTS\22000715.GPJ

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH 1 BAG BENTONITE CHIPS

PROJECT: <u>LITTLE WALNUT CREEK</u>	DRILLING FIRM / OPERATOR: <u>ADC / TIM</u>	DRILL RIG: <u>ADC CME 550X</u>	STATION / OFFSET: <u>0+12</u>	EXPLORATION ID
TYPE: <u>UNDERGROUND UTILITY</u>	SAMPLING FIRM / LOGGER: <u>ADC / KKC</u>	HAMMER: <u>AUTOMATIC HAMMER</u>	ALIGNMENT: _____	B-4
PID: _____ SFN: _____	DRILLING METHOD: <u>HSA</u>	CALIBRATION DATE: <u>4/28/23</u>	ELEVATION: <u>919.0 (NAVD88)</u>	EOB: <u>30.0 ft.</u>
START: <u>9/17/24</u> END: <u>9/17/24</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>85</u>	COORD: <u>Not Recorded</u>	PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
ASPHALT - 12 INCHES	919.0																		
CRUSHED STONES / AGGREGATE - 18 INCHES	918.0	1	20																
	916.5	2	11	23	39	SS-1	NP	-	-	-	-	-	-	-	-	3	A-1-a (V)	-	
HARD, BROWN, SILT AND CLAY , LITTLE SAND, TRACE GRAVEL, MOIST		3																	
		4	3	4	14	33	SS-2	>4.5	-	-	-	-	-	-	-	15	A-6a (V)	-	
		5		6															
		6	0																
		7	0	15	21	50	SS-3	>4.5	-	-	-	-	-	-	-	15	A-6a (V)	-	
		8																	
		9	2																
		10	4	6	14	100	SS-4	>4.5	-	-	-	-	-	-	-	17	A-6a (V)	-	
		11																	
		12																	
@8.5': TRACE CALCITE STAIN SEAM		13																	
		14	2																
@13.5': BROWN/GRAY, TRACE IRON OXIDE STAIN SEAM		15	6	5	16	22	SS-5	>4.5	-	-	-	-	-	-	15	A-6a (V)	-		
		16																	
		17																	
		18																	
@18.5': VERY STIFF		19	4																
		20	4	4	11	28	SS-6	2.50	-	-	-	-	-	-	20	A-6a (V)	-		
		21																	
		22																	
		23																	
DENSE, BROWN/GRAY, COARSE AND FINE SAND , LITTLE CLAY, LITTLE GRAVEL, TRACE SILT, MOIST	895.5	24	8																
		25	12	19	44	50	SS-7	NP	-	-	-	-	-	-	13	A-3a (V)	-		
		26																	
		27																	
	890.5	28																	
BROWN/GRAY, SEVERELY WEATHERED SANDSTONE	890.5	TR																	
	889.0	29	50/5"		60		SS-8	NP	-	-	-	-	-	-	9	Rock (V)	-		
	889.0	EOB																	
		30																	

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 11/20/24 15:23 - X:\PROJECTS\22000715.GPJ

NOTES: NONE
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH 1.5 BAGS BENTONITE CHIPS

PROJECT: <u>LITTLE WALNUT CREEK</u>	DRILLING FIRM / OPERATOR: <u>ADC / TIM</u>	DRILL RIG: <u>ADC CME 550X</u>	STATION / OFFSET: <u>0+16</u>	EXPLORATION ID
TYPE: <u>UNDERGROUND UTILITY</u>	SAMPLING FIRM / LOGGER: <u>ADC / KKC</u>	HAMMER: <u>AUTOMATIC HAMMER</u>	ALIGNMENT: _____	B-5
PID: _____ SFN: _____	DRILLING METHOD: <u>HSA</u>	CALIBRATION DATE: <u>4/28/23</u>	ELEVATION: <u>924.0 (NAVD88)</u>	EOB: <u>30.0 ft.</u>
START: <u>9/16/24</u> END: <u>9/16/24</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>85</u>	COORD: <u>Not Recorded</u>	PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO ₄ ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
ASPHALT - 2 INCHES	924.0																		
CRUSHED STONES / AGGREGATE - 28 INCHES	923.8	1	13																
	921.5	2	11	24	39	SS-1	NP	-	-	-	-	-	-	-	-	-	7	A-1-a (V)	-
HARD, BROWN, SILT AND CLAY, LITTLE SAND, TRACE GRAVEL, MOIST		3																	
		4	6	18	44	SS-2	>4.5	-	-	-	-	-	-	-	-	-	15	A-6a (V)	-
		5	5	8															
		6	3																
		7	5	8	18	100	SS-3	>4.5	-	-	-	-	-	-	-	-	17	A-6a (V)	-
		8																	
@8.5': GRAY/BROWN		9	5																
		10	6	8	20	61	SS-4	>4.5	-	-	-	-	-	-	-	-	13	A-6a (V)	-
		11																	
		12																	
		13																	
@13.5': BROWN, SOME SAND, LITTLE GRAVEL		14	4																
		15	11	41	17	SS-5	>4.5	-	-	-	-	-	-	-	-	-	11	A-6a (V)	-
		16																	
		17																	
		18																	
BROWN/BLACK, WEATHERED SHALE	905.5	19	4																
		20	3	10	39	SS-6	NP	-	-	-	-	-	-	-	-	-	16	Rock (V)	-
		21																	
		22																	
		23																	
BROWN, SEVERELY WEATHERED SANDSTONE (FREE WATER NOTED)	900.5	24	7																
		25	11	34	28	SS-7	NP	-	-	-	-	-	-	-	-	-	18	Rock (V)	-
		26																	
		27																	
		28																	
@28.5': GRAY		29	7																
	894.0	30	15	45	39	SS-8	NP	-	-	-	-	-	-	-	-	-	11	Rock (V)	-
			17																

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 11/20/24 15:24 - X:\PROJECTS\22000715.GPJ

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH 1.5 BAGS BENTONITE CHIPS

PROJECT: <u>LITTLE WALNUT CREEK</u>	DRILLING FIRM / OPERATOR: <u>ADC / TIM</u>	DRILL RIG: <u>ADC CME 550X</u>	STATION / OFFSET: <u>0+20</u>	EXPLORATION ID
TYPE: <u>UNDERGROUND UTILITY</u>	SAMPLING FIRM / LOGGER: <u>ADC / KKC</u>	HAMMER: <u>AUTOMATIC HAMMER</u>	ALIGNMENT: _____	B-6
PID: _____ SFN: _____	DRILLING METHOD: <u>HSA</u>	CALIBRATION DATE: <u>4/28/23</u>	ELEVATION: <u>919.0 (NAVD88)</u>	EOB: <u>25.0 ft.</u>
START: <u>9/16/24</u> END: <u>9/16/24</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>85</u>	COORD: <u>Not Recorded</u>	PAGE
				1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO ₄ ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
ASPHALT - 4 INCHES	919.0																		
CRUSHED STONES / AGGREGATE - 26 INCHES	918.7	1	25																
		2	17	34	50	SS-1	NP	72	10	6	11	1	NP	NP	NP	2	A-1-a (0)	<100	
STIFF, BROWN, SILT AND CLAY, SOME SAND, TRACE GRAVEL, MOIST	916.5	3																	
		4	0	11	50	SS-2	2.00	3	7	13	21	56	31	20	11	21	A-6a (8)	150	
@6': HARD, BROWN/GRAY, LITTLE SAND		5																	
		6	2	20	100	SS-3	>4.5	-	-	-	-	-	-	-	-	15	A-6a (V)	-	
@8.5': GRAY		7	5																
		8																	
		9	4	24	89	SS-4	>4.5	-	-	-	-	-	-	-	-	13	A-6a (V)	-	
		10	8																
		11																	
		12																	
		13																	
		14	1	16	100	SS-5	>4.5	-	-	-	-	-	-	-	-	13	A-6a (V)	-	
@18.5': VERY STIFF, GRAY		15	5																
		16																	
		17																	
		18																	
		19	1	11	100	SS-6	3.00	-	-	-	-	-	-	-	-	15	A-6a (V)	-	
@23.5': HARD		20	3																
		21																	
		22																	
		23																	
		24	2	11	83	SS-7	>4.5	-	-	-	-	-	-	-	-	14	A-6a (V)	-	
	894.0	25	3																
			5																

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 11/20/24 15:25 - X:\PROJECTS\22000715.GPJ

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH 1 BAG BENTONITE CHIPS

PROJECT: <u>LITTLE WALNUT CREEK</u>	DRILLING FIRM / OPERATOR: <u>ADC / TIM</u>	DRILL RIG: <u>ADC CME 550X</u>	STATION / OFFSET: <u>0+24</u>	EXPLORATION ID <u>B-7</u>
TYPE: <u>UNDERGROUND UTILITY</u>	SAMPLING FIRM / LOGGER: <u>ADC / KKC</u>	HAMMER: <u>AUTOMATIC HAMMER</u>	ALIGNMENT: _____	PAGE 1 OF 1
PID: _____ SFN: _____	DRILLING METHOD: <u>HSA</u>	CALIBRATION DATE: <u>4/28/23</u>	ELEVATION: <u>921.0 (NAVD88)</u> EOB: <u>21.0 ft.</u>	
START: <u>9/16/24</u> END: <u>9/16/24</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>85</u>	COORD: <u>Not Recorded</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO ₄ ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
ASPHALT - 2.3 INCHES	921.0																		
AGGREGATE BASE - 2 INCHES	920.8																		
VERY STIFF, BROWN, SILT AND CLAY, SOME SAND, TRACE GRAVEL, MOIST	920.6	1	18																
		2	5	16	39	SS-1	4.00	-	-	-	-	-	-	-	-	-	15	A-6a (V)	-
@3.5': BROWN/GRAY, TRACE CALCITE STAIN SEAM		3																	
		4	7																
@6': HARD, LITTLE SAND		5	5	16	28	SS-2	3.00	-	-	-	-	-	-	-	-	-	18	A-6a (V)	-
		6																	
@8.5': HARD, BROWN		7	5																
		8	8	34	33	SS-3	>4.5	-	-	-	-	-	-	-	-	-	15	A-6a (V)	-
		9																	
@13.5': MEDIUM STIFF, TRACE IRON OXIDE STAIN SEAM		10	4																
		11																	
		12																	
		13																	
		14	5																
		15	10	33	61	SS-5	0.50	-	-	-	-	-	-	-	-	-	10	A-6a (V)	-
		16																	
		17																	
		18																	
		19	8																
DENSE, BROWN/GRAY, COARSE AND FINE SAND, LITTLE CLAY, TRACE GRAVEL, TRACE SILT, WET (FREE WATER NOTED)	902.5	20	13	43	50	SS-6	NP	-	-	-	-	-	-	-	-	-	12	A-3a (V)	-
	900.0	21	17																

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 11/20/24 15:26 - X:\PROJECTS\22000715.GPJ

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH 1 BAG BENTONITE CHIPS

PROJECT: <u>LITTLE WALNUT CREEK</u>	DRILLING FIRM / OPERATOR: <u>ADC / TIM</u>	DRILL RIG: <u>ADC CME 550X</u>	STATION / OFFSET: <u>0+28</u>	EXPLORATION ID
TYPE: <u>UNDERGROUND UTILITY</u>	SAMPLING FIRM / LOGGER: <u>ADC / KKC</u>	HAMMER: <u>AUTOMATIC HAMMER</u>	ALIGNMENT: _____	B-8
PID: _____ SFN: _____	DRILLING METHOD: <u>HSA</u>	CALIBRATION DATE: <u>4/28/23</u>	ELEVATION: <u>923.0 (NAVD88)</u>	EOB: <u>30.0 ft.</u>
START: <u>9/16/24</u> END: <u>9/16/24</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>85</u>	COORD: <u>Not Recorded</u>	PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
ASPHALT - 3 INCHES	923.0																		
CRUSHED STONES / AGGREGATE - 27 INCHES	922.7	1	23																
	920.5	2	8	17	44	SS-1	NP	-	-	-	-	-	-	-	-	5	A-1-a (V)	-	
VERY STIFF TO HARD, GRAY/BROWN, SILT AND CLAY, SOME SAND, TRACE GRAVEL, MOIST		3																	
		4	8																
		5	5	18	33	SS-2	>4.5	-	-	-	-	-	-	-	-	16	A-6a (V)	-	
@6': HARD, LITTLE SAND, TRACE IRON OXIDE STAIN SEAM		6																	
		7	7																
		8																	
@8.5': BROWN		9	7																
		10	15	35	72	SS-4	NI	-	-	-	-	-	-	-	-	15	A-6a (V)	-	
		11	10																
		12																	
		13																	
@13.5': HARD		14	2																
		15	3	7	22	SS-5	>4.5	-	-	-	-	-	-	-	-	14	A-6a (V)	-	
		16	2																
		17																	
		18																	
@18.5': MEDIUM STIFF TO STIFF, SOME SAND		19	1																
	904.0	20	2	9	22	SS-6	0.50	-	-	-	-	-	-	-	-	19	A-6a (V)	-	
		21	4																
		22																	
		23																	
VERY DENSE, GRAY/BROWN, COARSE AND FINE SAND, LITTLE CLAY, LITTLE GRAVEL, TRACE SILT, MOIST	899.5	24	5		40	SS-7	NP	-	-	-	-	-	-	-	-	15	A-3a (V)	-	
		25	6																
		26	50/3"																
		27																	
		28																	
HARD, BROWN, SILT AND CLAY, SOME SAND, LITTLE GRAVEL, MOIST	894.5	29	17																
	893.0	30	14	54	22	SS-8	NI	-	-	-	-	-	-	-	-	12	A-6a (V)	-	
		EOB	24																

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 11/20/24 15:26 - X:\PROJECTS\22000715.GPJ

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH 1.5 BAGS BENTONITE CHIPS

PROJECT: <u>LITTLE WALNUT CREEK</u>	DRILLING FIRM / OPERATOR: <u>ADC / TIM</u>	DRILL RIG: <u>ADC CME 550X</u>	STATION / OFFSET: <u>0+05</u>	EXPLORATION ID <u>B-9</u>
TYPE: <u>UNDERGROUND UTILITY</u>	SAMPLING FIRM / LOGGER: <u>ADC / KKC</u>	HAMMER: <u>AUTOMATIC HAMMER</u>	ALIGNMENT: _____	PAGE 1 OF 2
PID: _____ SFN: _____	DRILLING METHOD: <u>HSA</u>	CALIBRATION DATE: <u>4/28/23</u>	ELEVATION: <u>930.0 (NAVD88)</u> EOB: <u>40.0 ft.</u>	
START: <u>9/6/24</u> END: <u>9/6/24</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>85</u>	COORD: <u>Not Recorded</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				WC	ODOT CLASS (GI)	SO ₄ ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI					
ASPHALT - 6 INCHES	930.0																			
CRUSHED STONES / AGGREGATE - 24 INCHES	929.5	1	37																	
	927.5	2	17	31	50	SS-1	NP	-	-	-	-	-	-	-	-	-	3	A-1-a (V)	-	
VERY STIFF, GRAY/BROWN, SILT AND CLAY, LITTLE SAND, TRACE GRAVEL, MOIST		3																		
		4	7	14	56	SS-2	4.00	3	5	12	20	60	31	19	12	21	A-6a (9)	150		
@6': BROWN		5	4	6																
		6	2	4	11	61	SS-3	3.50	-	-	-	-	-	-	-	-	18	A-6a (V)	-	
@8.5': BRWON/GRAY		7	4	4																
		8																		
		9	3	5	18	78	SS-4	4.00	-	-	-	-	-	-	-	-	15	A-6a (V)	-	
		10	5	8																
		11																		
		12																		
		13																		
DENSE, BROWN, SEVERELY WEATHERED SANDSTONE, MOIST	916.5	14	21	58	39	SS-5	NP	-	-	-	-	-	-	-	-	-	7	Rock (V)	-	
		15	24	17																
		16																		
		17																		
		18																		
HARD, BROWN/GRAY, SILT AND CLAY, SOME SAND, LITTLE GRAVEL, MOIST	911.5	19	9	51	67	SS-6	>4.5	-	-	-	-	-	-	-	-	-	9	A-6a (V)	-	
		20	17	19																
		21																		
		22																		
		23																		
@23.5': TRACE GRAVEL		24	12	41	72	SS-7	>4.5	-	-	-	-	-	-	-	-	-	10	A-6a (V)	-	
		25	14	15																
		26																		
		27																		
		28																		
@28.5': GRAY, LITTLE GRAVEL		29	21	62	28	SS-8	NI	-	-	-	-	-	-	-	-	-	14	A-6a (V)	-	
		30	24	20																

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 11/20/24 15:27 - X:\PROJECTS\22000715.GPJ

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO4 ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
HARD, BROWN/GRAY, SILT AND CLAY, SOME SAND, LITTLE GRAVEL, MOIST (continued)	899.0	32																	
		33																	
		34	9	13	41	83	SS-9	>4.5	-	-	-	-	-	-	-	12	A-6a (V)	-	
		35		16															
		36																	
GRAY, SEVERELY WEATHERED SANDSTONE	891.5	37																	
		38																	
		39	35	42	122	22	SS-10	NP	-	-	-	-	-	-	-	9	Rock (V)	-	
		40	44																
	890.0	EOB																	

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 11/20/24 15:27 - X:\PROJECTS\22000715.GPJ

NOTES: NONE
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH 2 BAGS BENTONITE CHIPS

PROJECT: <u>LITTLE WALNUT CREEK</u>	DRILLING FIRM / OPERATOR: <u>ADC / TIM</u>	DRILL RIG: <u>ADC CME 550X</u>	STATION / OFFSET: <u>0+11</u>	EXPLORATION ID: <u>B-10</u>
TYPE: <u>UNDERGROUND UTILITY</u>	SAMPLING FIRM / LOGGER: <u>ADC / KKC</u>	HAMMER: <u>AUTOMATIC HAMMER</u>	ALIGNMENT: _____	PAGE 1 OF 2
PID: _____ SFN: _____	DRILLING METHOD: <u>HSA</u>	CALIBRATION DATE: <u>4/28/23</u>	ELEVATION: <u>935.0 (NAVD88)</u> EOB: <u>40.0 ft.</u>	
START: <u>9/6/24</u> END: <u>9/6/24</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>85</u>	COORD: <u>Not Recorded</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO ₄ ppm	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI					
ASPHALT - 9.5 INCHES	935.0																			
CRUSHED STONES / AGGREGATE - 20 INCHES	934.2	1	20																	
HARD, BROWN, SILT AND CLAY, LITTLE SAND, TRACE GRAVEL, MOIST	932.5	2	9	18	56	SS-1	NP	-	-	-	-	-	-	-	-	4	A-1-a (V)	-		
		3																		
		4	4	6	20	61	SS-2	>4.5	-	-	-	-	-	-	-	15	A-6a (V)	-		
		5																		
		6	4	7	21	50	SS-3	>4.5	-	-	-	-	-	-	-	17	A-6a (V)	-		
		7																		
		8																		
		9	5	7	21	78	SS-4	>4.5	-	-	-	-	-	-	-	15	A-6a (V)	-		
		10																		
		11																		
@13.5': GRAY, TRACE CALCITE STAIN SEAM		14	2	5	17	56	SS-5	>4.5	-	-	-	-	-	-	14	A-6a (V)	-			
@18.5': VERY STIFF		19	2	4	18	100	SS-6	4.00	-	-	-	-	-	-	12	A-6a (V)	-			
		20		9																
@23.5': HARD, GRAY, SOME SAND, LITTLE GRAVEL		24	7	13	44	50	SS-7	>4.5	-	-	-	-	-	-	10	A-6a (V)	-			
		25		18																
GRAY, SEVERELY WEATHERED SHALE	906.5	29	50/4"	-	100	SS-8	NP	-	-	-	-	-	-	-	10	Rock (V)	-			

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 11/20/24 15:21 - X:\PROJECTS\22000715.GPJ

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO ₄ ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
GRAY, SEVERELY WEATHERED SHALE (continued)	904.0	32																	
		33																	
		34	24 50/3"	-	100	SS-9	NP	-	-	-	-	-	-	-	-	-	15	Rock (V)	-
		35																	
		36																	
		37																	
		38																	
		39	12 50/2"	-	100	SS-10	NP	-	-	-	-	-	-	-	-	-	13	Rock (V)	-
	895.0	40																	

EOB

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 11/20/24 15:21 - X:\PROJECTS\22000715.GPJ

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: AUGER CUTTINGS MIXED WITH 2 BAGS BENTONITE CHIPS

PROJECT: <u>LITTLE WALNUT CREEK</u>	DRILLING FIRM / OPERATOR: <u>ADC / TIM</u>	DRILL RIG: <u>ADC CME 550X</u>	STATION / OFFSET: <u>0+16</u>	EXPLORATION ID: <u>B-11</u>
TYPE: <u>UNDERGROUND UTILITY</u>	SAMPLING FIRM / LOGGER: <u>ADC / KKC</u>	HAMMER: <u>AUTOMATIC HAMMER</u>	ALIGNMENT: _____	PAGE 1 OF 2
PID: _____ SFN: _____	DRILLING METHOD: <u>HSA</u>	CALIBRATION DATE: <u>4/28/23</u>	ELEVATION: <u>930.0 (NAVD88)</u> EOB: <u>40.0 ft.</u>	
START: <u>9/6/24</u> END: <u>9/6/24</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>85</u>	COORD: <u>Not Recorded</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	SO ₄ ppm	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI				
TOPSOIL - 4 INCHES	930.0																		
HARD, BROWN, SILT AND CLAY, LITTLE SAND, MOIST @0.3': TRACE CRUSHED STONES	929.7	1	5																
		2	6	16	67	SS-1	>4.5	-	-	-	-	-	-	-	-	-	12	A-6a (V)	-
		3																	
		4	6																
		5	4	16	61	SS-2	>4.5	-	-	-	-	-	-	-	-	-	19	A-6a (V)	-
		6																	
@6': GRAY/BROWN, TRACE GRAVEL		7	1																
		8	4	11	56	SS-3	>4.5	-	-	-	-	-	-	-	-	-	17	A-6a (V)	-
		9																	
		10	3																
		11	8	24	89	SS-4	>4.5	-	-	-	-	-	-	-	-	-	14	A-6a (V)	-
		12																	
		13																	
@13.5': STIFF, GRAY		14	2																
		15	1	6	67	SS-5	2.00	-	-	-	-	-	-	-	-	-	16	A-6a (V)	-
		16																	
		17																	
		18																	
@18.5': HARD, GRAY/BROWN, SOME SAND		19	3																
	W 910.0	20	9	27	78	SS-6	>4.5	-	-	-	-	-	-	-	-	-	15	A-6a (V)	-
		21																	
		22																	
		23																	
		24	8																
		25	17	47	44	SS-7	4.25	-	-	-	-	-	-	-	-	-	23	A-6a (V)	-
		26																	
		27																	
		28																	
@28.5': LITTLE SAND		29	50		100	SS-8	4.00	-	-	-	-	-	-	-	-	-	14	A-6a (V)	-
		30																	

STANDARD ODOT LOG W/ SULFATES (8.5 X 11) - OH DOT.GDT - 11/20/24 15:21 - X:\PROJECTS\22000715.GPJ

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 on September 16 and 17, 2024 hollow-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, stations for all borings were surveyed by CT via a hand-held GPS device. The ground surface elevations and stations are depicted on the project plan and profile sheet.

APPENDIX C

LABORATORY TEST RESULTS

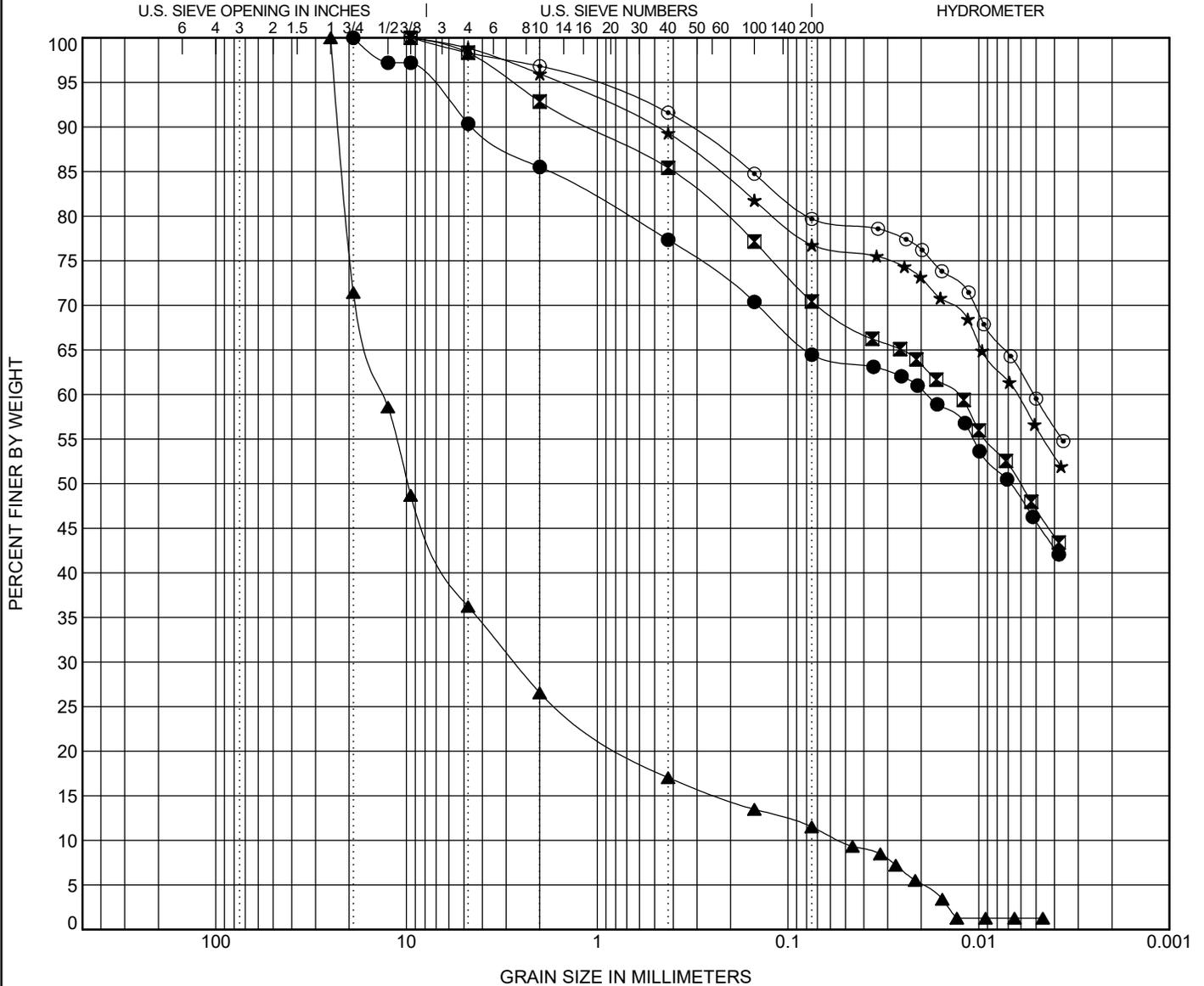


PROJECT LITTLE WALNUT CREEK

PID _____

OGE NUMBER N/A

PROJECT TYPE SUBGRADE



COBBLES	GRAVEL	SAND		SILT	CLAY
		coarse	fine		

Specimen Identification			ODOT (Modified AASHTO) ~ USCS Classification							LL	PL	PI	
●	B-1	1.0	A-6a ~ SANDY LEAN CLAY(CL)							30	18	12	
■	B-1	3.5	A-6a ~ LEAN CLAY with SAND(CL)							31	19	12	
▲	B-6	1.0	A-1-a ~ POORLY GRADED GRAVEL with SILT and SAND(GP-GM)							NP	NP	NP	
★	B-6	3.5	A-6a ~ LEAN CLAY with SAND(CL)							31	20	11	
◎	B-9	3.5	A-6a ~ LEAN CLAY with SAND(CL)							31	19	12	
Specimen Identification			D90	D50	D30	D10	%G	%CS	%FS	%M	%C	Cc	Cu
●	B-1	1.0	4.449	0.007			15	8	13	18	46		
■	B-1	3.5	1.102	0.006			8	7	15	23	47		
▲	B-6	1.0	22.71	9.848	2.724	0.053	72	10	6	11	1	10.64	245.53
★	B-6	3.5	0.499				3	7	13	21	56		
◎	B-9	3.5	0.333				3	5	12	20	60		

GRAIN SIZE - OH.DOT.GDT - 10/3/24 14:51 - X:\PROJECTS\22000715.GPJ

APPENDIX D

PAVEMENT CORE PHOTOGRAPHIC LOGS

CORE LOG for B-1

Project: Little Walnut Creek Interceptor

Project Location: Sunbury, Ohio

CT Project No. 22000715

Core Date: September 17, 2024



ASPHALT THICKNESS (in)	=	10
AGGT. BASE THICKNESS (in)	=	N/A
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

Pavement core performed 5-ft West of Boring B-1.

Pavement core appeared in good condition in top 10 in.

Vertical cracking noticed at lower 3 in..

CORE LOG for B-3

Project: Little Walnut Creek Interceptor

Project Location: Sunbury, Ohio

CT Project No. 22000715

Core Date: September 17, 2024



ASPHALT THICKNESS (in)	=	4.65
AGGT. BASE THICKNESS (in)	=	N/A
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

Pavement core recovered at 11-ft East of Boring B-3.

Pavement core appeared in good condition.

Bottom of the core shows sign of mud / clay presence.

Core bottom suggests a possible water interaction.

CORE LOG for B-5

Project: Little Walnut Creek Interceptor

Project Location: Sunbury, Ohio

CT Project No. 22000715

Core Date: September 16, 2024



ASPHALT THICKNESS (in)	=	2
AGGT. BASE THICKNESS (in)	=	0
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

Pavement core recovered at 15-ft West of Boring B-5.

Pavement core appeared in good condition.

CORE LOG for B-7

Project: Little Walnut Creek Interceptor
 Project Location: Sunbury, Ohio
 CT Project No. 22000715
 Core Date: September 16, 2024



ASPHALT THICKNESS (in)	=	2
AGGT. BASE THICKNESS (in)	=	0
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

 Pavement core recovered at 16-ft West of Boring B-7.
 Pavement core appeared in good condition.

CORE LOG for B-10

Project: Little Walnut Creek Interceptor

Project Location: Sunbury, Ohio

CT Project No. 22000715

Core Date: September 16, 2024



ASPHALT THICKNESS (in)	=	9.5
AGGT. BASE THICKNESS (in)	=	N/A
CORE BARREL DIAMETER (in)	=	4

VISUAL DESCRIPTION:

Pavement core recovered at 12-ft North of Boring B-10.

Pavement core appeared in good condition.

Potential presence of water is noted at bottom 4 in..

APPENDIX E

SUBGRADE ANALYSIS OUTPUTS

OHIO DEPARTMENT OF TRANSPORTATION**OFFICE OF GEOTECHNICAL ENGINEERING****PLAN SUBGRADES****Geotechnical Design Manual Section 600**

Instructions: Enter data in the shaded cells only.

(Enter state route number, project description, county, consultant's name, prepared by name, and date prepared. This information will be transferred to all other sheets. The date prepared must be entered in the appropriate cell on this sheet to remove these instructions prior to printing.)

LWCI Little Walnut Creek Sewer**CT Consultants**

Prepared By: Imad El Hajjar, EI
Date prepared: Tuesday, December 10, 2024

Imad El Hajjar
Project Manager
CT Consultants, Inc.
8150 Sterling Court, Mentor OH 44060
440-951-9000
ihajjar@ctconsultants.com

NO. OF BORINGS: 11

#	Boring ID	Alignment	Station	Offset	Dir	Drill Rig	ER	Boring EL.	Proposed Subgrade EL	Cut Fill
1	B-1	Cheshire Road	0+00			ADC CME 550X	85	915.0	914.7	0.3 C
2	B-2	Cheshire Road	0+04			ADC CME 550X	85	912.0	910.5	1.5 C
3	B-3	Cheshire Road	0+08			ADC CME 550X	85	911.0	908.5	2.5 C
4	B-4	Cheshire Road	0+12			ADC CME 550X	85	919.0	916.5	2.5 C
5	B-5	Cheshire Road	0+16			ADC CME 550X	85	924.0	921.5	2.5 C
6	B-6	Cheshire Road	0+20			ADC CME 550X	85	919.0	916.5	2.5 C
7	B-7	Domigan Road	0+24			ADC CME 550X	85	921.0	920.6	0.4 C
8	B-8	Domigan Road	0+28			ADC CME 550X	85	923.0	920.5	2.5 C
9	B-9	Cheshire Road	0+05			ADC CME 550X	85	930.0	927.5	2.5 C
10	B-10	Cheshire Road	0+11			ADC CME 550X	85	935.0	932.5	2.5 C
11	B-11	Cheshire Road	0+16			ADC CME 550X	85	930.0	929.7	0.3 C

PID:
County-Route-Section: LWC Little Walnut Creek Sewer

No. of Borings: 11

Geotechnical Consultant: CT Consultants

Prepared By: Imad El Hajjar, EI

Date prepared: 12/10/2024

Chemical Stabilization Options		
320	Rubblize & Roll	Option
206	Cement Stabilization	Option
	Lime Stabilization	No
206	Depth	12"

Excavate and Replace Stabilization Options	
Global Geotextile Average(N60L):	12"
Average(HP):	0"
Global Geogrid Average(N60L):	0"
Average(HP):	0"

Design CBR	6
-----------------------	----------

% Samples within 3 feet of subgrade			
$N_{60} \leq 5$	0%	$HP \leq 0.5$	0%
$N_{60} < 12$	8%	$0.5 < HP \leq 1$	0%
$12 \leq N_{60} < 15$	15%	$1 < HP \leq 2$	4%
$N_{60} \geq 20$	4%	$HP > 2$	38%
M+	15%		
Rock	0%		
Unsuitable Soil	0%		

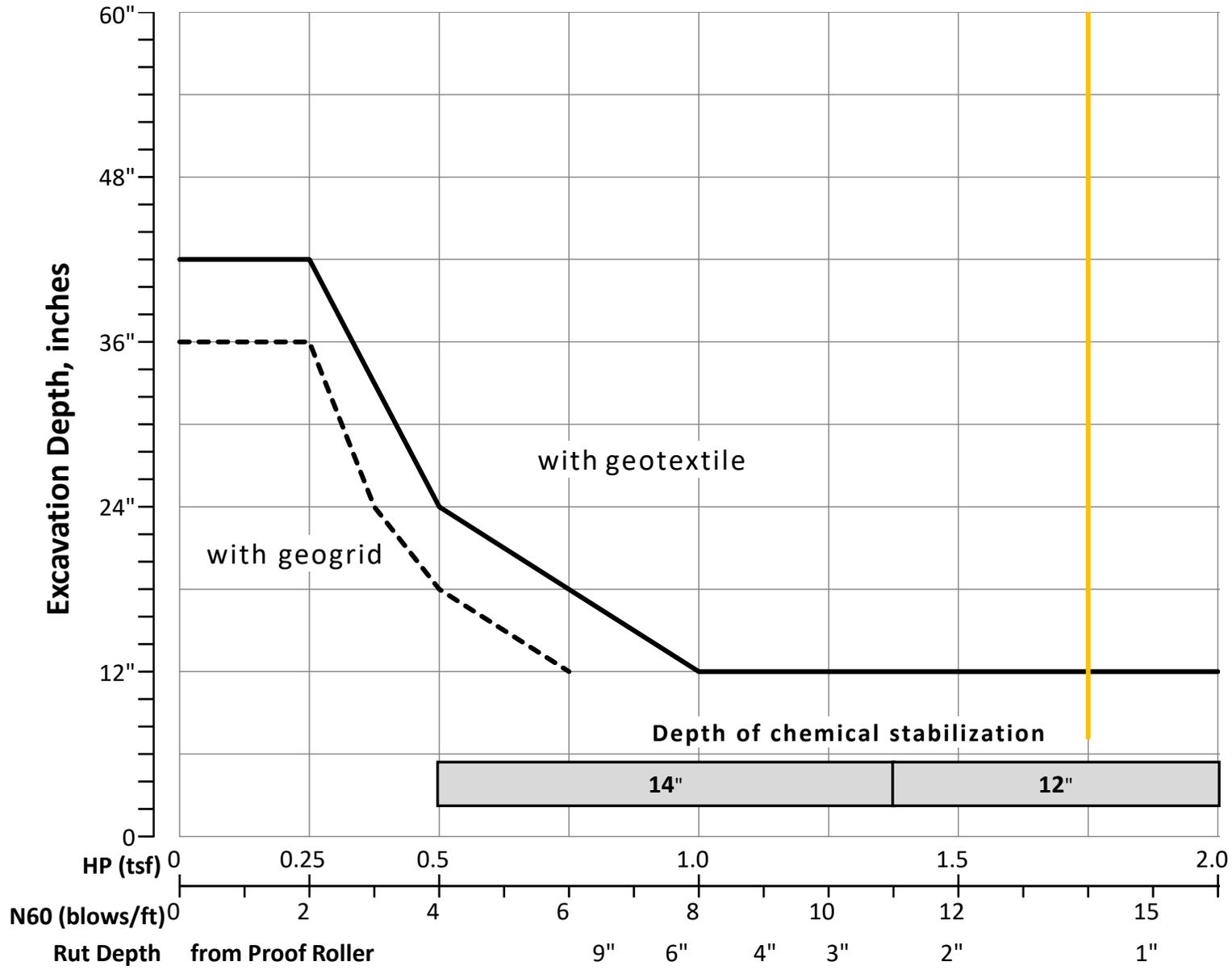
Excavate and Replace at Surface	
Average	1"
Maximum	6"
Minimum	0"

% Proposed Subgrade Surface	
Unstable & Unsuitable	21%
Unstable	21%
Unsuitable (Soil & Rock)	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	18	14	4.16	31	19	12	21	52	73	16	14	9
Maximum	47	28	4.50	31	20	12	23	60	80	21	15	10
Minimum	4	6	2.00	30	18	11	11	1	12	2	6	0

Classification Counts by Sample																				
ODOT Class	UCF	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	0	0	0	0	0	0	0	2	0	0	0	24	0	0	0	0	0	26
Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	8%	0%	0%	0%	92%	0%	0%	0%	0%	0%	100%
% Rock Granular Cohesive	0%	0%	8%										92%							100%
Surface Class Count	0	0	7	0	0	0	0	0	0	1	0	0	0	11	0	0	0	0	0	19
Surface Class Percent	0%	0%	37%	0%	0%	0%	0%	0%	0%	5%	0%	0%	0%	58%	0%	0%	0%	0%	0%	100%

Fig. 600-1 – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
4.16		<input type="checkbox"/> HP
14.00		<input type="checkbox"/> N60L

Average HP —
Average N₆₀L —