June 4, 2025

HILLIS-CARNES
ENGINEERING ASSOCIATES
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Pittsburgh, Pennsylvania 15238
Phone (412) 206-0195
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Mr. Justin Welsh
Buildings & Grounds Director
County of Washington
95 West Beau Street
Washington, Pennsylvania 15301

Re: Geotechnical Engineering Study
Washington County Public Safety Facility
West Beau and South Franklin Streets
City of Washington, Washington County, Pennsylvania
HCEA Project Number U24177

Dear Mr. Welsh:

Hillis-Carnes Engineering Associates, Inc. (HCEA) is pleased to submit this report conveying results of the subsurface exploration and subsequent geotechnical evaluation for the proposed project referenced above. Authorization to perform this work was provided through your written execution of HCEA Proposal No. P240307PIT dated December 18, 2024.

The material samples collected during the site exploration will be stored at our office for a period of 30 days from the date of this report. If you require the samples to be stored for a longer period of time or to be delivered to you or another party, please make a request in writing prior to the end of the 30-day period. Otherwise, the samples will be discarded at the end of the 30-day storage period.

HCEA appreciates having had the opportunity to provide the geotechnical consultation for this project, and we will remain available for further consultation during the various design stages. Please contact our office if questions arise concerning the contents of this report, or additional consultation, design, inspection, or testing services are required.

Sincerely,
HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

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HILLIS-CARNES
ENGINEERING ASSOCIATES

Geotechnical Engineering Study
New Public Safety Facility
City of Washington, Washington County, Pennsylvania

HCEA Project No. U24177

June 4, 2025

Prepared for:

County of Washington
95 West Beau Street
Washington, Pennsylvania 15301

Prepared by:

Hillis-Carnes Engineering Associates, Inc.
534 Alpha Drive
Pittsburgh, Pennsylvania 15238

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1.0 PURPOSE AND SCOPE

The purpose of this study was to characterize the general subsurface conditions at the boring locations and to evaluate those conditions with respect to the concept and design of a foundation system and related geotechnical aspects for the proposed construction.

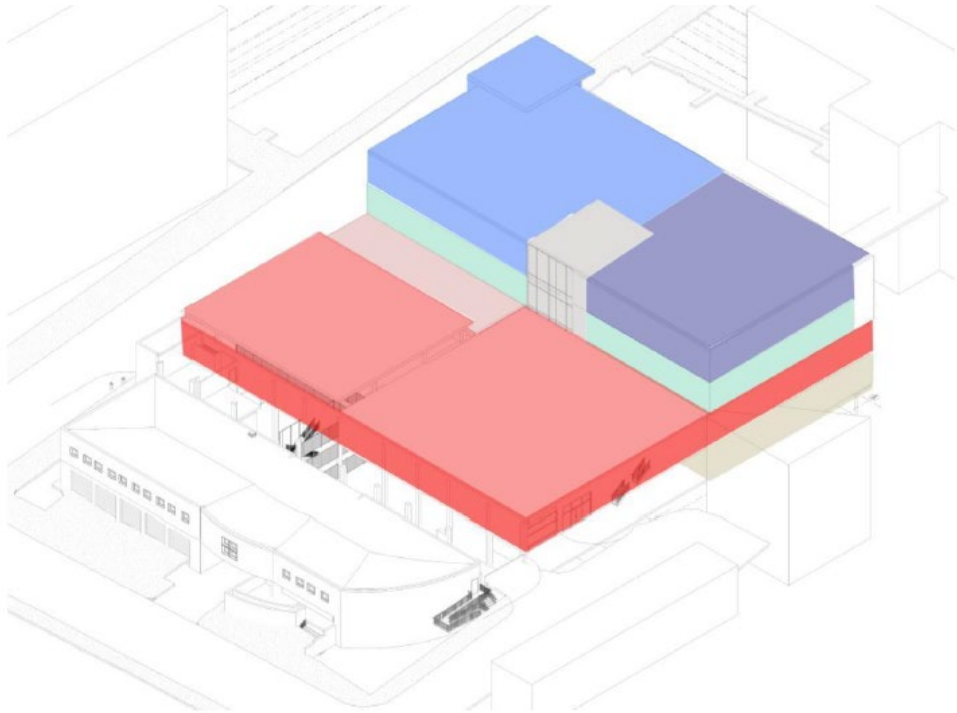
The evaluations and recommendations presented in this report were developed from a review of project characteristics and an interpretation of the general subsurface conditions at the site based on the results of the site exploration. The stratification lines indicated on the Records of Subsurface Exploration (boring logs) represent the approximate boundaries between soil types. However, the in-situ transitions may actually be gradual. Such variations can best be evaluated during construction and any minor design changes can be made at that time, if necessary.

An evaluation of the site with respect to potential construction problems and recommendations dealing with the earthwork and inspection during construction are also included. The inspection is considered necessary to verify the subsurface conditions and that the earthwork and foundation related construction phases are performed properly. The Appendix of this report contains a summary of the field and laboratory work performed for this study.

2.0 PROJECT CHARACTERISTICS

2.1 Project Information

Based on discussions with the design team and review of provided conceptual drawings, we understand the project will include demolition of the existing parking garage, open-air plazas, and office tower building at the Courthouse Square facility and construction of a new integral office and parking structure. The County's 911 Operations Center and Vehicle Maintenance Garage along South Franklin Street is currently scheduled to remain. The conceptual layout is presented below.



Currently, the lowest existing garage level (Level D) will remain and continue to serve for vehicular parking. The easternmost portion of the garage level will be utilized for storage and will contain the new elevator and stairwells. A new generator is planned at the southwestern quadrant.

Up to three stories of new office space is planned above the approximate eastern third of the existing garage Level D. One story of new office space is planned above Level D at the central and western thirds. New corridors extending from the new 3-story section east to the County Family Court Center and south to the County Jail buildings are planned. The lowest level of the new office structure will have a finished floor elevation of EL 1114 feet (red level as shown above).

New construction will include structural steel framing, masonry and/or cast-in-place concrete walls, concrete slabs-on-deck, and concrete slabs-on-grade. Preliminarily, column loads are anticipated to range from approximately 200 to 800 kips. Our report is based on maximum slab loads of 200 psf.

2.2 Project Site Location and Conditions

The existing facility includes three stories of parking (Levels D, C, and B) with the roof of the uppermost parking level B consisting of an open-air pedestrian plaza surrounding a 7-story office building above. The provided J. James Fillingham Architect “Plan of Foundation” Drawing S4 dated October 31, 1977, indicates the garage structure is supported on a system of drilled piers. Grade beams were designed between perimeter piers, between the elevator piers, and between the mechanical area piers. The drawing notes indicate all pier excavations were to be extended to the top of sandstone and in addition to auger refusal. Pier bearing

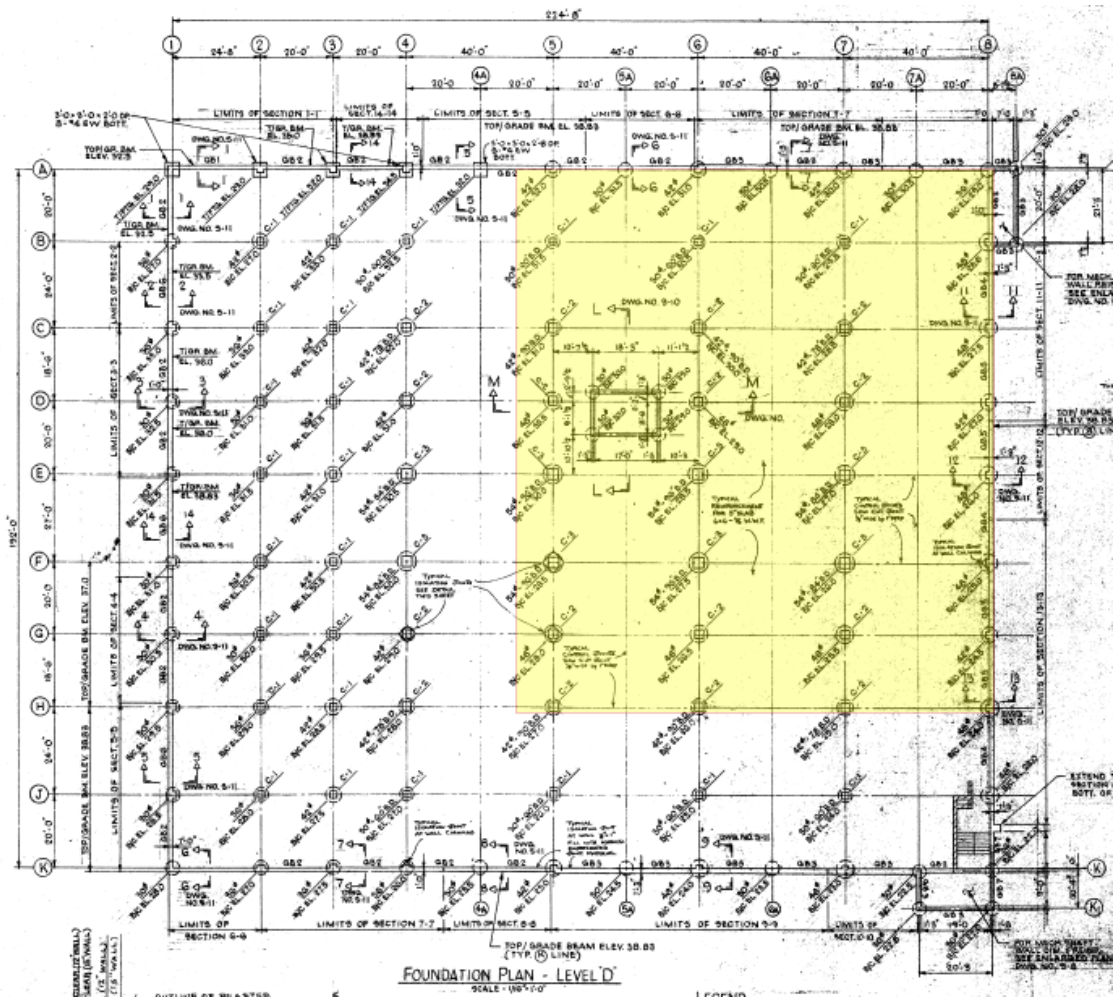
elevations are indicated to range from approximately EL 22 to EL 34.5 feet. Design diameters ranged from 30 to 42 inches with some of the interior piers designed with bell diameters of up to 90 inches. The Level D floor elevation is indicated as EL 39.6 feet, which we have equated as the current surveyed elevation of EL 1098 feet. Accordingly, the pier bearing elevations are estimated to range from approximately EL 1080.4 to 1093 feet. The provided Geo-Mechanics, Inc. "Report of Subsurface Exploration and Geotechnical Engineering Investigation" report dated November 18, 1977, indicates recommended allowable design bearing pressures of 12 tsf (24,000 psf) for sandy shale and 20 tsf (40,000 psf) for sandstone, and 30 psf for skin friction in rock sockets with a maximum of 50 percent skin friction to be used in pier design.

The eastern wall of the garage and eastern portions of the northern and southern walls are completely below grade. Concrete and modular block site retaining walls exist at the southern and western sides for stairs, landscape planters, and plaza retention. East of the plaza and garage, concrete walks and steps exist to provide pedestrian access between West Beau Street and the plaza. A sandstone and mortar retaining wall supporting a vertically extended brick wall exists along the east side of the walk/step structure. The stone wall retains the open grass and pavement area between the wall and the Family Court Center Building to the east.

Around the perimeter of the facility, surfaces include landscaped and grass areas, sparse trees and/or shrubs, concrete walks and steps, and concrete pavements. Surface topography adjacent to the north (West Beau Street) side of the facility slopes gradually downhill to the west. Surfaces along the west (South Franklin Street) side slope gradually to steeply downhill to the west and north to the sidewalks and street. Surfaces along the southern side adjacent to West Cherry Street slope gradually to steeply downhill to the west. The southeastern portion at the plaza level is generally level to slightly sloping for surface water drainage. Terrain at the grass/pavement area immediately west of the Family Court Center building slopes gradually downhill to the north.

Within the overall parcel boundaries for the facility, the existing surface elevations range from about EL 1135 feet at the southeast corner to about EL 1084 feet at the northwest corner. The floor level of the 911 Operations Center and Vehicle Maintenance Garage is approximately EL 1090 feet and the lowest level of the existing parking garage is approximately EL 1098 feet (Level D).

The 1977 drawings provided to HCEA indicate Level D floor elevations were designed with minor slopes for drainage of water to the existing floor drains. Based on our visual observations and cursory measurements of the Level C deck T's to the Level D floor, some sloping of the Level D floor to drains appears to exist. However, significant floor slab heave has occurred, generally between Column Lines A and H from Line 8 to roughly 10 feet west of Line 5, shown below.



The greatest magnitude of heave appears to be approximately 10 inches. The provided Geo-Mechanics, Inc. "Geotechnical Engineering Investigation Report" dated September 22, 2016, was reviewed and includes discussion of shallow test borings performed within the garage structure at Level D, results of Total Forms of Sulfur tests indicating pyritic sulfur contents as high as 2.15 percent, and alternatives for corrective action.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 Test Borings

Thirteen (13) Standard Penetration Test (SPT) Borings B-1 through B-13 were performed by HCEA's drilling subcontractor, Test Boring Services, between January 30 and February 11, 2025. Borings B-1 through B-7, B-12, and B-13 were performed around the perimeter of the existing facility and Borings B-8 through B-11 were performed within the existing garage structure at the lowest level (Level D). The approximate boring locations are shown in Figure 3 - Boring Location Plan in the Appendix of this report. The borings were selected by the design team and HCEA and field located by HCEA using the provided drawings and the existing site features as reference.

The borings were advanced with hollow-stem augers and the subsurface soils and weathered rock were sampled at 3-foot intervals. Standard Penetration Testing (SPT) was performed, and disturbed samples were obtained by driving a 1-3/8-inch I.D. (2-inch O.D.) split-spoon sampler in general accordance with ASTM D1586 specifications. The sampler was first seated 6 inches to penetrate any loose cuttings and then was driven an additional one foot with blows of a 140-pound hammer, falling 30 inches. The number of hammer blows required to drive the sampler one foot following the initial 6-inch seating is designated as the "Penetration Resistance" or "N" value. The penetration resistance (N-value) can be used as an indication of the soil strength and compression characteristics.

All recovered samples were visually classified by HCEA's geotechnical engineer. Portions of each SPT sample were placed in glass jars and transported to HCEA's office for additional inspection and laboratory testing. Visual classification was performed in general accordance with the Unified Soil Classification System (USCS) and ASTM D2488. The Unified Soil Classification Symbols appear on the boring logs and the system nomenclature is generally described in the Appendix.

Bedrock was cored at Borings B-2, B-3, and B-6 through B-13 using rotary coring methods. Rock coring was performed using an NQ2 sized barrel, which yields a nominal 2-inch diameter rock core. The total length of recovered rock core, divided by the length of the run, is referred to as rock core recovery (REC), and is expressed as a percentage. The Rock Quality Designation (RQD) is a measure of the rock mass quality, and is defined as the total length of sound, intact rock core pieces 4 inches or more in length, divided by the length of the rock core run, also expressed as a percentage.

3.2 Infiltration Testing

Infiltration testing was performed at INF-1 through INF-4 in cased boreholes. Test locations were selected by Gateway Engineers. Testing was performed in general accordance with the Maryland Stormwater Design Manual Appendix D.1. Test reports are included in the Appendix of this report and results are summarized as follows.

Infiltration Test Results			
Test ID	**Estimated Ground Elevation (feet)**	**Test Depth (feet)**	**Infiltration Rate (inches per hour)**
INF-1	1096	2	0.50
INF-2	1098	4	0.50
INF-3	1098	4	0.50
INF-4	1098	1	3.63

3.3 Laboratory Testing

Laboratory testing performed on select samples of the overburden soils consisted of moisture content tests, Atterberg limits determination, sieve analysis, and direct shear tests. Total Forms of Sulfur tests were performed on select samples recovered from Borings B-8 through B-11. Unconfined compressive strength tests

were performed on select samples of bedrock. Laboratory testing was performed in general accordance with ASTM procedures. Visual classification of recovered soil samples was performed in general accordance with ASTM D2487 to obtain the USCS classification of the soils. The results of the laboratory testing are presented in the Appendix of this report and the USCS classifications presented on the boring logs were reviewed based on the laboratory testing results.

4.0 SUBSURFACE CONDITIONS

Details of the subsurface conditions encountered at the site are shown on the boring logs. Strata divisions shown on the boring logs have been estimated based on visual examinations of the recovered boring samples and the collection intervals. In the field, strata changes could occur gradually and/or at different levels than indicated on the boring logs.
Ground elevations discussed in this report and indicated on the boring logs are based on information contained on the provided excerpt of the existing conditions drawing (untitled/undated).

Groundwater conditions (if encountered) indicated on the boring logs are those observed during the subsurface exploration. Fluctuations in groundwater levels should be expected and are typically influenced by changes in seasons, grading, runoff, infiltration rates, and may be influenced by other factors.

General area geology, mining resource review, and the generalized subsurface stratigraphies encountered in our borings are discussed below.

4.1 Site Geology

Published USGS geologic information indicates the site is underlain by bedrock the Washington Formation. This formation is Pennsylvanian in age and includes cyclic sequences of sandstone, shale, limestone, and coal. The base of the formation is a the bottom of the Washington Coal seam. Soil survey mapping information published by the USDA indicates the natural overburden soils in this area of Washington consist of residuum weathered from limestone, sandstone, and shale.

4.2 Mining Information Review

Resources reviewed relative to mining in the general area of the subject property included published USGS historical topographic maps, published historical aerial imagery, the Pennsylvania Bureau of Topographic and Geologic Survey (PABTGS) “Coal Resources of Washington County, Pennsylvania Part 1 Coal Crop Lines, Mined-Out Areas, and Structure Contours” Publication, dated 1987, the Pennsylvania Department of Environmental Protection/Penn State University Mine Maps website, and the February 19, 2025 response to HCEA’s written inquiry to the Pennsylvania Department of Environmental Protection District Mining Operations office in Coal Center, Pennsylvania (Coal Status Report).

Published historical USGS mapping and aerial imagery do not indicate past surface mining at the site. PABTGS and PADEP/PSU Mine Atlas website mapping do not indicate deep mining of coal below the site nor below immediately adjacent properties.

The Coal Status Report, included in the Appendix of this report, indicates that the Pittsburgh Coal seam exists below the site and there is no record of mining of this or any other seams. The report lists the seam elevation as EL 660 feet, or 438 feet below the lowest level of the garage (Level D).

Please be aware that mining maps can be difficult to interpret, inaccurate, incomplete, or missing. The owner may contact the Pennsylvania Department of Environmental Protection in California, Pennsylvania (724) 769-1100 to obtain additional information concerning mining.

4.3 Surficial Cover

Approximately 4 to 8 inches of surficial cement concrete was encountered at Borings B-1, B-3, B-4, B-6, and B-8 through B-11. Approximately 6 inches of surficial mulch and topsoil were encountered at Borings B-2 and B-5. Approximately 3 inches of surficial topsoil was encountered at Borings B-7, B-12, and B-13. Please be aware that surficial material types and thicknesses may vary between widely spaced boring positions.

4.4 FILL

Materials classified as FILL were encountered below the surficial concrete/mulch/topsoil cover at all boring locations. The FILL ranged in depth from approximately 1.5 to 8.5 feet at Borings B-1 through B-6 and Borings B-8 through B-13. At Boring B-7, FILL was encountered to a depth of approximately 32 feet which is likely attributable to backfilling of the tallest perimeter walls of the existing garage structure Levels A (plaza) to D.

The FILL included silty GRAVEL with sand (GM), clayey GRAVEL with sand (GC), POORLY GRADED GRAVEL with clay and sand (GP-GC), clayey SAND with gravel (SC), LEAN CLAY with sand and/or gravel (CL), and sandy LEAN CLAY (CL). The gravel fractions included fragments of shale, sandstone, limestone, carbonaceous shale, and brick.

The SPT N-values in the FILL ranged from approximately 4 to 55 blows per foot (bpf) with most values ranging from about 7 to 20 bpf. It should be noted the results of the Standard Penetration Tests in man-placed fill may not be reliable indicators of the actual consistency or relative density. The miscellaneous character of the fill could cause erroneous values and, therefore, may not be indicative of the true engineering properties for the fill. The engineering characteristics of this material, such as strength and compressibility, are likely to be extremely variable.

The laboratory tested samples of the FILL typically exhibited moisture contents ranging from approximately 8 to 33 percent and fines contents of approximately 14 to 64 percent. Fines portions of the tested samples exhibited Liquid Limits of 29 to 42 and Plasticity Indices of 9 to 14.

4.5 Natural Materials (Residuum)

The FILL at Borings B-1 through B-5, B-8, B-9, B-12, and B-13 was underlain by Residual materials. Residuum was generally encountered to depths ranging from approximately 6 to 11 feet at B-1 through B-5, B-8, B-9, and B-13, and to 20 feet at B-12. LEAN CLAY (CL) soils were encountered at Borings B-3, B-12, and B-13 and silty SAND (SM) was encountered at Boring B-9. The SPT N-values in the clayey soils ranged from approximately 17 to 22 bpf, indicating stiff consistencies.

At the remaining borings, the Residuum consisted of decomposed sandy shale, shale, sandy siltstone, clayey shale, and coal and carbonaceous shale (B-5, B-12) rock. These materials were classified as POORLY GRADED GRAVEL (GP), silty GRAVEL (GM), and clayey GRAVEL (GC). The SPT N-values in these materials ranged from approximately 16 to 35 bpf, indicating medium dense to dense relative densities.

The laboratory tested samples of clay soils exhibited moisture contents of approximately16 to 23 percent. The undisturbed samples from Borings B-12 and B-13 exhibited fines contents of approximately 63 to 66 percent. The fines exhibited Liquid Limits of 44 and 48 and Plasticity Indices of 25 and 29, respectively.

4.6 Weathered Rock and Bedrock

The FILL at B-7, B-10, and B-11 and the Residuum at the remaining borings were underlain by Weathered Rock consisting of Shale, Sandstone, Claystone, Limestone, Carbonaceous Shale, and Clayey Shale. Augering was possible in the Weathered Rock and the limited-size split-spoon samples were classified as Poorly Graded Gravel (GP) and Clayey Gravel (GC). The SPT N-values were 76 blows for 10 inches of sampler penetration to 50 blows for 1 to 4 inches of sampler penetration, indicating very dense relative densities.

Bedrock was cored at Borings B-2, B-3, and B-6 through B-13. Rock depths are summarized below.

Summary of Weathered Rock and Bedrock Depths/Elevations						
Boring	Location	Appx. Ground Elev.	Weathered Rock		Bedrock	
			Appx. Depth	Appx. Elev.	Appx. Depth	Appx. Elev.
B-1	NW corner of Vehicle Maintenance Garage	1090	6.5	1083.5	Not Cored	N/A
B-2	Parking Garage North Wall	1096	6.5	1089.5	15.4	1086.6

Summary of Weathered Rock and Bedrock Depths/Elevations						
Boring	Location	Appx. Ground Elev.	Weathered Rock		Bedrock	
			Appx. Depth	Appx. Elev.	Appx. Depth	Appx. Elev.
B-3	Sidewalk near NE corner of Parking Garage	1116	11	1105	13.2	1102.8
B-4	West Entrance to Parking Garage	1089	5	1084	Not Cored	N/A
B-5	SW corner of 911	1099	11	1088	Not Cored	N/A
B-6	South Wall of Parking Garage	1109	8.5	1100.5	8.6	1100.4
B-7	South of Plaza SE Corner	1132	32	1100	34.1	1097.9
B-8	Parking Garage Interior, west	1098	6.5	1091.5	12.1	1085.9
B-9	Parking Garage Interior, center of north end	1098	6	1092	10.2	1087.8
B-10	Parking Garage Interior, SE quadrant	1098	2	1096	6.9	1091.1
B-11	Parking Garage Interior, NE quadrant	1098	1.5	1096.5	10	1088
B-12	South end of yard adjacent to Family Court Building	1131	20	1111	22.2	1108.8
B-13	South end of yard adjacent to Family Court Building	1137	11	1126	15.1	1121.9

Core recoveries ranged from approximately 4 to 100 percent with most values in excess of 80 percent. The RQD values ranged from 0 to approximately 100 percent. The Bedrock was observed to be soft to hard with very thin to thin bedding and very high to medium jointing.

Laboratory tested samples of the Limestone from Borings B-3, B-6, B-7, B-12, and B-13 exhibited unconfined compressive strengths of 3,088 to 32,774 psi.

4.7 Coal and Carbonaceous Shale

Coal and/or Carbonaceous Shale were encountered at the following locations and depths.

Summary of Coal and/or Carbonaceous Shale				
Boring	Material	Appx. Ground Elev.	Depth Range (feet)	Elevation Range (feet)
B-1	None Encountered	1090	-	-
B-2	None Encountered	1096	-	-
B-3	Carbonaceous Shale Coal	1116	18.9 – 27.4 27.4 – 31.1	1097.1 – 1088.6 1088.6 – 1084.9
B-4	None Encountered	1089	-	-
B-5	Decomposed Coal and Carbonaceous Shale	1099	8 – 11	1091 – 1088
B-6	Carbonaceous Shale and Coal	1109	22.1 – 25.4	1086.9 – 1083.6

Summary of Coal and/or Carbonaceous Shale				
Boring	**Material**	**Appx. Ground Elev.**	**Depth Range (feet)**	**Elevation Range (feet)**
B-7	Coal interbedded with Carbonaceous Shale	1132	43.9 – 49	1088.1 – 1083
B-8	Carbonaceous Shale	1098	6.5 – 8	1091.5 – 1090
B-9	None Encountered	1098	-	-
B-10	Carbonaceous Shale and Coal	1098	8 – 15.2	1090 – 1082.8
B-11	Weathered Carbonaceous Shale	1098	1.5 – 10	1096.5 – 1088
B-12	Carbonaceous Shale and Coal Lense Coal interbedded with Carbonaceous Shale	1131	23.9 – 24.2 42.1 – 47.2	1107.1 – 1106.8 1088.9 – 1083.8
B-13	Carbonaceous Shale with Coal Lenses Carbonaceous Shale interbedded with Coal	1137	21.2 – 24.4 46.5 – 50	1115.8 – 1112.6 1090.5 – 1087

Laboratory Total Forms of Sulfur tests were performed on select samples with results summarized as follows.

Summary of Total Forms of Sulfur Tests					
Boring	**Material**	**Appx. Elev. Range of sample (feet)**	**Pyritic Sulfur (%)**	**Organic Sulfur (%)**	**Sulfate Sulfur (%)**
B-3	Claystone	1104 – 1102.5	None detected	None detected	None detected
B-5	Decomposed Coal and Carbonaceous Shale	1090 – 1088.5	0.01	0.33	0.01
B-7	**LEAN CLAY with carbonaceous shale, shale, and sandstone fragments**	**1111 – 1109.5**	**0.24**	0.14	0.10
B-8	**Weathered Carbonaceous Shale**	**1092 – 1090.5**	**0.27**	0.49	0.02
B-8	Weathered Clayey Shale	1089 – 1088.9	None detected	None detected	None detected
B-10	Clayey Gravel FILL	1097.5 – 1096	0.05	0.02	0.08
B-11	Clayey SAND FILL	1097.5 – 1096	0.00	0.08	0.40
B-11	**Weathered Carbonaceous Shale**	**1095 – 1093.5**	**1.40**	0.31	0.19
B-12	Decomposed Coal and Carbonaceous Shale	18 – 19.5	0.01	0.15	0.03
B-13	Carbonaceous Shale	1114 – 1113.8	0.03	0.17	0.03

4.8 Groundwater

Infiltrating groundwater was not encountered within the depths explored during drilling and sampling operations in our borings. Upon completion and prior to rock coring, the boreholes were observed to be dry. For safety reasons, the boreholes were backfilled upon completion of drilling.

A more accurate determination of the hydrostatic water table would require the installation of perforated pipes or piezometers which could be monitored over an extended period. The actual level of the hydrostatic water table and the amount and level of perched water should be anticipated to fluctuate throughout the year, depending on variations in precipitation, surface run-off, infiltration, site topography, and drainage. The Contractor should determine the actual groundwater levels at the time of construction to evaluate groundwater impact on the proposed construction procedures.

5.0 EVALUATIONS AND RECOMMENDATIONS

5.1 Discussion

Based on our discussions with the design team, it does not appear that the new structure column layout will align with the existing drilled pier foundation configuration to consider re-use of the existing piers for support of the new structure. From the geotechnical perspective, the following challenges for proposed redevelopment are as follows.

5.1.1 Stormwater Management Considerations

To minimize stormwater discharge impacts and the need for an NPDES permit, the disturbance area must be kept less than 1 acre. Removal of the existing parking garage Level D floor slab would be included as part of the disturbance area. Therefore, the placement of a new concrete topping slab over the existing slab has been considered by the design team.

5.1.2 Level D Floor Slab Heave

As previously discussed, detrimental heave of the existing floor slab has occurred. The heave is due to the presence of pyritic materials resulting from gypsum formation upon exposure of the pyritic sulfur to oxygen. The magnitude and rate of additional heave cannot be readily predicted. Removal of affected portions of the slab concrete and underlying pyritic materials will result in the disturbance area exceeding the 1-acre limit as discussed above.

The heave pressures cannot be fully determined as they are a function of the pyritic sulfur contents, thicknesses, depths, and degrees of exposure to oxygen. While published studies of swell pressures of pyritic shales are limited, the “Structural Damage Induced by Pyritic Shale” study dated April 15, 2004 performed by

Missouri University of Science & Technology indicates swell pressures of core samples of up to 92 psi for pyritic sulfur contents similar to those encountered at this site. Further, the Missouri S&T "Swelling Pressure Studies of Shale" report dated January 1, 1986 indicates pressure increases of up to 800 psi for relative humidities of 80 to 100 percent. The greatest magnitude of heave at Level D of the existing garage structure is located at the easternmost side. This area contains full-height below-grade walls and, as such, receives less flow of air as compared to the other areas of the garage. The combination of shales containing higher levels of expansive pyritic sulfur and larger variations in relative humidity are considered significant contributors to the floor slab heave.

Installation of slab tie-downs to prevent future heave were initially discussed with the design team. While tie-downs can be designed to resist the aforementioned heave pressures, the available drawings indicate the slabs are not reinforced. Therefore, the concrete between new tie-down elements is not expected to be of sufficient strength to resist heave forces, which would result in further distress and poor long-term performance. Therefore, placement of an elevated, structurally supported slab is recommended. A degradable (paper-based) form system such as VoidForm's SureVoid™ is placed to facilitate placement of new reinforcement and concrete. As the form system degrades over time, a void between the existing garage slab and new structural slab is left. Should additional heave of the existing slab occur, the void space and compression of any remaining form materials should not result in any adverse distress to the new structural slab.

5.1.3 New Structure Foundations

Support of the new building structure on conventional footing foundations supporting columns and walls is feasible. However, excavations will need to be extended below all existing FILL materials and natural overburden soils to at least the weathered rock. Further, additional overexcavation, application of bitumastic sealant or a concrete mud-mat seal, and placement of lean concrete to attain the design bearing levels must be performed where potentially expansive carbonaceous shale and/or coal is present.

To minimize disturbance through excavation for large footing foundations, and alternative approach would consist of installation of deep foundations. Deep foundations such as drilled piers and micropiles would result in smaller disturbance areas, eliminate the need for overexcavation and replacement of overburden soils to reach suitable rock strata, and maximize end bearing capacity and increase lateral support and uplift resistance.

5.1.4 Support of Existing Parking Garage Perimeter Walls

The original 1977 design drawings do not indicate that the perimeter walls of the parking garage structure include tieback systems for lateral support. Tieback systems consisting of passive-based soil nails and active-based tiebacks anchored into rock will be necessary for temporary lateral force resistance during the demolition and construction phases. These lateral support systems can also

result in reduction of lateral loads imposed on framing elements. Based on our discussions with the design team, lateral restrain elements appear to be more cost effective than installation of shoring systems such as secant piles or soldier piles and lagging. The primary consideration for nail and tieback elements is the potential for underground utilities behind the existing walls. Accordingly, a site utilities investigation and mapping program should be implemented to identify all underground utilities and other obstructions which could impact the nail/tieback design and installation.

The recommendations in the following sections have been developed on the basis of the previously described project characteristics and subsurface conditions encountered. If there are any changes to the project characteristics or if different subsurface conditions are encountered during construction, HCEA should be consulted so that the recommendations of this report can be reviewed and revised accordingly.

5.2 Foundations

5.2.1 Conventional Footing Foundations

If conventional footing foundations are selected for support of the new building structure, they should be designed to bearing on non-pyritic rock or lean concrete. Where the uppermost weathered rock is below the design bearing elevations, the excavations must be extended to the weathered rock and the overexcavations backfilled to the design bearing level with lean concrete. Lean concrete backfill should be proportioned to achieve a minimum 28-day compressive strength of 2,000 psi. Foundations bearing on approved weathered rock or lean concrete backfill may be proportioned based on a maximum allowable net bearing pressure of 8,000 psf. An allowable friction coefficient of 0.45 may be used for sliding resistance design.

To preclude punching shear failures, continuous footings for new walls should be at least 18 inches wide and spread footings for new columns should be at least 36 inches wide. It is recommended that wall footings be provided with longitudinal reinforcement. Proper longitudinal reinforcement is designed to provide the footings with greater bending capacity that should allow them to span across localized weak bearing zones that may go undetected during construction. Since a net soil pressure is specified, the weights of the footing concrete and backfill need not be added to the structural loads when proportioning the footings.

Perimeter footings and footings in unheated areas should be located at depths of at least 42 inches below the final exterior grades so as to provide adequate protection from frost heave. Interior footings within heated areas may bear at minimum elevations required for floor slab clearance but should include provisions for overexcavation and replacement with lean concrete as discussed above. Where steps are necessary for continuous footings, the maximum vertical height of each step should be no greater than twice the thickness of the footing and the horizontal overlap should be at least twice the footing thickness. Where materials at the design

bearing elevations consist of coal and/or carbonaceous shale, the pyritic materials should be sealed with a bitumastic coatings or concrete mudmat (please see Section 5.6.2 of this report for sealing recommendations).

If the structure is to be constructed during the winter months or if the building interior is likely subjected to freezing temperatures after footing construction, then all footings should be provided with adequate frost cover protection. Otherwise, interior footings can be located on suitable materials at nominal depths below finished floor grade.

5.2.2 Drilled Pier Foundations

5.2.2.1 Drilled Pier Design Recommendations

If selected, drilled piers may be designed to utilize end bearing and side friction capacity. Our Borings B-8 through B-11 indicate that suitable Sandstone bedrock exists below approximate elevation EL 1078 feet. This stratum is consistent with the findings of the 1977 geotechnical report. Drilled piers bearing in the sandstone bedrock at or below EL 1078 feet may be proportioned based on a maximum pressure of 40,000 psf. A small amount of pier tip movement is needed to mobilize skin friction. An allowable unit side friction value of 1,500 psf may be used for sandstone rock sockets. These values may also be used for design of encasement for the solider-pile and lagging retention systems, if planned.

A minimum pier diameter of 30 inches is recommended to facilitate cleaning out. Temporary steel casing should be provided to support the walls of the pier during inspection, clean out, and concrete operations. As a minimum, a partial reinforcement cage is typically installed in the drilled piers prior to concreting. Steel casing will also help to control natural groundwater inflows or water trapped (perched) within overburden FILL materials.

5.2.2.2 Drilled Pier Construction

Drilled pier design and construction should be in general accordance with ACI 336.1, modified for conditions on this site. The wet method of installation shall be followed where a tight seal between the temporary casing and bedrock cannot be made, where groundwater infiltrates the pier, or where slurry method of drilling is used. Piers bearing in soil will require the wet method. Drilled piers will require special attention during construction to assure that recently placed concrete is not damaged by adjacent pier installation. A minimum edge-to-edge spacing of at least 6 pier diameters should be maintained between piers installed on the same day.

Pier sidewalls should be maintained throughout construction of the pier; the dry method of construction using casing or the wet method using a polymer slurry is acceptable. Should design and construction be planned such that the casings become sacrificial and remain in place after placement of concrete, the annular space between the outside of the casing and the soil

shall be pressure grouted. Once the pier is drilled to the tip elevation, a full-length steel reinforcement is lowered into the pier before filling the pier with concrete. The required pier embedment will depend on the pier diameter, the specific location on the site, subsurface conditions, and the applied design loads.

Concrete should have a minimum 28-day compressive strength of 4,000 pounds per square inch (psi). To facilitate construction, concrete should be on site and ready for placement as the pier excavation is completed. The foundation excavation should be cleaned of loose or disturbed materials before placing reinforcing steel and concrete.

Loose materials on the bearing surface must be removed prior to concrete placement and a clean and firm bearing surface must be verified prior to concrete placement. To reduce the lateral movement of the pier, the contractor must place the concrete in intimate contact with undisturbed natural soil. The contractor must fill voids or enlargements in the pier excavation with concrete at the time of concrete placement.

Concrete slumps ranging from 5 to 7 inches are recommended for drilled pier foundation construction using the dry method of placement; and 7 to 9 inches when using the wet method of placement. Concrete with slumps in this range will usually fill irregularities along the side and bottom of the hole. Concrete should be placed into the drilled hole through a centering chute or tremie pipe at the surface to prevent contact with the sides of the hole and reinforcing steel. This procedure will reduce the potential side flow and segregation. The sequence of operations should be scheduled so that each pier is drilled, reinforcing steel is placed, and concrete is placed in a continuous, rapid, and orderly manner to reduce the time the excavation is open.

We recommend that detailed field records be maintained by a representative of the Geotechnical Engineer to verify drilled pier location, length, diameter, tip elevation and stratum, confirm a clean and firm bearing condition prior to concrete placement, the quantity of concrete placed into each drilled pier at 5-foot intervals, and any other pertinent remarks. Concrete volumes should be monitored both pump displacement and/or by observing the time rate at which the concrete rises within the pier. Compressive strength of the concrete should be confirmed by casting, curing, and testing concrete cylinders on a regular basis.

The quality of drilled piers is subject to the installation conditions and the proficiency of the foundation contractor. Quality control, monitoring and documentation of the installation are essential to verifying successful construction of a drilled pier. Maintaining side-wall integrity, proper tip elevation and bearing stratum, and verifying proper end bearing conditions will help avoid defects in the pier. We request that we be allowed to review the contractor's proposed equipment and installation procedure prior to mobilization and construction.

5.2.3 Micropiles

If selected, a minimum bond zone of 10 feet below the pipe tip level is recommended for micropiles. Our borings indicate variable rock types (coal, carbonaceous shale, limestone, siltstone, and/or claystone) and thicknesses above the sandstone stratum encountered at approximately EL 1078 feet. For micropiles bond zone design, we recommend an allowable (factor of safety = 3) grout-to-soil bond strength of 30 psi in the bedrock layers above EL 1078 feet and an allowable strength of 75 psi in the sandstone below EL 1078 feet. If axial compression load testing is performed to verify capacities, the factor of safety may be reduced to 2.

For micropile elements, galvanized, minimum Schedule 40 steel pipe having a minimum diameter of 3 inches is recommended. Grout or fine-aggregate concrete fill should have a minimum 28-day compressive strength of 4,000 psi. Diameter selection, spacing, and final embedment depths of the vertical elements must be determined by the system designer.

5.3 Seismic Site Class

Based on the subsurface conditions encountered during the field exploration at the site, a Site Class “C” as defined by Section 1613.2.2 International Building Code (IBC) and ASCE 7-16 Chapter 20 is recommended for design purposes.

5.4 Ground-Supported Slabs

Where applicable, new concrete slabs constructed in accordance with the recommendations discussed previously in this report may be designed as grade-supported. It is recommended that the slabs be directly supported on a minimum 4-inch layer of clean granular materials such as AASHTO M43 No. 57 coarse aggregate or approved equivalent. These materials will require acquisition from an off-site source. A suitable moisture/vapor barrier (that is, polyethylene sheeting) should also be provided. These procedures will provide a moisture break that will help to prevent capillary rise and also help to cure the slab concrete. It is also recommended that construction joints on the slab surface and isolation joints between the slab and structural walls be provided (such that the slab would be ground-supported). Subgrade conditions should be modeled for design utilizing a subgrade modulus, K_s, of not more than 120 pci.

On most projects, there is a significant time lag between initial grading and a point when the contractor is ready to pour the slabs-on-grade. Environmental conditions and construction traffic often disturb the subgrade soil. Provisions should be made in the construction specifications for the restoration of the subgrade soil to a stable condition prior to the placement of the concrete for the floor slabs.

5.5 Earth Pressure Recommendations

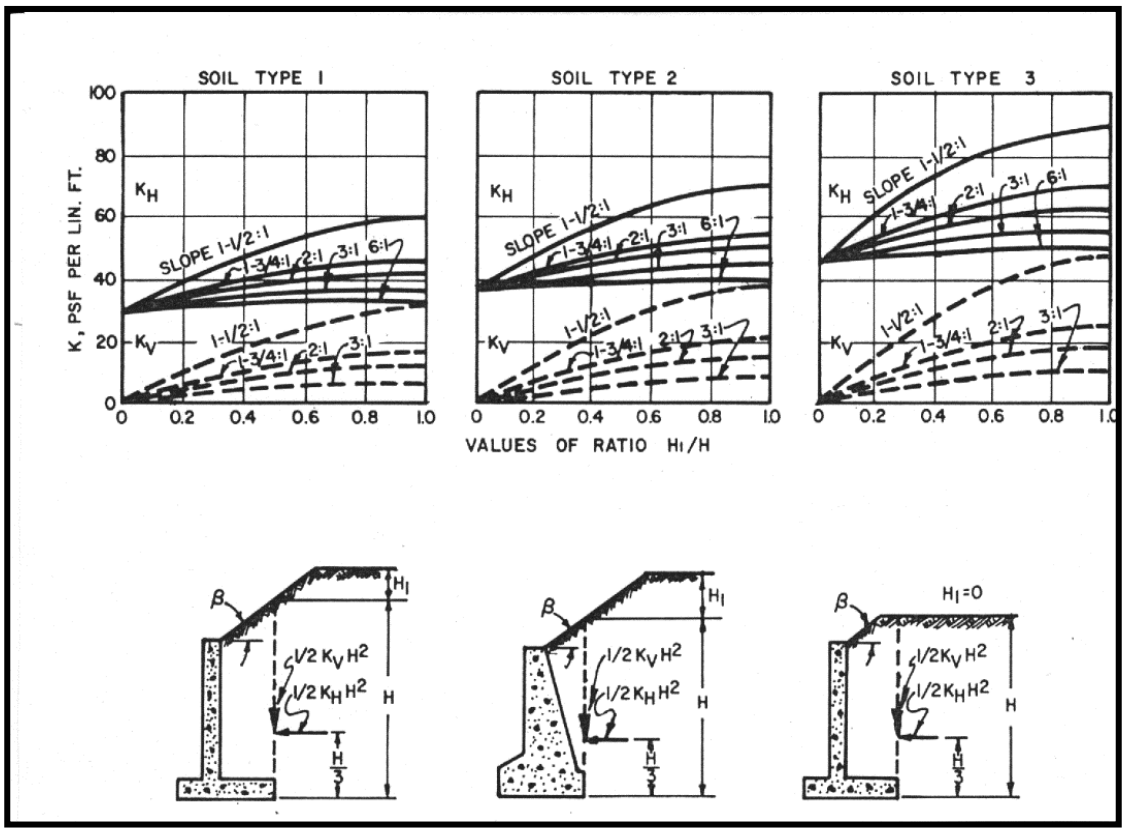
5.5.1 Earth Pressures

If planned, below-grade walls for the new building and for new site retaining walls, and for nail/rock-anchored tiebacks should be designed to resist lateral earth pressures. Lateral earth pressure is developed from the soils present within a wedge formed by the vertical wall and an imaginary line extending up and away from the bottom of the wall at an approximate 45° angle. The lateral earth pressures are determined by multiplying the vertical applied pressure by the appropriate lateral earth pressure coefficient K. Walls that are designed to limit rotation should be designed based on at-rest (K_o) conditions. Walls designed to permit a limited amount of rotation should be designed based on active (K_a) conditions. Recommended parameters are presented as follows.

Earth Pressure Parameter Recommendations					
Material Type	**Drained Friction Angle, ϕ' (Degrees)**	**Total Density, Y (pcf)**	**Coefficient of At-Rest Pressure (K_o)**	**Coefficient of Active Pressure (K_a)**	**Coefficient of Passive Pressure (K_p)**
Existing Overburden Soils	24	120	0.59	0.42	1.58
Weathered Rock	34	135	0.44	0.28	2.35
Bedrock above EL 1078	38	155	0.38	0.31	2.17
Bedrock below EL 1078	42	160	0.33	0.20	3.36
Freely Draining Aggregate such as AASHTO M43 No. 57 Aggregate	35	110	0.43	0.27	2.46
Densely Graded Aggregate such as PennDOT 2A	35	130	0.43	0.27	2.46

The active and passive pressure coefficients presented above may be used for design only if the aggregate backfill extends back from the wall certain distances. These are a horizontal distance approximately equal to or greater than the total height of the wall at the surface, and at least one foot beyond the heel of the wall footing. A Factor of Safety of 1.5 has been applied to passive pressure coefficients.

The pressure coefficients presented above assume level slope conditions behind the wall. However, the designs of retaining walls should consider the effects of geometry and loading conditions. The following charts have been included from NAVFAC 7.02 concerning inclined slopes extending above retaining wall structures. Depending on the geometry of the site, the lateral loading on the wall should be modified according to these charts.



Soil Type 1 – Clean Sand and Gravel, GW, GP, SW, SP
Soil Type 2 – Dirty Sand and Gravel of Restricted Permeability, GM, GM-GP, SM-SP, SM
Soil Type 3 – Stiff Alluvial Silts and Clays, Silty Fine Sands, Clayey Sands and Gravels: CL, ML, SM, SC, GC

The values presented above were calculated based on positive foundation drainage being provided to prevent the buildup of hydrostatic pressure. Where pavements for vehicular access/parking are constructed adjacent to the walls, a uniform surcharge load of 300 psf should be applied to the parameters provided above. An "equivalent fluid" pressure can be obtained from the above table values by multiplying the appropriate K-factor times the total unit weight of the soil. This applies to unsaturated conditions only. If a saturated "equivalent fluid" pressure is needed, the effective unit weight (total unit weight minus unit weight of water) should be multiplied times the appropriate K-factor and the unit weight of water added to that resultant. However, HCEA recommends that drainage be provided to relieve the pressure and does not recommend that the walls be designed with a hydrostatic load.

5.5.2 Tiebacks and Soil Nails

For design of garage wall tiebacks anchored in rock, we recommend maximum allowable grout-to-rock bond strengths of 21 psi in bond zones above EL 1078 feet and 52 psi below EL 1078 feet.

For nails designed within the overburden soils, the tensile resistance is governed by the overburden soil pressure and angle of internal friction of the soils. The general equation for tensile strength design is as follows.

$$T = (3.14 \times D \times c') + (2 \times D \times \sigma_v' \times \tan \Phi) \times L$$

where

T = shear strength
D = nail diameter
c' = effective soil cohesion
σ_v' = effective overburden pressure
Φ = internal friction angle
L = nail length within the embedded slide mass

For calculation of the effective overburden pressure, we recommend a unit weight of soil of 120 pcf be used. An internal friction angle of 23 degrees and an effective cohesion value of 400 psf for the overburden soils are recommended.

5.6 Site Preparation

5.6.1 General Recommendations

At areas adjacent to the new building structure which are to receive new amenities such as pavements, sidewalks, etc. all surficial vegetation, landscape mulch, topsoil including rootmat, trees including root systems and root balls, pavements and walks scheduled for removal, and utilities to be abandoned/relocated should be removed from the areas of planned new construction. Topsoil may be screened and stockpiled for re-use in future landscape areas. Under no circumstances should topsoil be placed as fill or backfill in areas of future structures.

After the additional clearing/grubbing/demolition process is completed, at areas of the site to receive fill and at the finished subgrades in planned cut areas, the exposed subgrades should be proofrolled. The proofrolling operations should be performed using a smooth-drum vibratory roller or other similar vehicle having a gross weight of at least 10 tons. In restricted areas, proofrolling should be performed using the heaviest rubber-tire vehicle possible that can access the area. The purpose of the proofrolling will be to locate any near-surface pockets of soft or loose soils requiring undercutting. A Geotechnical Engineer or experienced Soils Technician should witness the proofrolling operations and should determine which areas need further undercutting and/or stabilization as a result of yielding, pumping, or rutting subgrade soils. Depending on the time of year construction is performed, soft yielding conditions may be present and may require significant scarification and aeration and, if scarification/aeration is unsuccessful, then removal and replacement or chemical stabilization to achieve stable subgrade conditions.

Materials exhibiting unstable conditions (yielding, pumping, or rutting) under proofroll equipment loads should be further over excavated, aerated to achieve optimum moisture contents, and placed and compacted, or removed and replaced. Significant aeration effort should be anticipated based on the soil types and our moisture content test results. Over excavated/backfill areas should then be proofrolled again. If these areas exhibit further instability under proofroll loads, they should be removed to a depth of at least 8 inches and the over excavations replaced with triaxial geo-grid (Tensar NX850 or equivalent), 8 inches of AASHTO M-43 No. 1 and/or No. 2 coarse aggregate to attain the design finished subgrades for receipt of new PennDOT 2A aggregate. No. 1/No. 2 aggregate should be end-loaded, tracked into place, and compacted using a medium-size track dozer. All proofrolling and over excavation operations should be observed by a representative of HCEA.

Overall site grading should be designed to provide positive drainage away from the proposed structure. Positive drainage should be maintained throughout construction activities.

5.6.2 Coal and Carbonaceous Shales

For bitumastic coating applications as previously discussed, the bitumastic coating should be applied to the exposed bearing materials and to excavation sidewall heights equal to at least the footing thicknesses and diameters of utility pipes. In floor slab areas, coating application should be performed at the design finished subgrade level prior to granular base materials.

Bitumastic materials should meet the requirements of PennDOT Publication 408 (latest edition) section 702 MC-30 (cut-back petroleum asphalt applied at minimum 70° F and maximum 100° F) or MC-70 (cut-back petroleum asphalt applied at minimum 100° F and maximum 150° F). Alternatively, sealant materials such as BASF Master Builders MasterSeal 610 or 615, or equivalent may be applied. Prior to initial application, all surfaces should be cleaned of dust, loose soil and rock particles, and water so a proper bond is achieved. A minimum of 2 coats of sealant should be applied at a rate of 1½ to 2 gallons per 100 square feet of exposed area per coat. The manufacturer's recommendations should be followed with respect to application temperatures, protection from precipitation, and curing period.

If concrete sealing is selected in lieu of bitumastic coatings, we recommend the seal thickness be a minimum of 3 inches and the mix be designed to achieve a minimum 28-day compressive strength of 2,000 psi.

5.6.3 Substrate for Structurally Supported Slabs

Where a structurally supported floor is implemented above the existing garage Level D slab as discussed in Section 5.1.2, the following are recommended.

- The existing slabs should be thoroughly cleaned to remove debris, loose particles, and dust.

- A bitumastic coating should be applied to the existing slab concrete. Slab surfaces shall be free of water and/or ice. A minimum of one coat of bitumastic sealant/coating should be applied at rate of 1½ to 2 gallons per 100 square feet of floor area. The manufacturer's recommendations application temperature and protection recommendations should be followed. We recommend the ambient air temperature be at least 40 degrees F and rising during the application and curing. Coating materials should meet the specifications of PennDOT Publication 408 Section 702 types MC-30 or MC-70. Alternatively, BASF Mater Builders MasterSeal 610 or 615 may be used.

- We recommend the voidform height be at least 10 inches. If fill is needed to attain the design bottom-of-voidform elevation, we recommend the fill materials be placed in maximum 6-inch loose lifts with each lift compacted to non-yielding conditions. Fine-grained, low plastic soils will provide a lower water infiltration rate. If a coarse-grained material is selected, the fill must be protected from precipitation and runoff water infiltration through placement of an impermeable membrane prior to voidform placement. Surface dewatering shall also be performed continuously following precipitation events.

5.7 Rock Excavation Considerations

Based on our borings, the uppermost overburden soils and some of the immediately underlying Weathered Rock should generally be excavatable using conventional excavation equipment. Excavation difficulties in rock are anticipated to increase with increased depth, and over-sized equipment and special excavation techniques may be necessary. Some of the weathered rock above the auger refusal depths may be of limited thickness and very dense conditions (high SPT N-values) should be anticipated. SPT N-values in excess of 50 BPF may require pre-splitting or pre-loosening with specialized rock excavation equipment to achieve excavation. Bulldozer and/or track-hoe equipment equipped with ripper teeth should generally be sufficient for excavation of the uppermost weathered rock; however, top-down excavation through these materials may be difficult. The rippability of the very dense weathered rock and underlying bedrock is expected to be limited and may require impact hammers, depending on design finished grades and bearing levels for foundations and underground utilities.

For the purposes of this report, we recommend the contract documents define rock as those materials in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material ¾ cubic yard or more in volume that exceed a standard penetration resistance of 50 blows for 3 inches of penetration or less according to ASTM D1586.

5.8 Fill Selection, Placement, and Compaction

Materials to be used as fill or backfill should be observed, tested, and approved by the Geotechnical Engineer. Existing, overburden FILL and natural soils may be re-used as new fill and backfill provided these materials do not contain coal and/or carbonaceous shale. Suitable soils to be used as fill and backfill should exhibit

Unified Soil Classifications of CL, ML, CL-ML, SW, SP, SC, SM, GW, GP, GC, or GM, have a Liquid Limit of less than 45, a Plasticity Index of less than 20, and be free of organic and other deleterious components. Based on our borings, the pre-demolition FILL, Residual materials and some of the weathered rock/bedrock are expected to be suitable for re-use as structural fill/backfill. All excavated soils and rock should be inspected by HCEA prior to re-use. Uniformly graded materials, such as AASHTO M43 No. 57 aggregate, should only be utilized as structural fill where the subject area includes a permanent drainage system to maintain dewatered conditions.

Care should be exercised during the grading operations. Heavy equipment could create pumping and a general deterioration of site soil if conducted in the presence of water. Therefore, if at all possible, earthwork should be carried out during a dry season. This should minimize these potential problems, although they may not be eliminated. If such problems arise, the Geotechnical Engineer should be consulted for an evaluation of the conditions.

It is anticipated that it will be difficult to achieve proper compaction and acceptable moisture contents during periods of adverse weather conditions. Moisture conditioning, wetting or drying of the soils, should be anticipated to achieve proper compaction. Moisture conditioning can include scarification, mixing, or other processes of conditioning through chemical means such as lime stabilization, soil cement, etc. The moisture contents of the soil should be controlled properly to avoid extensive construction delays.

All new fill materials should be placed in relatively horizontal 8-inch (maximum) loose lifts and should be compacted to a minimum of 95 percent of the Modified Proctor (ASTM D1557) maximum dry density. Higher compaction percentages may be specified by the designer. Moisture contents should be maintained within 2 percent of the optimum moisture content.

5.9 Groundwater and Drainage

As previously discussed, infiltrating groundwater was not encountered within the depths explored during drilling and sampling operations in our borings. However, the boreholes were backfilled upon completion for safety reasons and therefore, long-term groundwater measurements were not made. Longer times may have been required to stabilize groundwater levels within the boreholes.

Any water infiltration resulting from precipitation, surface run-off, or a shallow interception of the groundwater table should be able to be controlled by means of sump pits and pumps, or by gravity ditching procedures. However, during higher-precipitation periods of the year, higher groundwater conditions may exist and may warrant the installation of a wellpoint system. If any conditions are encountered which cannot be handled in such a manner, the Geotechnical Engineer should be consulted.

Adequate drainage should be provided at the site to minimize any increases in the moisture contents of the foundation soils. All pavement or parking areas should be sloped away from the structure to prevent the ponding of water.

6.0 RECOMMENDED ADDITIONAL SERVICES

Additional soil and foundation engineering, testing, and consulting services recommended for this project are summarized below:

Site Preparation and Proofrolling: A Geotechnical Engineer or experienced Soils Inspector should observe the proofrolling of the site after it has been stripped and excavated. The inspector should recommend if any undercutting or in-place densification is necessary to prepare a subgrade for fill placement or for slab support.

Fill Placement and Compaction: A Geotechnical Engineer or experienced Soils Inspector should witness any required filling operations and should take sufficient in-place density tests to verify that the specified degree of fill compaction is achieved. They should observe and approve borrow materials used and should determine if their existing moisture contents are suitable.

Shallow Footing Foundation Observations: A Geotechnical Engineer or experienced Soils Inspector should observe and test the footing excavations for footing foundations, if selected. The inspector should verify that the design bearing pressure is available and that no loose pockets exist beneath the bearing surfaces of the footing excavations. Based on the inspection, the Inspector would either approve the bearing surfaces or recommend that loose or soft soils be undercut to expose satisfactory bearing materials.

Deep Foundation Construction: A Geotechnical Engineer or their experienced representative should perform observation during deep foundation construction to verify the bearing materials at the design tip elevations are suitable and in accordance with recommendations provided herein. The engineer or representative should also verify such items as proper placement and extraction of temporary casing (if needed), bearing surface cleaning, reinforcement placement, and concrete placement as required by the project specifications.

7.0 REMARKS

This report has been prepared to aid in the evaluation of the site for the proposed construction. It is considered that adequate recommendations have been provided to serve as a basis for design of plans and specifications. Additional recommendations can be provided as needed.

These analyses and recommendations are, of necessity, based on the information made available to us at the time of the actual writing of the report and the on-site conditions, surface and subsurface, that existed at the time the exploratory borings

were drilled. A further assumption has been made that the limited exploratory borings, in relation both to the areal extent of the site and to depth, are representative of conditions across the site. The recommendations contained herein have been based on relatively widely spaced soil borings. Actual subsurface conditions encountered could vary from those outlined in this report.

If subsurface conditions are encountered which differ from those reported herein, this Office should be notified immediately so that the analyses and recommendations can be reviewed and/or revised as necessary. It is also recommended that:

1. We are given the opportunity to review any plans and specifications prepared subsequent to the final geotechnical study in order to comment on the interaction of the soil conditions as described herein and the design requirements.

2. A Geotechnical Engineer or experienced Soils Inspector is present at the site during the construction phase to verify installation according to the approved plans and specifications. This is particularly important during excavation, placement, and compaction of fill materials.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties either implied or expressed. Hillis-Carnes Engineering Associates, Inc. assumes no responsibility for interpretations made by others based on work or recommendations made by HCEA.

APPENDIX

Important Information About This Geotechnical-Engineering Report
Figure 1 - Project Location Map
Figure 2 – Aerial Location Map
Figure 3 – Boring Location Plan
PADEP Coal Status Report
Records of Subsurface Exploration
Field Classification Sheet
General Rock Core Classification Sheet
Rock Core Photographs
Laboratory Test Results
Infiltration Test Reports

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

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Map adapted from USGS Topographic Map dated 2023

HILLIS-CARNES
ENGINEERING ASSOCIATES
534 Alpha Drive Pittsburgh, PA 15238
Phone: (412) 216-0195 Fax: (412) 744-3132

PROJECT LOCATION MAP

FIGURE 1

New Washington County Public Safety Facility
City of Washington, Washington County, Pennsylvania

JOB NO:	U24177	**DRAWN BY:**	SS
DATE:	02/28/25		
SCALE:	NTS		
PAGE:	1		

Map adapted from Google Earth 2024 imagery

HILLIS-CARNES
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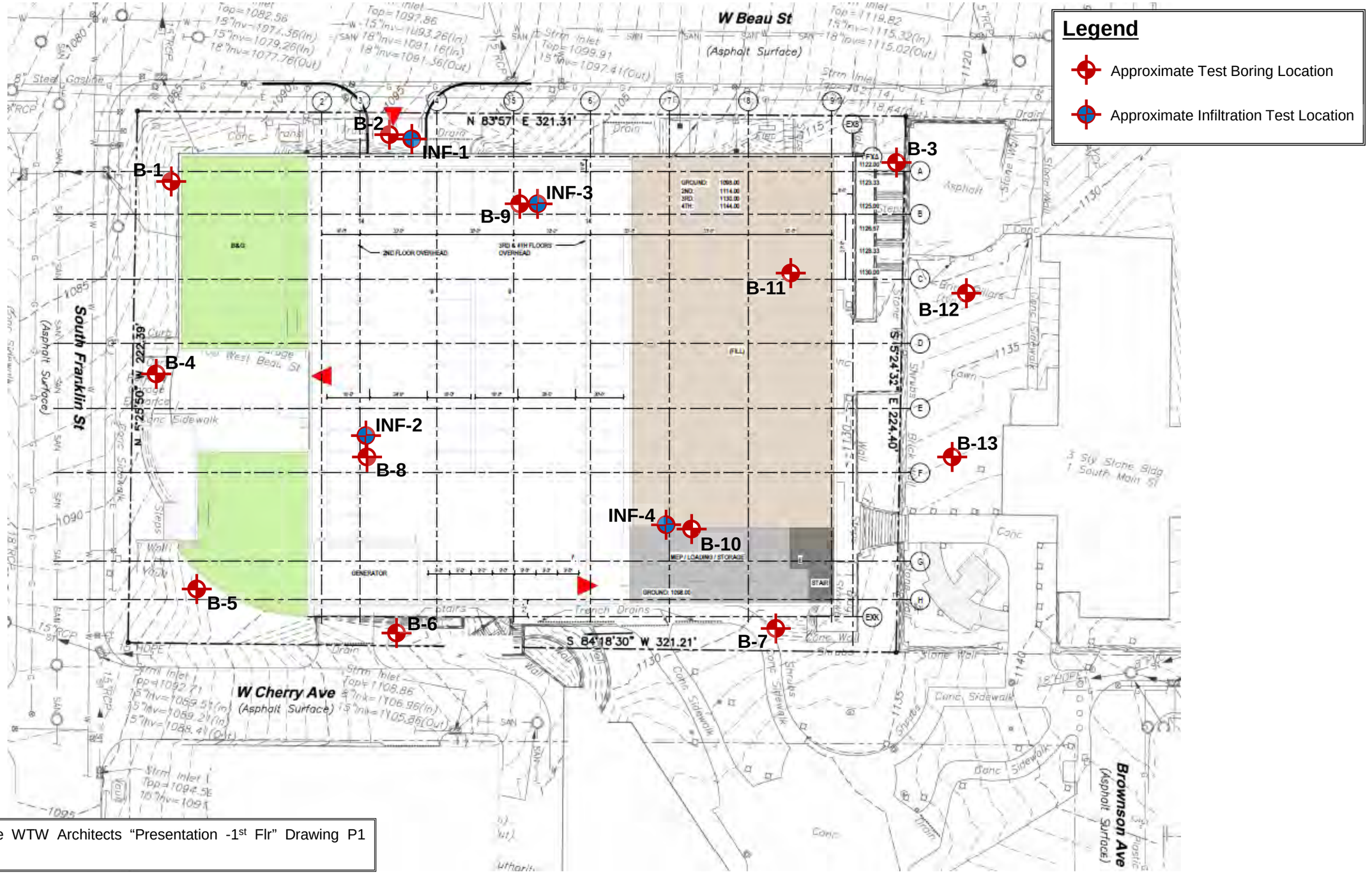
AERIAL LOCATION MAP

FIGURE 2

New Washington County Public Safety Facility
City of Washington, Washington County, Pennsylvania

JOB NO:	U24177	**DRAWN BY:**	SS
DATE:	02/28/25		
SCALE:	NTS		
PAGE:	1		



Plan developed using the WTW Architects "Presentation -1st Flr" Drawing P1 dated January 31, 2025

HILLIS-CARNES
ENGINEERING ASSOCIATES
534 Alpha Drive Pittsburgh, PA 15238
Phone: (412) 216-0195 Fax: (412) 744-3132

BORING & INFILTRATION TEST LOCATION PLAN

FIGURE 3

New Washington County Public Safety Facility
City of Washington, Washington County, Pennsylvania

JOB NO:	U24177	**DRAWN BY:**	SS
DATE:	02/28/25		
SCALE:	NTS		
PAGE:	1		

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DISTRICT MINING OPERATIONS
25 Technology Drive, California Technology Park, Coal Center, PA 15423
(724) 769-1100 www.dep.pa.gov/mining

COAL STATUS REPORT – BITUMINOUS COAL REGION

NAME: Stephen Simonette, PE
ADDRESS: Hillis-Carnes Engineering Associates
ssimonette@hcea.com

SITE ADDRESS / LOCATION:
Washington Site
40.170157, -80.247020
Latitude:40º 10’ 12.6”N Longitude:80º 14’ 49.3”W
MUNICIPALITY: Washington
COUNTY: Washington
USGS QUADRANGLE: Washington East

PURPOSE OF REPORT:
☐ MSI ☐ O & G ☒ OTHER

COAL SEAM RESEARCHED: Pittsburgh
MINE NAME: N/A
OPERATOR: N/A
LAST MINING DATE: N/A

SURFACE ELEVATION: 1,120 FEET +/-
COAL SEAM ELEVATION: 660 FEET +/-
COVER* (OVERBURDEN): 460 FEET +/-

MINING UNDER OR NEAR THIS SITE: ☐ Yes ☒ No ☐ Future Possibility ☐ Unknown ☐ Coal Seam Non-Existent

REMARKS:

The Pittsburgh coal seam exists at site. There is no record as to whether or not it was mined at the site.

There is no record of mining on any coal seam at the site.

REFERENCE SOURCES CHECKED

☒ WPA MAPPING
☒ CDO MINE MAP INDEX
☐ DETAILED MINE MAP
☒ COAL RESOURCES OF Washington County
☐ OTHER

☐ OSM MICROFILM
☐ BITUMINOUS COAL FIELDS OF PA PART II (SISLER)
☐ US GEOLOGICAL SURVEY FOLIOS
☐ MINERAL RESOURCE REPORT 68 – Coal Distribution & Thickness

REPORT INFORMATION OBTAINED FROM: Coal Resources Mapping - Mineral Resource Report 93

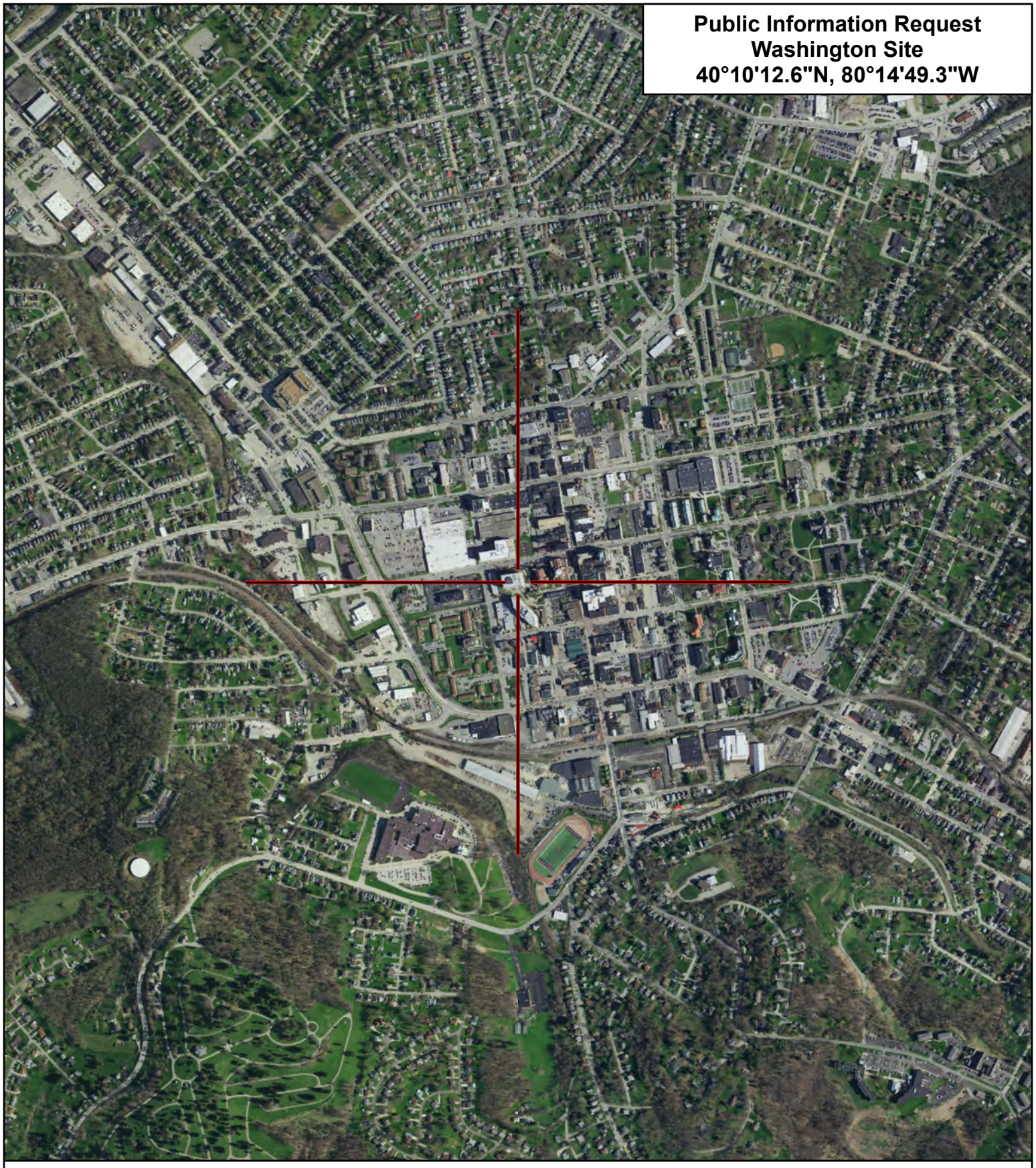
BY: Mara Evans **DATE:** 2/19/2025

***COVER = Vertical distance between the ground surface and the coal seam.**

Please note: This report is for informational purposes only and should not be considered an evaluation or assessment of environmental risks, liabilities, and/or concerns at the site. The information in this Coal Status Report is for the indicated point location only. Coal Status Reports are for underground coal mining information only. Information pertaining to surface coal mines and/or industrial mineral (non-coal) surface and underground mines is available from the applicable DEP District Mining Office for your site. Please visit www.dep.pa.gov/Business/Land/Mining/BureauofDistrictMining for further information.

Disclaimer: The information contained in this report may have been compiled from various sources. The Department cannot guarantee, and assumes no responsibility for, the accuracy, completeness, and/or veracity of the information in the report. The Department disclaims any responsibility for any actions, or the lack thereof, taken in reliance on the information contained in the report. The user agrees that the Department, its employees, officers, agents, or contractors will not be liable for any damages or losses resulting directly or indirectly from the use of, or reliance on, the information contained in the report.

Public Information Request
Washington Site
40°10'12.6"N, 80°14'49.3"W



Pennsylvania
Department of
Environmental Protection

This map was prepared using information considered to be the best historic data available. The Department cannot verify the accuracy or completeness of this information or alignment of images.

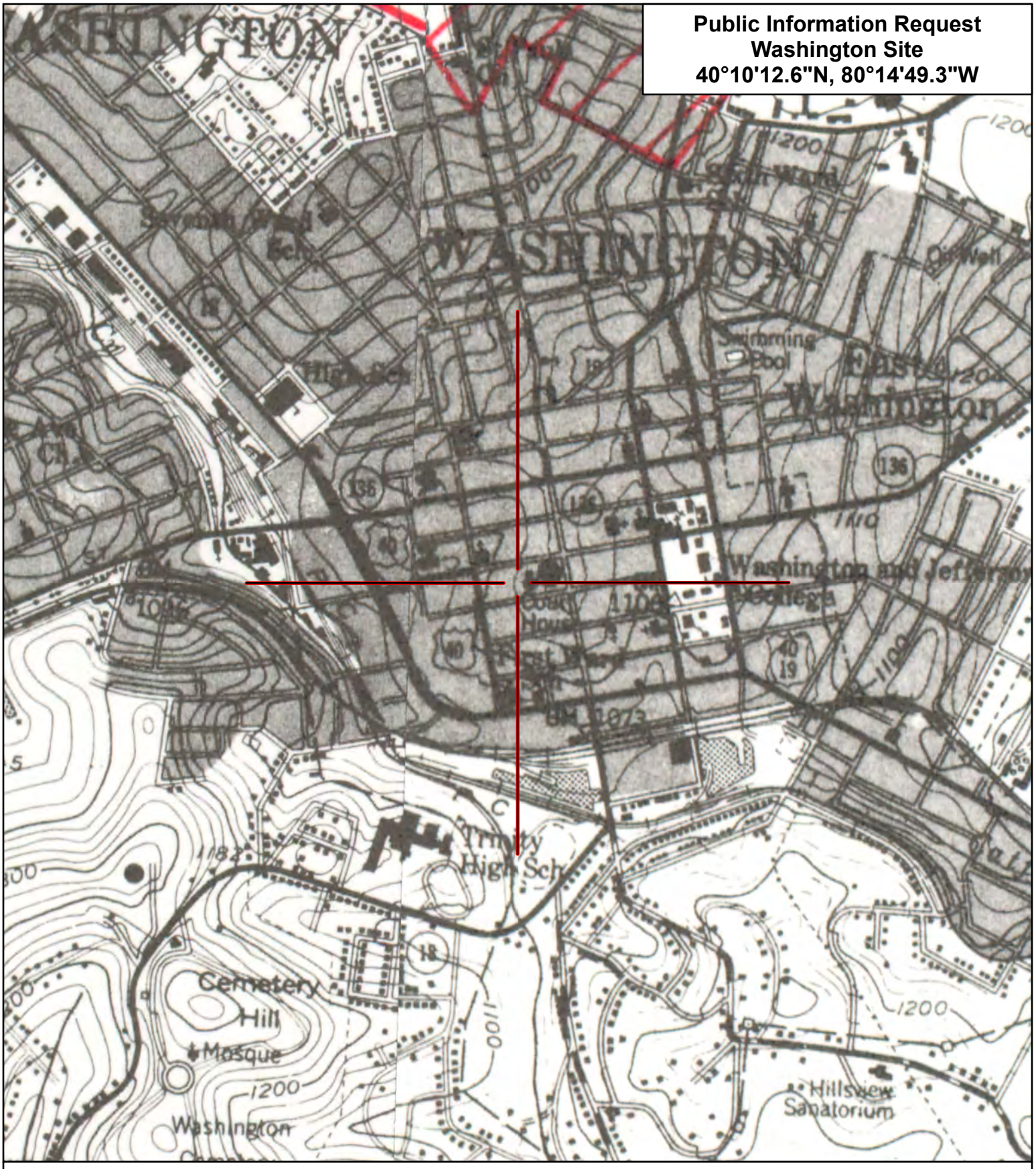
Scale: 1 inch = 1,000 feet

N

Aerial Map

Imagery Source:
PA's Aerial Imagery Program, PEMA 2018

Public Information Request
Washington Site
40°10'12.6"N, 80°14'49.3"W



Pennsylvania
Department of
Environmental Protection

This map was prepared using information considered to be the best historic data available. The Department cannot verify the accuracy or completeness of this information or alignment of images.

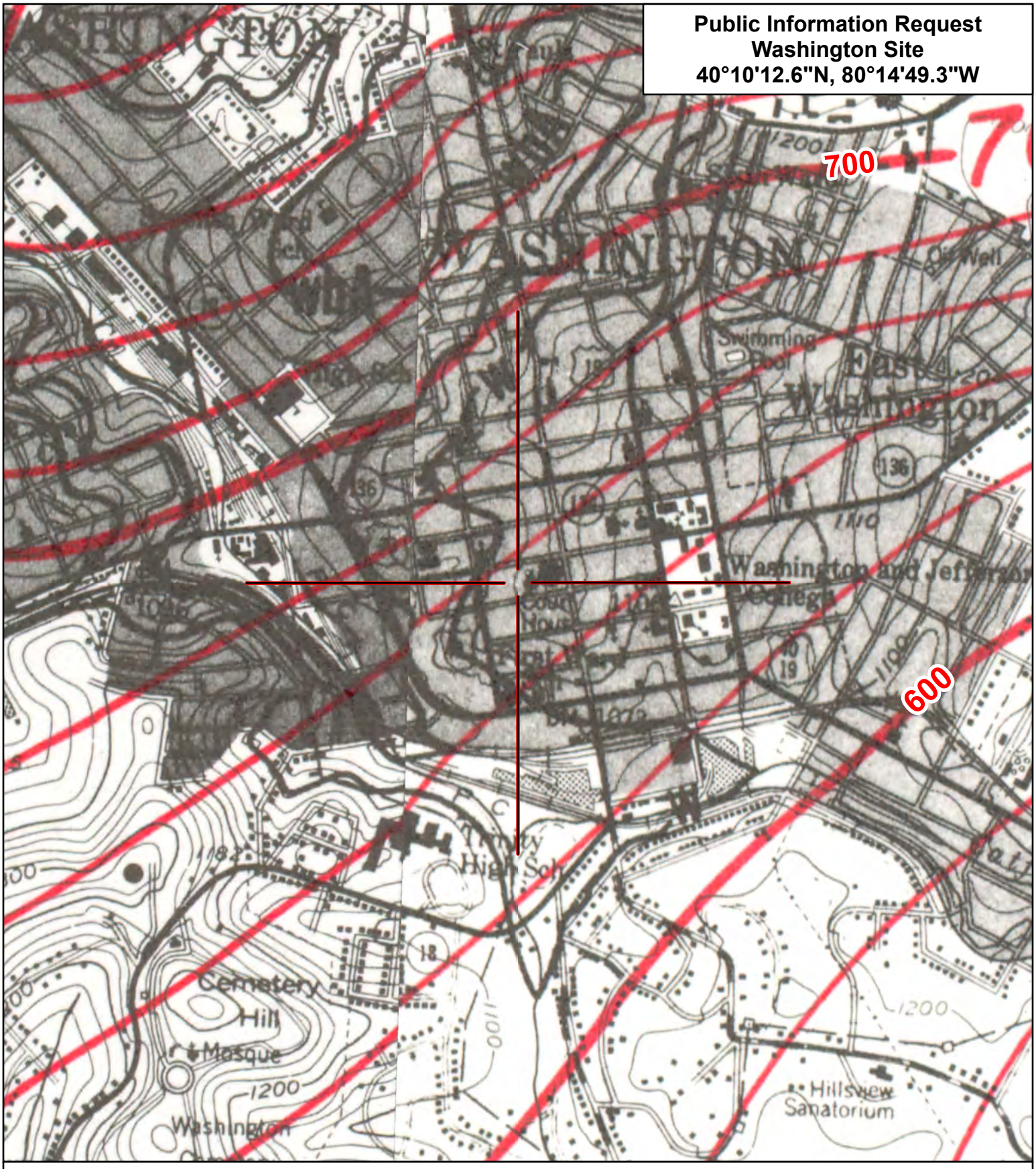
Scale: 1 inch = 1,000 feet

N

Coal Resources Map
Mineral Resource Report 93

Mined Out Area
Pittsburgh Coal Seam

Public Information Request
Washington Site
40°10'12.6"N, 80°14'49.3"W



Pennsylvania
Department of
Environmental Protection

This map was prepared using information considered to be the best historic data available. The Department cannot verify the accuracy or completeness of this information or alignment of images.

Scale: 1 inch = 1,000 feet

N

Coal Resources Map
Mineral Resource Report 93

Structure Contours and Outcrops
Pittsburgh Coal Seam

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-1

Location City of Washington, Washington County, Pennsylavnia Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1090 Ft. Hammer Drop 30 in. Rock Core Diameter N/A Classified By S. Simonette

Date Started 02/10/2025 Pipe Size N/A in. Boring Method HSA Date Completed 02/10/2025

Elevation/ Depth	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N
1090 — 0	0 - 0.6': Approximately 5.75 inches CEMENT CONCRETE	S-1/S-2: LL = 42, PI = 11 Fines = 23.8%	S-1	7	14.5	4-12-5	17
	0.6' - 5': FILL - Moist, light brown and light gray, silty GRAVEL with sand (GM) (Gravel is sandstone and shale fragments)	Decayed wood matter in S-2	S-2	11	32.8	5-4-3	7
1085 — 5			S-3	18	8.6	8-8-26	34
	5' - 11': RESIDUUM - Medium dense, dry, light brown, POORLY GRADED GRAVEL (decomposed sandy shale, GP)		S-4	17	7.1	15-16-19	35
1080 — 10							
	6.5' - 15.9': WEATHERED ROCK - Very dense, dry, light brown and brown, sandy SHALE (sampled as a poorly graded gravel, GP)		S-5	15		20-36-50/3"	86/9"
1075 — 15			S-6	9		33-50/4"	50/4"
	Boring discontinued at approximately 15.9 feet	Classifications based on Visual-Manual procedure (ASTM D2488) unless laboratory classified					
1070 — 20							
1065 — 25							
1060 — 30							

SPT Blows/Foot Curve: 10 30 50

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
DURING DRILLING	None ft.	-
UPON COMPLETION	Dry ft.	13 ft.
AFTER ___ HRS.	ft.	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-2

Location City of Washington, Washington County, Pennsylavnia Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1096 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 02/10/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 02/10/2025

Elevation/ Depth	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve (10 30 50)
0 / 1095	0 - 0.5': Approximately 6 inches MULCH AND TOPSOIL	S-1/S-2: LL = 37, PI = 14 Fines = 57.7%	S-1	14	18.9	2-4-5	9	
	0.5' - 4': FILL - Moist, brown and gray, sandy LEAN CLAY, trace gravel, trace root matter (CL) (Gravel is sandstone, shale, coal, and carbonaceous shale fragments)		S-2	9	13	5-9-11	20	
5 / 1090	4' - 6.5': RESIDUUM - Medium dense, dry, light brown, POORLY GRADED GRAVEL (decomposed shale, GP)		S-3	7	11.3	12-50/2"	50/2"	
	6.5' - 14': WEATHERED ROCK - Very dense, dry, light brown and brown, sandy SHALE (sampled as a poorly graded gravel, GP)		S-4	8		15-50/4"	50/4"	
10 / 1085			S-5	4		50/4"	50/4"	
15 / 1080	14' - 15.4': WEATHERED ROCK - Very dense, dry, gray, SANDSTONE (sampled as a poorly graded gravel, GP)	Core Run No. 1 15.4 to 18.4': Recovery = 100% RQD = 43%	S-6 RC1	4 36		50/4"	50/4"	
	15.4' - 17': BEDROCK - Gray, SANDSTONE, fine grained, hard, very thin to thin bedded, very high to high jointing		RC2	60				
20 / 1075	17' - 25': BEDROCK - Gray, sandy SHALE with occasional lenses of sandstone and claystone, fine grained, soft to hard, very thin to thin bedded, very high to high jointing	Core Run No. 2 18.4 to 23.4': Recovery = 100% RQD = 32%						
		Core Run No. 3 23.4 to 25': Recovery = 100% RQD = 19%	RC3	19				
25 / 1070	Boring discontinued at approximately 25 feet							
30	* No groundwater encountered prior to start of rock coring	Classifications based on Visual-Manual procedure (ASTM D2488)						

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
DURING DRILLING	None ft.	-
UPON COMPLETION	* ft.	11 ft.
AFTER ___ HRS.	ft.	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-2

Location City of Washington, Washington County, Pennsylavnia Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1096 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 02/10/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 02/10/2025

Elevation/ Depth	MATERIAL SYMBOL/ SAMPLE CONDITIONS	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve 10 30 50
1065			unless laboratory classified						
35									
1060									
40									
1055									
45									
1050									
50									
1045									
55									
1040									
60									
1035									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
DURING DRILLING	None ft.	-
UPON COMPLETION	* ft.	11 ft.
AFTER ___ HRS.	ft.	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-3

Location City of Washington, Washington County, Pennsylvania Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1116 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 02/04/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 02/04/2025

Elevation/ Depth	MATERIAL SYMBOL/ SAMPLE CONDITIONS	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve
0 / 1115	I	0 - 0.3': Approximately 4 inches CEMENT CONCRETE		S-1	5	22.4	5-6-12	18	
	I	0.3' - 8': FILL - Moist, gray, brown, and light brown, clayey SAND with gravel (SC) (Gravel is sandstone and shale fragments)		S-2	5	17.6	6-6-4	10	
5 / 1110	I			S-3	2	16.3	5-3-10	13	
	I	8' - 11': RESIDUUM - Stiff, moist, gray, LEAN CLAY (CL)		S-4	12	22.5	8-11-17	28	
10 / 1105	I	11' - 13.2': WEATHERED ROCK - Very dense, dry, gray, CLAYSTONE (sampled as a clayey gravel, GC)	S-5: Pyritic Sulfur = 0%	S-5	14		16-26-50/2"	76/8"	76/8"
	I			RC1	2				
	I	13.2' - 14.1': BEDROCK - Gray to dark gray, CLAYSTONE, fine grained, soft, thin bedded, very high jointing	Core Run No. 1 13.2 to 13.7': Recovery = 30% RQD = 0%	RC2	52				
15 / 1100	I	14.1' - 14.6': BEDROCK - Gray and brown, SANDSTONE, fine grained, hard, thin bedded, high jointing	Core Run No. 2 13.7 to 18.7': Recovery = 70% RQD = 10%	RC3	53				
	I	14.6' - 15.2': BEDROCK - Light brown, CLAYSTONE, fine grained, soft, thin bedded, high jointing	Core Run No. 3 18.7 to 23.7': Recovery = 62% RQD = 0%						
20 / 1095	I	15.2' - 18.9': BEDROCK - Gray and light brown, LIMESTONE, fine grained, hard to moderately soft, very thin to thin bedded, very high to high jointing	Core Run No. 4 23.7 to 28.7': Recovery = 100% RQD = 0%	RC4	60				
25 / 1090	I	18.9' - 27.4: BEDROCK - Gray to black, CARBONACEOUS SHALE, fine grained, soft to moderately soft, very thin to thin bedded, very high to high jointing	Core Run No. 5 28.7 to 33.7': Recovery = 100%	RC5	60				
30		27.4' - 31.1': BEDROCK - Black,							

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
DURING DRILLING	None	ft.	-	
UPON COMPLETION	*	ft.	12	ft.
AFTER ___ HRS.		ft.		ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-3

Location City of Washington, Washington County, Pennsylavnia Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1116 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 02/04/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 02/04/2025

Elevation/ Depth	MATERIAL SYMBOL/ SAMPLE CONDITIONS	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve (10 30 50)
1085	I	COAL interbedded with Carbonaceous Shale, fine grained, soft, very thin to thin bedded, very high to high jointing	RQD = 40%						
		31.1' - 31.9': BEDROCK - Gray, CLAYSTONE, fine grained, soft, thin bedded, high jointing	Core Run No. 6 33.7 to 38.7': Recovery = 100% RQD = 72%	RC6	60				
35 1080	I	31.9' - 40': BEDROCK - Gray, SANDSTONE, fine to coarse grained, moderately soft to hard, thin to thick bedded, high to medium jointing							
	I	Claystone lense from approximately 37.4 to 37.7 feet	Core Run No. 7 38.7 to 40': Recovery = 100% RQD = 31%	RC7	16				
40 1075		Boring discontinued at approximately 40 feet							
		* No groundwater encountered prior to start of rock coring	Classifications based on Visual-Manual procedure (ASTM D2488) unless laboratory classified						
45 1070			15.2 feet: UCS = 27,593 psi						
50 1065									
55 1060									
60 1055									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
DURING DRILLING	None ft.	-
UPON COMPLETION	* ft.	12 ft.
AFTER ___ HRS.	ft.	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-4

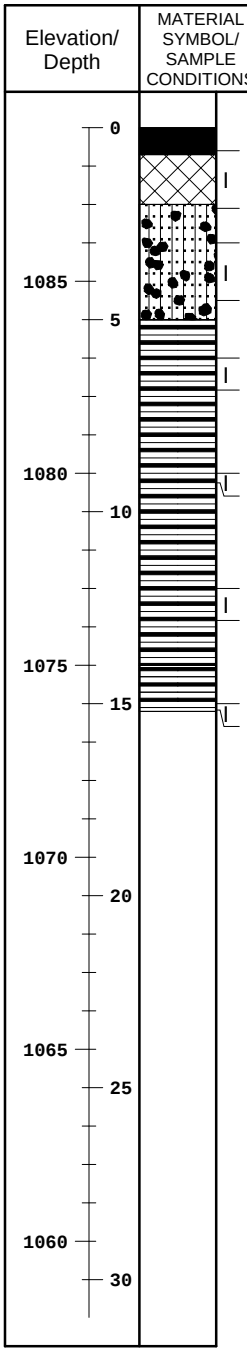
Location City of Washington, Washington County, Pennsylavnia Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1089 Ft. Hammer Drop 30 in. Rock Core Diameter N/A Classified By S. Simonette

Date Started 02/10/2025 Pipe Size N/A in. Boring Method HSA Date Completed 02/10/2025



Elevation/ Depth	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N
	0 - 0.7': Approximately 7.75 inches CEMENT CONCRETE		S-1	12	16.9	2-4-12	16
	0.7' - 2': FILL - Moist, light brown and light gray, sandy LEAN CLAY, trace gravel (CL) (Gravel is sandstone and shale fragments)		S-2	18	14.3	12-8-9	17
	2' - 5': RESIDUUM - Medium dense, dry, light brown, POORLY GRADED GRAVEL with silt (decomposed silty sandstone, GP-GM)		S-3	10	12.3	50/4"	50/4"
	5' - 14': WEATHERED ROCK - Very dense, dry, light brown and brown, sandy SHALE (sampled as a poorly graded gravel, GP)		S-4	3		50/3"	50/3"
			S-5	10		20-50/4"	50/4"
	14' - 15.2': WEATHERED ROCK - Very dense, dry, gray and light brown, CLAYSTONE (sampled as a clayey gravel, GC)		S-6	2		50/2"	50/2"
	Boring discontinued at approximately 15.2 feet	Classifications based on Visual-Manual procedure (ASTM D2488) unless laboratory classified					

SPT Blows/Foot Curve: 10 30 50

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
DURING DRILLING	None ft.	-
UPON COMPLETION	Dry ft.	9 ft.
AFTER ___ HRS.	ft.	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-5

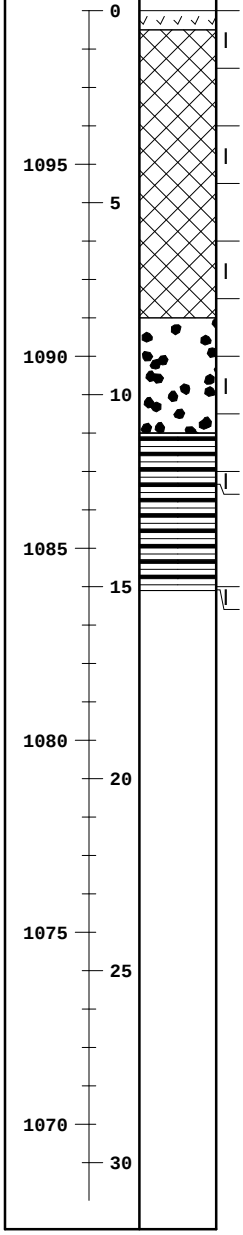
Location City of Washington, Washington County, Pennsylavnia Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1099 Ft. Hammer Drop 30 in. Rock Core Diameter N/A Classified By S. Simonette

Date Started 02/11/2025 Pipe Size N/A in. Boring Method HSA Date Completed 02/11/2025



Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N
0 - 0.5': Approximately 6 inches MULCH AND TOPSOIL		S-1	9	21.9	1-3-5	8
0.5' - 8': FILL - Moist, brown and gray, clayey SAND with gravel (SC) (Gravel is sandstone and shale fragments)	S-2/S-3: LL = 32, PI = 10 Fines = 27.5%	S-2	15	10.5	4-4-6	10
		S-3	12	12.5	4-3-4	7
8' - 11': RESIDUUM - Medium dense, dry, black and dark gray, POORLY GRADED GRAVEL (decomposed coal and carbonaceous shale, GP)	S-4: Pyritic Sulfur = 0.01%	S-4	14	25.3	12-10-12	22
11' - 14': WEATHERED ROCK - Very dense, dry, light brown and brown, sandy SHALE (sampled as a poorly graded gravel, GP)		S-5	4		50/4"	50/4"
		S-6	1		50/1"	50/1"
Boring discontinued at approximately 15.1 feet	Classifications based on Visual-Manual procedure (ASTM D2488) unless laboratory classified					

SPT Blows/Foot Curve: 10 30 50

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
DURING DRILLING	None ft.	-
UPON COMPLETION	Dry ft.	7.5 ft.
AFTER ___ HRS.	ft.	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-6

Location City of Washington, Washington County, Pennsylvania Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1109 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 02/11/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 02/11/2025

Elevation/ Depth	MATERIAL SYMBOL/ SAMPLE CONDITIONS	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve (10 30 50)
0	I	0 - 0.3': Approximately 4 inches CEMENT CONCRETE	S-1/S-2: LL = 29, PI = 9 Fines = 13.9%	S-1	5	7.5	2-3-4	7	
		0.3' - 1': Approximately 8 inches AGGREGATE BASE							
1105	I	1' - 8.5': FILL - Moist, brown and gray, clayey GRAVEL with sand (GC) (Gravel is sandstone and shale fragments)		S-2	8	10.8	6-4-3	7	
5	I			S-3	3	10.1	4-4-2	6	
1100	I	8.5' - 8.6': WEATHERED ROCK - Very dense, dry, gray and brown, LIMESTONE, sampled as a poorly graded gravel, GP)	Core Run No. 1 8.6 to 13.6': Recovery = 32% RQD = 14%	S-4 RC1	1 19		50/1"	50/1"	
10	I	8.6' - 14': BEDROCK - Gray and brown, LIMESTONE, fine grained, hard to moderately soft, thin to very thin bedded, medium to very high jointing	Tool drop from appx. 9.6 to 11.1 feet	RC2	2				
1095	I	14' - 22.1': BEDROCK - Gray and brown, CLAYSTONE, fine grained, soft, very thin to thin bedded, very high to high jointing	Core Run No. 2 13.6 to 18.6': Recovery = 4% RQD = 0%	RC3	52				
15	I		Limestone piece at bottom of core barrel rotated resulting in low recovery						
1090	I	22.1' - 25.4': BEDROCK - Dark gray and black, CARBONACEOUS SHALE and COAL, fine grained, soft, very thin to thin bedded, very high to high jointing		RC4	46				
20	I		Core Run No. 3 18.6 to 23.6': Recovery = 86% RQD = 0%						
1085	I	25.4' - 27.1': BEDROCK - Light gray to gray, CLAYSTONE, fine grained, soft, very thin to thin bedded, very high to high jointing		RC5	17				
25	I		Core Run No. 4 23.6 to 28.6':						
1080	I	27.1' - 27.9': BEDROCK - Gray, SILTSTONE, fine grained,							
30									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
DURING DRILLING	None	ft.	-	
UPON COMPLETION	*	ft.	6	ft.
AFTER ___ HRS.		ft.		ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-6

Location City of Washington, Washington County, Pennsylavnia Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1109 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 02/11/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 02/11/2025

Elevation/ Depth	MATERIAL SYMBOL/ SAMPLE CONDITIONS	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve 10 30 50
1075 35		moderately soft, very thin to thin bedded, very high to high jointing 27.9' - 30': BEDROCK - Gray, SANDSTONE, coarse grained, hard, thick bedded, low jointing Boring discontinued at approximately 30 feet * No groundwater encountered prior to start of rock coring	Recovery = 76% RQD = 0% Core Run No. 5 28.6 to 30': Recovery = 100% RQD = 100% Classifications based on Visual-Manual procedure (ASTM D2488) unless laboratory classified 8.7 feet: UCS = 32,774 psi						
1070 40									
1065 45									
1060 50									
1055 55									
1050 60									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
DURING DRILLING	None	ft.	-	
UPON COMPLETION	*	ft.	6	ft.
AFTER ___ HRS.		ft.		ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-7

Location City of Washington, Washington County, Pennsylavnia Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1132 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 02/06/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 02/07/2025

Elevation/ Depth	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve
0	0 - 0.3': Approximately 3 inches TOPSOIL		S-1	12	20.5	2-3-4	7	
1130	0.3' - 14': FILL - Moist, brown, clayey SAND with gravel (SC) (Gravel is shale, sandstone, and brick fragments)	S-2/S-3: LL = 33, PI = 13 Fines = 40.8%	S-2	14	19.8	7-6-8	14	
5			S-3	13	18.7	6-4-5	9	
1125			S-4	5	24.9	5-5-4	4	
10			S-5	5	20	3-3-2	5	
1120	14' - 20': FILL - Moist, brown and gray, clayey GRAVEL with sand (GC) (Gravel is sandstone, shale, and limestone fragments)	S-6/S-7: LL = 36, PI = 14 Fines = 32.5%	S-6	8	20.4	8-6-7	13	
15			S-7	5	17.9	10-8-7	15	
1115	20' - 23': FILL - Moist, brown, LEAN CLAY with sand and gravel (CL) (Gravel is carbonaceous shale, shale, and sandstone fragments)	S-8: Pyritic Sulfur = 0.24%	S-8	8	16	10-7-4	11	
20	23' - 32': FILL - Moist, brown and gray, POORLY GRADED GRAVEL with clay and sand (GP-GC) (Gravel is sandstone, shale, and limestone fragments)		S-9	0		3-2-4	7	
1110			S-10	1		7-10-9	19	
25			S-11	14		8-6-7	13	
1105								
30								

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
DURING DRILLING	None	ft.	-	
UPON COMPLETION	*	ft.	11	ft.
AFTER ___ HRS.		ft.		ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-7

Location City of Washington, Washington County, Pennsylavnia Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1132 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 02/06/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 02/07/2025

Elevation/ Depth	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve (10 30 50)
1100	32' - 34': WEATHERED ROCK - Very dense, dry, brown and gray, LIMESTONE (sampled as a poorly graded gravel, GP)		S-12	4		50/4"	50/4"	
35	34.1' - 37.5': BEDROCK - Gray and brown, LIMESTONE, fine grained, hard, very thin to thin bedded, very high to high jointing	Core Run No. 1 34 to 36.5': Recovery = 100% RQD = 40%	RC1					
1095	37.5' - 38.3': BEDROCK - Gray, CLAYSTONE, fine grained, soft to moderately soft, thin bedded, medium jointing	Core Run No. 2 36.5 to 41.5': Recovery = 70% RQD = 0%	RC2					
40	38.3' - 38.9': BEDROCK - Gray, LIMESTONE, fine grained, moderately soft, thin bedded, high jointing		RC3					
1090	38.9' - 43.9': BEDROCK - Gray, CLAYSTONE, fine grained, soft, very thin to thin bedded, very high to high jointing	Core Run No. 3 41.5 to 46.5': Recovery = 100% RQD = 0%						
45	43.9' - 49': BEDROCK - Black, COAL INTERBEDDED WITH CARBONACEOUS SHALE, fine grained, moderately soft to soft, very thin to thin bedded, very high to high jointing	Core Run No. 4 46.5 to 51.5': Recovery = 92% RQD = 30%	RC4					
1085	49' - 50.2': BEDROCK - Gray, CLAYSTONE, fine grained, soft to moderately soft, very thin to thin bedded, very high to high jointing							
50	50.2' - 51.5': BEDROCK - Gray, SANDSTONE, fine grained, hard, thin bedded, high jointing	Classifications based on Visual-Manual procedure (ASTM D2488) unless laboratory classified						
1080	Boring discontinued at approximately 51.5 feet	34.2 feet: UCS = 24,232 psi						
55	* No groundwater encountered prior to start of rock coring							
1075								
60								

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
DURING DRILLING	None ft.	-
UPON COMPLETION	* ft.	11 ft.
AFTER ___ HRS.	ft.	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-8

Location City of Washington, Washington County, Pennsylvania Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1098 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 01/30/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 01/30/2025

Elevation/ Depth	MATERIAL SYMBOL/ SAMPLE CONDITIONS	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve
0	I	0 - 0.4': Approximately 5.5 inches CEMENT CONCRETE		S-1	12	11.9	14-15-12	27	
1095 / 5	I	0.4' - 2.5': FILL - Moist, light brown, clayey GRAVEL with sand (GC) (Gravel is sandstone and shale fragments)		S-2	12	18.9	7-13-20	33	
	I	2.5' - 6.5': RESIDUUM - Hard, moist, light brown and light gray, LEAN CLAY with sand, trace gravel (CL) (Gravel is shale fragments)	S-3: Pyritic Sulfur = 0.27%	S-3	15	15.6	9-18-50/3"	68/9"	68/9"
1090 / 10	I	6.5' - 8': WEATHERED ROCK - Very dense, damp, dark gray to black, CARBONACEOUS SHALE (sampled as a poorly graded gravel, GP)	S-4: Pyritic Sulfur = 0%	S-4	4	16.5	50/4"	50/4"	
1085 / 15	I	8' - 11': WEATHERED ROCK - Very dense, damp, gray-brown, CLAYEY SHALE (sampled as a clayey gravel, GC)	Core Run No. 1 12.1 to 17.1': Recovery = 100% RQD = 34%	S-5 RC1	1 60	3.5	50/1"	50/1"	
	I	11' - 12.1': WEATHERED ROCK - Very dense, dry, gray, SANDSTONE (sampled as a poorly graded gravel, GP)	Core Run No. 2 17.1 to 20.1': Recovery = 100% RQD = 0%	RC2	30				
1080 / 20	I	12.1 - 14.9': BEDROCK - Gray, SANDSTONE, coarse grained, moderately soft to hard, very thin to thin bedded, very high to medium jointing							
1075 / 25		14.9' - 18.8': BEDROCK - Gray, CLAYSTONE, fine grained, soft to moderately soft, very thin to thin bedded, very high to high jointing Carbonaceous from approximately 14.9 to 15.1 feet	Classifications based on Visual-Manual procedure (ASTM D2488) unless laboratory classified						
1070 / 30		18.8' - 20.1': BEDROCK - Gray, SANDSTONE, coarse grained, hard. very thin to thin bedded, very high to high bedded							

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
DURING DRILLING	None	ft.	-	
UPON COMPLETION	*	ft.	5	ft.
AFTER ___ HRS.		ft.		ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-8

Location City of Washington, Washington County, Pennsylavnia Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1098 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 01/30/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 01/30/2025

Elevation/ Depth	MATERIAL SYMBOL/ SAMPLE CONDITIONS	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve (10 30 50)
1065 / 35		Boring discontinued at approximately 20.1 feet * No groundwater encountered prior to start of rock coring							
1060 / 40									
1055 / 45									
1050 / 50									
1045 / 55									
1040 / 60									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
DURING DRILLING	None	ft.	-	
UPON COMPLETION	*	ft.	5	ft.
AFTER ___ HRS.		ft.		ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-9

Location City of Washington, Washington County, Pennsylavnia Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1098 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 01/31/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 01/31/2025

Elevation/ Depth	MATERIAL SYMBOL/ SAMPLE CONDITIONS	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve
0	I	0 - 0.4': Approximately 5 inches CEMENT CONCRETE	S-1/S-2: LL = 29, PI = 10 Fines = 63.9%	S-1	14	13.5	7-10-14	24	
	I	0.4' - 5': FILL - Moist to wet, light brown and brown-gray, LEAN CLAY with gravel (CL) (Gravel is sandstone and shale fragments)		S-2	2	18.1	19-30-25	55	
1095 5	I	5' - 6': RESIDUUM - Dense, damp, light brown, silty SAND with gravel (SM) (Gravel is sandstone fragments)		S-3	12	11.4	12-14-23	37	
1090	I	6' - 10.2': WEATHERED ROCK - Very dense, dry, gray, CLAYSTONE (sampled as a clayey gravel, GC)		S-4	2	6	50/3"	50/3"	
10	I	10.2 - 13.8': BEDROCK - Gray, SANDSTONE, coarse grained, moderately soft to hard, very thin to thick bedded, very high to medium jointing	Core Run No. 1 10 to 13': Recovery = 100% RQD = 63%	RC1	36				
1085 15	I	13.8' - 17.2': BEDROCK - Gray, CLAYSTONE, fine grained, soft to moderately soft, very thin to thin bedded, very high to high jointing	Core Run No. 2 13 to 18': Recovery = 100% RQD = 14%	RC2	8				
1080	I	Carbonaceous from approximately 13.8 to 14.1 feet	Core Run No. 3 18 to 20': Recovery = 75% RQD = 60%	RC3	18				
20		17.2' - 20"': BEDROCK - Gray, SANDSTONE, coarse grained, hard, very thin to thin bedded, very high to medium jointing							
1075		Boring discontinued at approximately 20 feet	Classifications based on Visual-Manual procedure (ASTM D2488) unless laboratory classified						
25		* No groundwater encountered prior to start of rock coring							
1070									
30									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
DURING DRILLING	None	ft.	-	
UPON COMPLETION	*	ft.	5	ft.
AFTER ___ HRS.		ft.		ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30"': COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-10

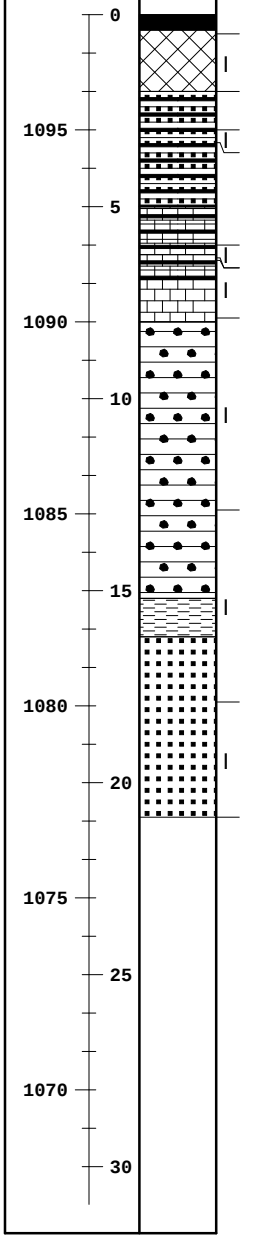
Location City of Washington, Washington County, Pennsylvania Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1098 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 01/31/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 01/31/2025



Elevation/ Depth	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N
0	0 - 0.4': Approximately 5.5 inches CEMENT CONCRETE	S-1: Pyritic Sulfur = 0.05%	S-1	5	16.2	4-6-10	16
1095	0.4' - 2': FILL - Moist, light brown, clayey GRAVEL with sand (GC) (Gravel is sandstone and shale fragments)		S-2	4	12.6	50/4"	50/4"
5	2' - 5': WEATHERED ROCK - Very dense, dry, light brown and brown-gray, SANDSTONE (sampled as a poorly graded gravel, GP)	Core Run No. 1 6.4 to 7.9': Recovery = 100% RQD = 33%	S-3 RC1	3 18		50/4"	50/4"
1090	5' - 6.9': WEATHERED ROCK - Very dense, dry, gray, LIMESTONE (sampled as a poorly graded gravel, GP)	Core Run No. 2 7.9 to 12.9': Recovery = 86% RQD = 0%	RC2	52			
10	6.9' - 8': BEDROCK - Gray, LIMESTONE, fine grained, moderately soft to hard, very thin to thin bedded, very high to high jointing	Core Run No. 3 12.9 to 17.9': Recovery = 88% RQD = 32%	RC3	53			
1085	8' - 15.2': BEDROCK - Dark gray and black, CARBONCEOUS SHALE AND COAL, fine grained, soft, very thin to thin bedded, very high to high jointing						
15	15.2' - 16.2': BEDROCK - Gray, SILTSTONE, fine grained, moderately soft, thin bedded, high jointing	Core Run No. 4 17.9 to 20.9': Recovery = 100% RQD = 100%	RC4	36			
1080	16.2 - 20.9': BEDROCK - Gray, SANDSTONE, coarse grained, moderately soft to hard, very thin to thick bedded, very high to medium jointing	Classifications based on Visual-Manual procedure (ASTM D2488) unless laboratory classified					
20	Boring discontinued at approximately 20.9 feet						
1075	* No groundwater encountered prior to start of rock coring						
25							
1070							
30							

SPT Blows/Foot Curve: 10 30 50

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
DURING DRILLING	None	ft.	-	
UPON COMPLETION	*	ft.	4	ft.
AFTER ___ HRS.		ft.		ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-11

Location City of Washington, Washington County, Pennsylvania Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1098 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 02/03/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 02/03/2025

Elevation/ Depth	MATERIAL SYMBOL/ SAMPLE CONDITIONS	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve (10 30 50)
0	I	0 - 0.4': Approximately 4.5 inches CEMENT CONCRETE							
		0.4' - 1.5': FILL - Moist, light brown, clayey SAND (SC)	S-1: Pyritic Sulfur = 0%	S-1	7	9.5	7-16-28	44	
1095	I	1.5' - 10': WEATHERED ROCK - Very dense, dry, dark gray, CARBONACEOUS SHALE (sampled as a poorly graded gravel, GP)	S-2: Pyritic Sulfur = 1.40%	S-2	4	2.2	50/4"	50/4"	
5	I			S-3	4	9.8	50/4"	50/4"	
1090	I			S-4	0		50/4"	50/4"	
10	I	10' - 11': BEDROCK - Black, COAL, fine grained, soft, laminated to thin bedded, very high jointing	Core Run No. 1 10 to 11': Recovery = 80% RQD = 0%	RC1	10				
1085	I	11' - 12.1': BEDROCK - Gray, CLAYSTONE, fine grained, moderately soft, very thin to thin bedded, very high to high jointing	Core Run No. 2 11 to 16': Recovery = 100% RQD = 48%	RC2	60				
15				RC3	48				
1080	I	12.1' - 20' BEDROCK - Gray, SANDSTONE, coarse grained, moderately soft to hard, very thin to thick bedded, very high to medium jointing	Core Run No. 3 16 to 20': Recovery = 100% RQD = 75%						
20		Boring discontinued at approximately 20 feet * No groundwater encountered prior to start of rock coring	Classifications based on Visual-Manual procedure (ASTM D2488) unless laboratory classified						
1075									
25									
1070									
30									

SAMPLER TYPE	SAMPLE CONDITIONS		GROUND WATER	CAVE IN DEPTH	BORING METHOD
DRIVEN SPLIT SPOON UNLESS OTHERWISE	D - DISINTEGRATED	DURING DRILLING	None ft.	-	HSA - HOLLOW STEM AUGERS
PT - PRESSED SHELBY TUBE	I - INTACT	UPON COMPLETION	* ft.	3 ft.	CFA - CONTINUOUS FLIGHT AUGERS
CA - CONTINUOUS FLIGHT AUGER	U - UNDISTURBED	AFTER ___ HRS.	ft.	ft.	DC - DRIVING CASING
RC - ROCK CORE	L - LOST				MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-12

Location City of Washington, Washington County, Pennsylavnia Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1131 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 02/05/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 02/05/2025

Elevation/ Depth	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve
0 / 1130	0 - 0.3': Approximately 3 inches TOPSOIL		S-1	12	18.8	2-4-4	8	
	0.3' - 5': FILL - Moist, light brown and brown, LEAN CLAY with sand and gravel (CL) (Gravel is shale, carbonaceous shale, sandstone and brick fragments)		S-2	13	23	4-7-7	14	
5 / 1125	5' - 11': RESIDUUM - Stiff, moist, light brown, LEAN CLAY, trace gravel (CL) (Gravel is shale fragments)	Undisturbed (Shelby tube) sample obtained from offset borehole from approximately 7 to 9 feet: LL = 44, PI = 25 Fines = 63%	S-3	15	18	5-7-10	17	
			S-4	14	30.4	9-11-11	22	
10 / 1120	11' - 14.5': RESIDUUM - Very dense, damp, light brown and brown, clayey GRAVEL (decomposed clayey shale, GC)		S-5	13	12	2-8-9	17	
15 / 1115	14.5' - 20': RESIDUUM - Medium dense, damp, black, POORLY GRADED GRAVEL (decomposed carbonaceous shale and coal, GP)		S-6	13	52.2	7-7-9	16	
		S-7: Pyritic Sulfur = 0.01%	S-7	14	60	14-12-8	20	
20 / 1110	20' - 22.2': WEATHERED ROCK - Very dense, dry, gray, CLAYSTONE (sampled as a clayey gravel, GC)		S-8	3		50/3"	50/3"	
		Core Run No. 1 22.2 to 27.2': Recovery = 50% RQD = 18%	RC1	30				
25 / 1105	22.2' - 36': BEDROCK - Gray and light brown, LIMESTONE, fine grained, hard to moderately soft, very thin to thin bedded, very high to medium jointing							
	Carbonaceous Shale and Coal lense from approximately 23.9 to 24.2 feet	Core Run No. 2 27.2 to 32.2': Recovery = 96% RQD = 0%	RC2	58				
30								

SPT Blows/Foot Curve: 10, 30, 50

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
DURING DRILLING	None	ft.	-	
UPON COMPLETION	*	ft.	16	ft.
AFTER ___ HRS.		ft.		ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-12

Location City of Washington, Washington County, Pennsylavnia Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1131 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 02/05/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 02/05/2025

Elevation/ Depth	MATERIAL SYMBOL/ SAMPLE CONDITIONS	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve (10 30 50)
1100									
			Core Run No. 3 32.2 to 37.2': Recovery = 84% RQD = 14%	RC3	50				
35	I								
1095		36' - 42.1': BEDROCK - Gray, CLAYSTONE, fine grained, soft to moderately soft, very thin to thin bedded, very high to high jointing	Core Run No. 4 37.2 to 42.2': Recovery = 100% RQD = 0%	RC4	60				
40	I								
1090		Carbonaceous Shale and Coal lense from approximately 40.6 to 41.5 feet)	Core Run No. 5 42.2 to 47.2': Recovery = 96% RQD = 0%	RC5	57				
45	I	42.1' - 47.2': BEDROCK - Black, COAL INTERBEDDED WITH CARBONACEOUS SHALE, fine grained, moderately soft to soft, very thin to thin bedded, very high to high jointing							
1085									
50		Boring discontinued at approximately 47.2 feet * No groundwater encountered prior to start of rock coring	Classifications based on Visual-Manual procedure (ASTM D2488) unless laboratory classified 23 feet: UCS = 3,088 psi						
1080									
55									
1075									
60									
1070									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER		CAVE IN DEPTH	
DURING DRILLING	None	ft.	-	
UPON COMPLETION	*	ft.	16	ft.
AFTER ___ HRS.		ft.		ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-13

Location City of Washington, Washington County, Pennsylavnia Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1137 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 02/06/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 02/06/2025

Elevation/ Depth	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve
0	0 - 0.3': Approximately 3 inches TOPSOIL		S-1	12	13	2-4-4	8	
1135	0.3' - 5': FILL - Moist, gray, light brown and brown, LEAN CLAY with sand and gravel (CL) (Gravel is shale, carbonaceous shale, sandstone and brick fragments)	Undisturbed (Shelby tube) sample obtained from offset borehole from approximately 4.5 to 6.5 feet: LL = 48, PI = 29 Fines = 66.2%	S-2	14	27	5-5-7	12	
5	5' - 8': RESIDUUM - Stiff, moist, light brown, sandy LEAN CLAY with gravel (CL) (Gravel is sandstone fragments)		S-3	13	18	5-6-15	21	
1130	8' - 11': RESIDUUM - Medium dense, damp, light brown and brown, clayey GRAVEL (decomposed clayey shale, GC)		S-4	15	16.1	10-10-15	25	
10	11' - 15.1': WEATHERED ROCK - Very dense, dry, light brown and brown, CLAYEY SHALE (sampled as a clayey gravel, GC)		S-5	16	6.7	8-26-50/4"	76/ 10"	76/10"
1125	15.1' - 16.4': BEDROCK - Gray, SANDSTONE, coarse grained, hard, thin bedded, medium jointing	Core Run No. 1 15.1 to 18.1': Recovery = 100% RQD = 53%	S-6 RC1	1 36		50/1"	50/1"	
15	16.4' - 21.2': BEDROCK - Light brown and brown, sandy SHALE, fine grained, soft to moderately soft, very thin to thin bedded, very high to high jointing	Core Run No. 2 18.1 to 23.1': Recovery = 88% RQD = 0%	RC2	53				
1120	21.2' - 24.4': BEDROCK - Black, CARBONACEOUS SHALE with occasional Coal lenses, fine grained, soft, very thin to thin bedded, very high to high jointing	Core Run No. 3 23.1 to 28.1': Recovery = 44% RQD = 0% Core water loss at appx. 25'	RC3	26				
20	24.4' - 30.2': BEDROCK - Gray, LIMESTONE, fine grained, moderately soft to hard, very thin to thin bedded, high to medium jointing	RC3: Pyritic Sulfur = 0.03% Core Run No. 4	RC4	55				
1115	30.2' - 37.1': BEDROCK - Gray,							
25								
1110								
30								

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
DURING DRILLING	None ft.	-
UPON COMPLETION	* ft.	8 ft.
AFTER ___ HRS.	___ ft.	___ ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SUBSURFACE EXPLORATION

Project Name **Washington County Public Safety Facility** Boring No. B-13

Location City of Washington, Washington County, Pennsylvania Job # U24177

SAMPLER

Datum Gateway PSB-2 Hammer Wt. 140 lbs. Hole Diameter 3.25" ID Foreman K. McIlvaine

Surf. Elev. 1137 Ft. Hammer Drop 30 in. Rock Core Diameter NQ2 Classified By S. Simonette

Date Started 02/06/2025 Pipe Size N/A in. Boring Method HSA, Coring Date Completed 02/06/2025

Elevation/ Depth	MATERIAL SYMBOL/ SAMPLE CONDITIONS	Description	Boring & Sampling Notes	Sample No.	Rec.	NM %	SPT Blows	SPT Blows/Foot N	SPT Blows/Foot Curve (10 30 50)
1105		CLAYSTONE, fine grained, soft to moderately, very thin to thin bedded, very high to medium jointing	28.1 to 33.1': Recovery = 92% RQD = 30% Core Run No. 5 33.1 to 38.1': Recovery = 90% RQD = 0%	RC5	54				
35	I								
1100		37.1' - 41.4': BEDROCK - Brown to gray, LIMESTONE, fine grained, moderately soft to hard, very thin to thin bedded, high to medium jointing	Core Run No. 6 38.1 to 43.1': Recovery = 80% RQD = 10%	RC6	48				
40	I								
1095		41.4' - 46.5': BEDROCK - Gray, CLAYSTONE with occasional limestone seams, fine grained, soft to moderately soft, very thin to thin bedded, very high to medium jointing	Core Run No. 7 43.1 to 48.1': Recovery = 100% RQD = 0%	RC7	60				
45	I								
1090		46.5' - 50': BEDROCK - Black, CARBONACEOUS SHALE INTERBEDDED WITH COAL, fine grained, moderately soft to soft, very thin to thin bedded, very high to high jointing	Core Run No. 8 48.1 to 50': Recovery = 100% RQD = 0%	RC8	23				
50	I								
1085		Boring discontinued at approximately 50 feet * No groundwater encountered prior to start of rock coring	Classifications based on Visual-Manual procedure (ASTM D2488) unless laboratory classified 28.2 feet: UCS = 24,989 psi						
55									
1080									
60									

SAMPLER TYPE
DRIVEN SPLIT SPOON UNLESS OTHERWISE
PT - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

SAMPLE CONDITIONS
D - DISINTEGRATED
I - INTACT
U - UNDISTURBED
L - LOST

	GROUND WATER	CAVE IN DEPTH
DURING DRILLING	None ft.	-
UPON COMPLETION	* ft.	8 ft.
AFTER ___ HRS.	ft.	ft.

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

534 Alpha Drive • Pittsburgh, PA 15238

PHONE: (412) 206-0195 • FAX: (412) 744-3132

Description of Soils – per ASTM D2487

Major Component	Component Type	Component Description	Symbol	Group Name
Coarse-Grained Soils, More than 50% is retained on the No. 200 sieve	**Gravels** – More than 50% of the coarse fraction is retained on the No. 4 sieve. Coarse = 1" to 3" Medium = ½" to 1" Fine = ¼" to ½"	Clean Gravels <5% Passing No. 200 sieve	**GW**	Well Graded Gravel
			GP	Poorly Graded Gravel
		Gravels with fines, >12% Passing the No. 200 sieve	**GM**	Silty Gravel
			GC	Clayey Gravel
	Sands – More than 50% of the coarse fraction passes the No. 4 sieve. Coarse = No.10 to No.4 Medium = No. 10 to No. 40 Fine = No. 40 to No. 200	Clean Sands <5% Passing No. 200 sieve	**SW**	Well Graded Sand
			SP	Poorly Graded Sand
		Sands with fines, >12% Passing the No. 200 sieve	**SM**	Silty Sand
			SC	Clayey Sand
Fine Grained Soils, More than 50% passes the No. 200 sieve	Silts and Clays Liquid Limit is less than 50 Low to medium plasticity	Inorganic	**ML**	Silt
			CL	Lean Clay
		Organic	**OL**	Organic silt
				Organic Clay
	Silts and Clays Liquid Limit of 50 or greater Medium to high plasticity	Inorganic	**MH**	Elastic Silt
			CH	Fat Clay
		Organic	**OH**	Organic Silt
				Organic Clay
Highly Organic Soils	Primarily Organic matter, dark color, organic odor		**PT**	Peat

Proportions of Soil Components

Component Form	Description	Approximate percent by weight
Noun	Sand, Gravel, Silt, Clay, etc.	50% or more
Adjective	Sandy, silty, clayey, etc.	35% to 49%
Some	Some sand, some silt, etc.	12% to 34%
Trace	Trace sand, trace mica, etc.	1% to 11%
With	With sand, with mica, etc.	Presence only

Particle Size Identification

Particle Size	Particle dimension
Boulder	12" diameter or more
Cobble	3" to 12" diameter
Gravel	¼" to 3" diameter
Sand	0.005" to ¼" diameter
Silt/Clay (fines)	Cannot see particle

Cohesive Soils

Field Description	No. of SPT Blows/ft	Consistency
Easily Molded in Hands	0 – 3	Very Soft
Easily penetrated several inches by thumb	4 – 5	Soft
Penetrated by thumb with moderate effort	6 – 10	Medium Stiff
Penetrated by thumb with great effort	11 – 30	Stiff
Indented by thumb only with great effort	Greater than 30	Hard

Granular Soils

No. of SPT Blows/ft	Relative Density
0 – 4	Very Loose
5 – 10	Loose
11 – 30	Medium Dense
31 – 50	Dense
Greater than 50	Very Dense

Other Definitions**:**

- **Fill:** Encountered soils that were placed by man. Fill soils may be controlled (engineered structural fill) or uncontrolled fills that may contain rubble and/or debris.
- **Saprolite**: Soil material derived from the in-place chemical and physical weathering of the parent rock material. May contain relic structure. Also called residual soils. Occurs in Piedmont soils, found west of the fall line.
- **Disintegrated Roc**k: Residual soil material with rock-like properties, very dense, N = 60 to 51/0".
- **Karst:** Descriptive term which denotes the potential for solutioning of the limestone rock and the development of sinkholes.
- **Alluvium:** Recently deposited soils placed by water action, typically stream or river floodplain soils.
- **Groundwater Level**: Depth within borehole where water is encountered either during drilling, or after a set period of time to allow groundwater conditions to reach equilibrium.
- **Caved Depth:** Depth at which borehole collapsed after removal of augers/casing. Indicative of loose soils and/or groundwater conditions**.**

HILLIS-CARNES
ENGINEERING ASSOCIATES

GENERAL ROCK CORE CLASSIFICATION SHEET

Grain Size	
Coarse Grained	Large crystals or grains can be seen easily by the naked eye
Fine Grained	Grains cannot be seen without magnification
Hardness	
Soft	Can be worked with a shovel, friable, can be broken by hand in a dry to moist hand specimen, easily carved with a knife when moist
Moderately Soft	Cannot be worked with a shovel, can be worked with a geology hammer or pick, can be scratched with a penny
Hard	Cannot be worked with a pick, has a ring when struck with a hammer, cannot be scratched with a penny but can with a knife
Very Hard	Has a distinct ring when struck with a hammer, cannot be scratched with a knife
Layering	
Fissile	Splits easily along closely spaced plains of 1/16-inch or less
Very Thin Bedded	Beds of 1/16-inch to 2 inches
Thin Bedded	Beds of 2 inches to 2 feet
Thick Bedded	Beds of 2 to 4 feet
Massive Bedded	Beds exceeding 4 feet
Jointing	
Very Low	More than 6.5 feet between discontinuities
Low	2 to 6.5 feet between discontinuities
Medium	8 inches to 2 feet between discontinuities
High	2.5 to 8 inches between discontinuities
Very High	Less than 2.5 inches between discontinuities

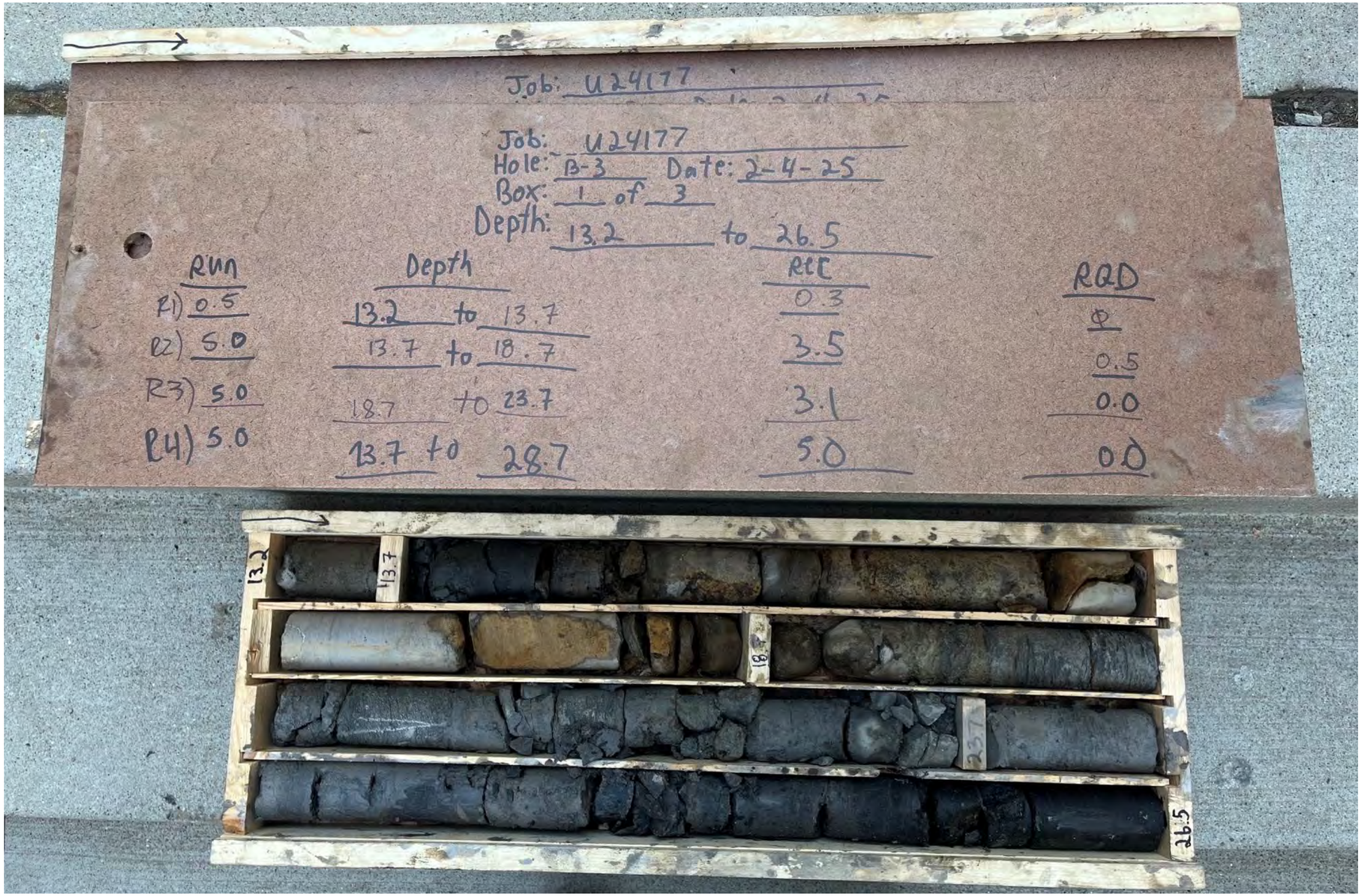
B-2

HILLIS-CARNES
ENGINEERING ASSOCIATES
534 Alpha Drive Pittsburgh, PA 15238
Phone: (412) 216-0195 Fax: (412) 744-3132

ROCK CORE PHOTOGRAPHS

New Washington County Public Safety Facility
City of Washington, Washington County, Pennsylvania

JOB NO:	U24177	**DRAWN BY:**	SS
DATE:	02/28/25		
SCALE:	NTS		
PAGE:	1		



B-3: 13.2 to 26.5 feet

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534 Alpha Drive Pittsburgh, PA 15238
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ROCK CORE PHOTOGRAPHS

New Washington County Public Safety Facility
City of Washington, Washington County, Pennsylvania

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PAGE:	1		

B-3: 26.5 to 36.7 feet

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ROCK CORE PHOTOGRAPHS

New Washington County Public Safety Facility
City of Washington, Washington County, Pennsylvania

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B-3: 36.7 to 40 feet

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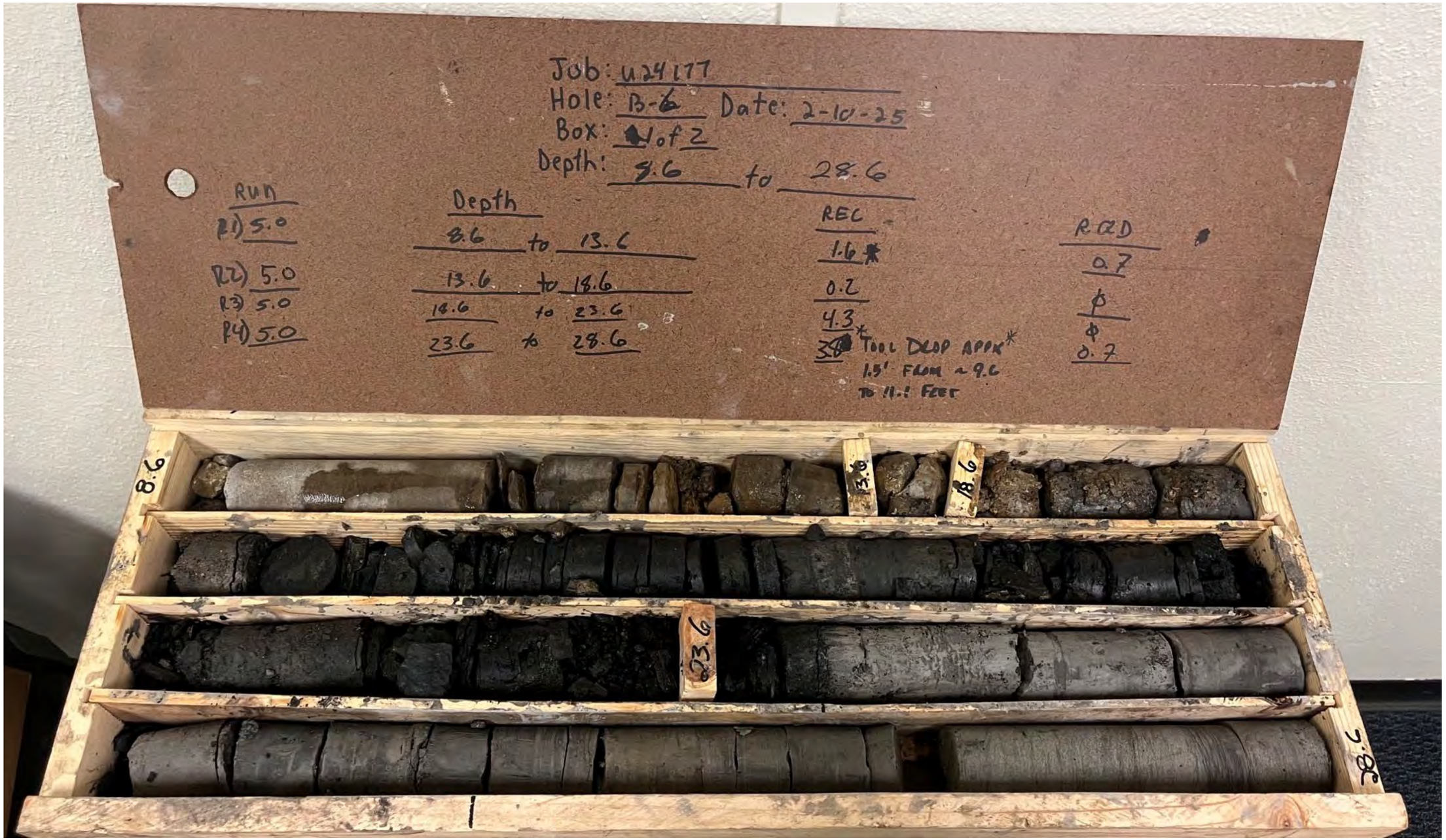
ROCK CORE PHOTOGRAPHS

New Washington County Public Safety Facility
City of Washington, Washington County, Pennsylvania

JOB NO:	U24177	**DRAWN BY:**	SS
DATE:	02/28/25		
SCALE:	NTS		
PAGE:	1		



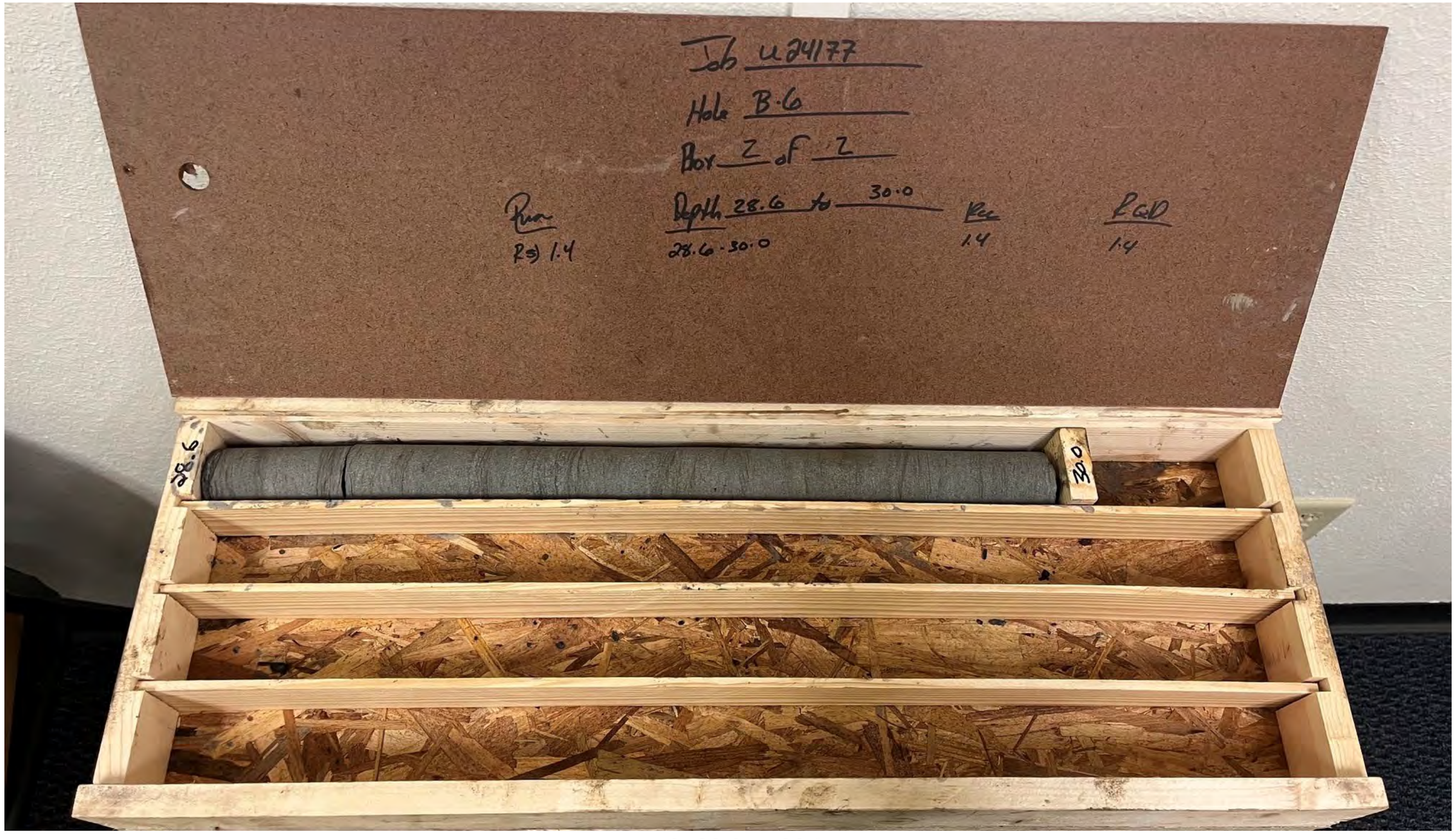
B-6: 8.6 to 28.6 feet

HILLIS-CARNES ENGINEERING ASSOCIATES
534 Alpha Drive Pittsburgh, PA 15238
Phone: (412) 216-0195 Fax: (412) 744-3132

ROCK CORE PHOTOGRAPHS

New Washington County Public Safety Facility
City of Washington, Washington County, Pennsylvania

JOB NO:	U24177	**DRAWN BY:**	SS
DATE:	02/28/25		
SCALE:	NTS		
PAGE:	1		



B-6: 28.6 to 30 feet

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534 Alpha Drive Pittsburgh, PA 15238
Phone: (412) 216-0195 Fax: (412) 744-3132

ROCK CORE PHOTOGRAPHS

New Washington County Public Safety Facility
City of Washington, Washington County, Pennsylvania

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B-7: 34 to 45.4 feet

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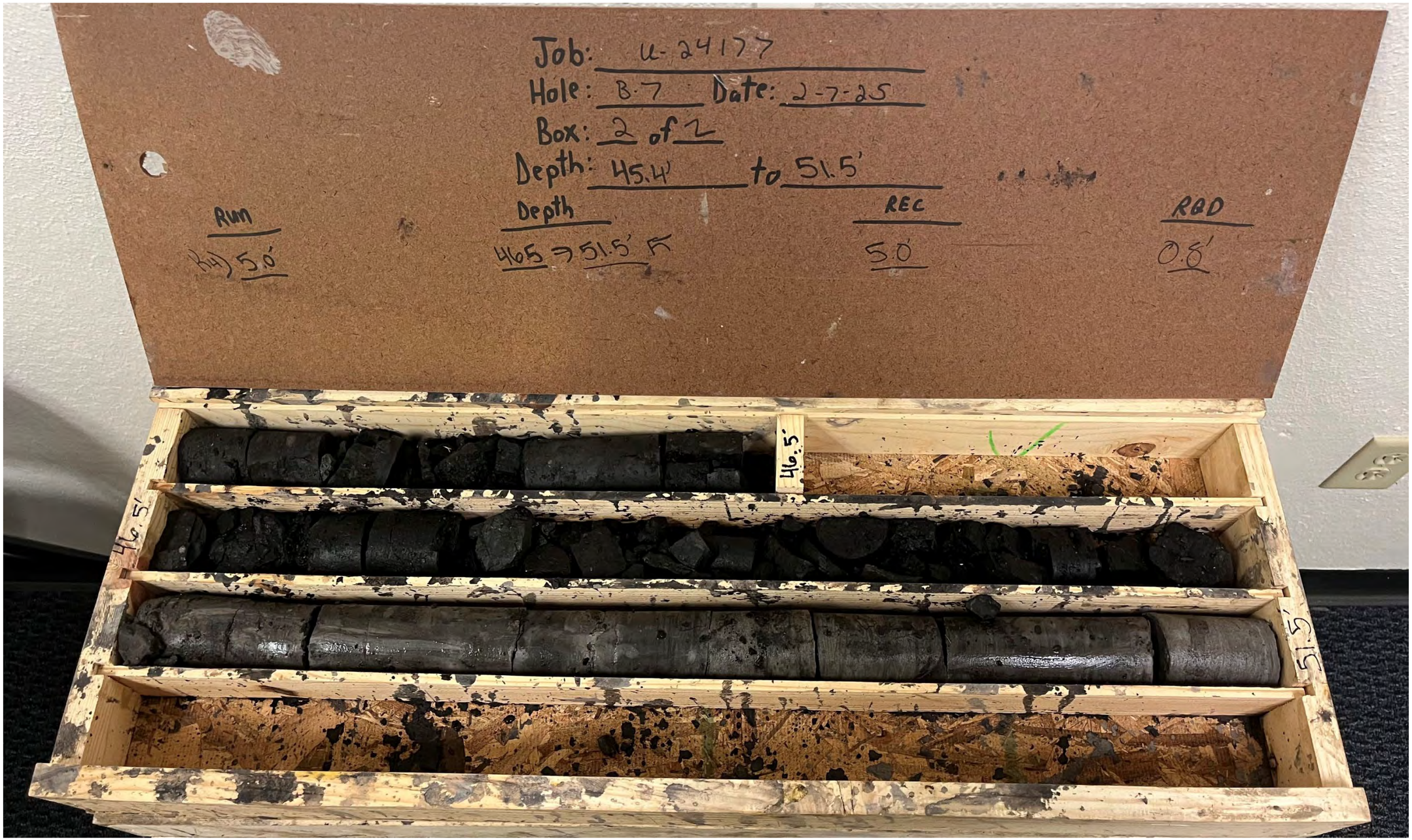

B-7: 45.4 to 51.5 feet

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B-8

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B-9

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B-10: 6.4 to 17 feet

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B-10: 17 to 20.9 feet

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B-11

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B-12: 22.2 to 34.7 feet

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B-12: 34.7 to 45 feet

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PAGE:	1		

B-12: 45 to 47 feet

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B-13: 15.1 to 28.1 feet

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B-13: 28.1 to 38.1 feet

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B-13: 38.1 to 48.1 feet

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City of Washington, Washington County, Pennsylvania

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B-13: 48.1 to 50 feet

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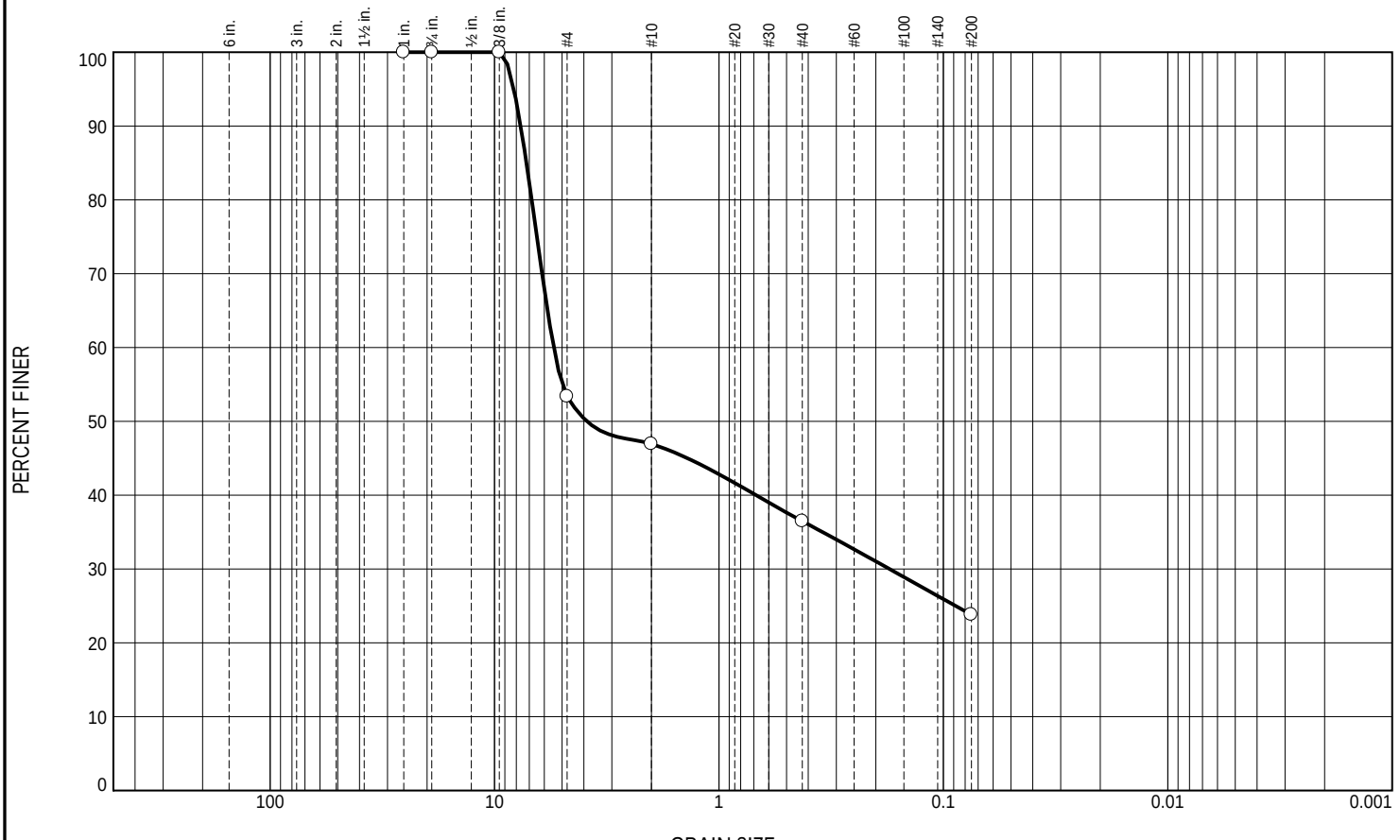
SCALE:	NTS		
PAGE:	1		

Particle Size Distribution Report

ASTM D422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	46.6	6.5	10.4	12.7	23.8	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	42	31	7.2075	5.4472	3.8742	0.1736				

Material Description	Test Date	USCS	NM
○ Silty GRAVEL with Sand	02/19/2025	GM	14.5

Project No. U24177 Client: County of Washington Pennsylvania

Project: Washington County Public Safety Facility

○Source of Sample: B-1 Depth: 0.6, 3 Sample Number: S-1, S-2

Remarks:

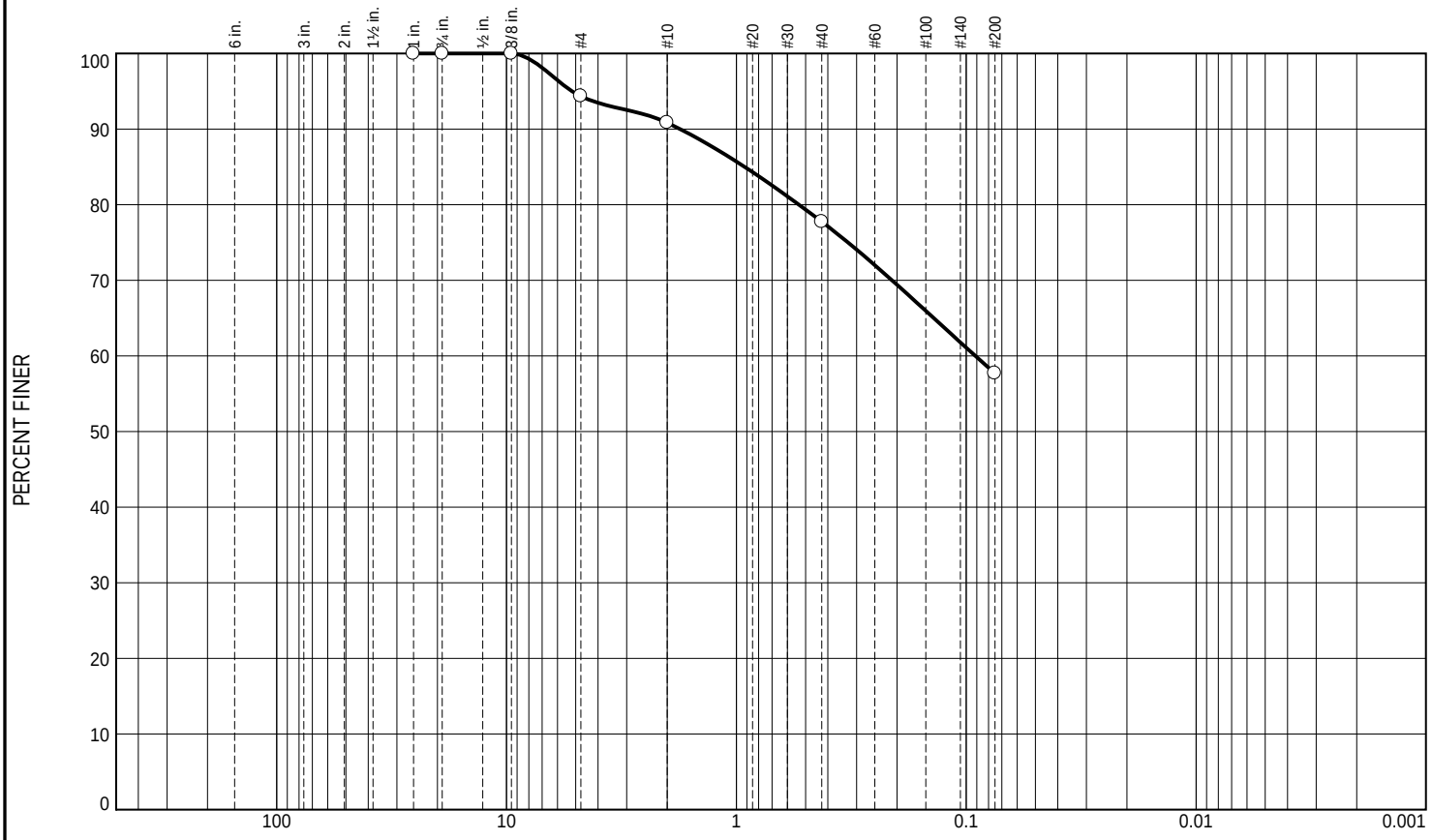
HILLIS-CARNES ENGINEERING ASSOCIATES

Pittsburgh, Pennsylvania

Checked By: SS

Particle Size Distribution Report

ASTM D422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	5.7	3.5	13.1	20.0	57.7	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	37	23	0.9198	0.0912						

	Material Description	Test Date	USCS	NM
○	Sandy LEAN CLAY	02/19/2025	CL	18.9

Project No. U24177 Client: County of Washington Pennsylvania

Project: Washington County Public Safety Facility

○ Source of Sample: B-2 Depth: 0, 3 Sample Number: S-1, S-2

Remarks:

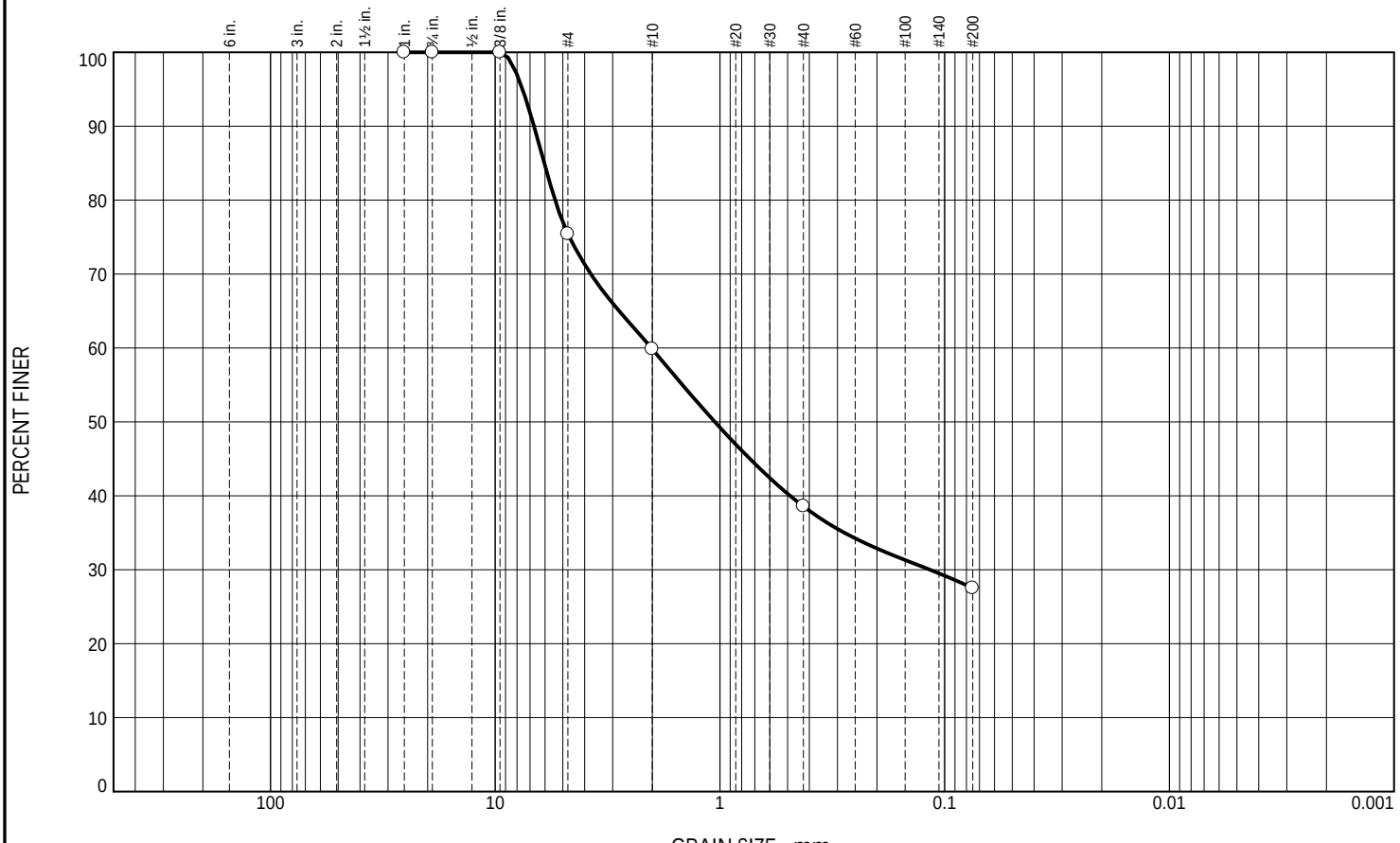
HILLIS-CARNES ENGINEERING ASSOCIATES

Pittsburgh, Pennsylvania

Tested By: DS Checked By: SS

Particle Size Distribution Report

ASTM D422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	24.6	15.5	21.3	11.1	27.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	32	22	6.0487	2.0179	1.0529	0.1162				

Material Description	Test Date	USCS	NM
○ Clayey SAND with Gravel	02/19/2025	SC	10.5

Project No. U24177 Client: County of Washington Pennsylvania

Project: Washington County Public Safety Facility

○Source of Sample: B-5 Depth: 3, 6 Sample Number: S-2, S-3

Remarks:

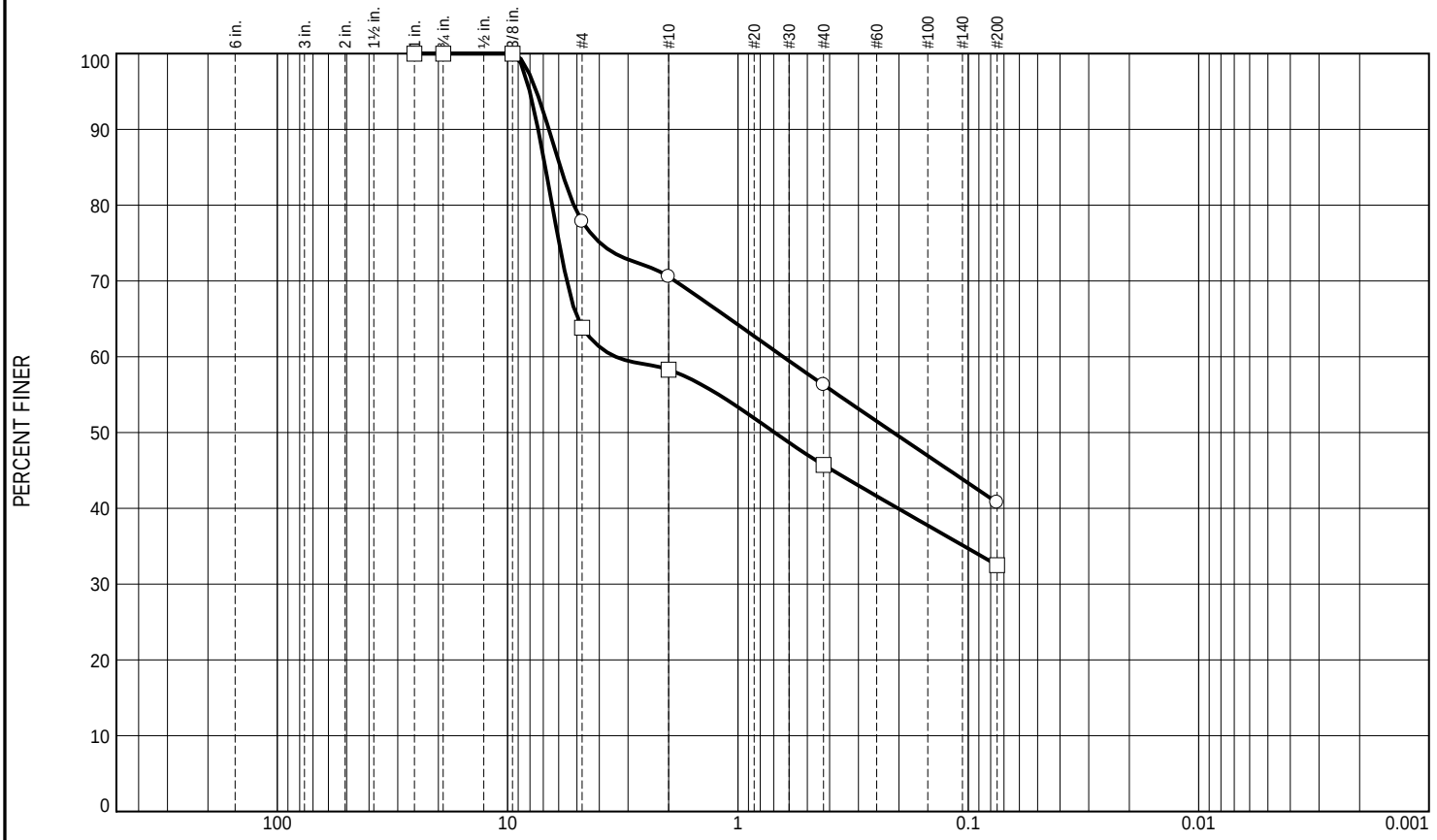
HILLIS-CARNES ENGINEERING ASSOCIATES

Pittsburgh, Pennsylvania

Tested By: DS Checked By: SS

Particle Size Distribution Report

ASTM D422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	22.2	7.2	14.3	15.5	40.8	
□	0.0	0.0	36.2	5.5	12.6	13.2	32.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	33	20	5.8965	0.6358	0.2114					
□	36	22	6.8622	3.3915	0.6926					

Material Description	Test Date	USCS	NM
○ Clayey SAND with Gravel	02/13/2025	SC	19.8
□ Clayey GRAVEL with Sand	02/13/2025	GC	20.4

Project No. U24177 Client: County of Washington Pennsylvania

Project: Washington County Public Safety Facility

○ Source of Sample: B-7 Depth: 3, 6 Sample Number: S-2, S-3

□ Source of Sample: B-7 Depth: 15, 18 Sample Number: S-6, S-7

Remarks:

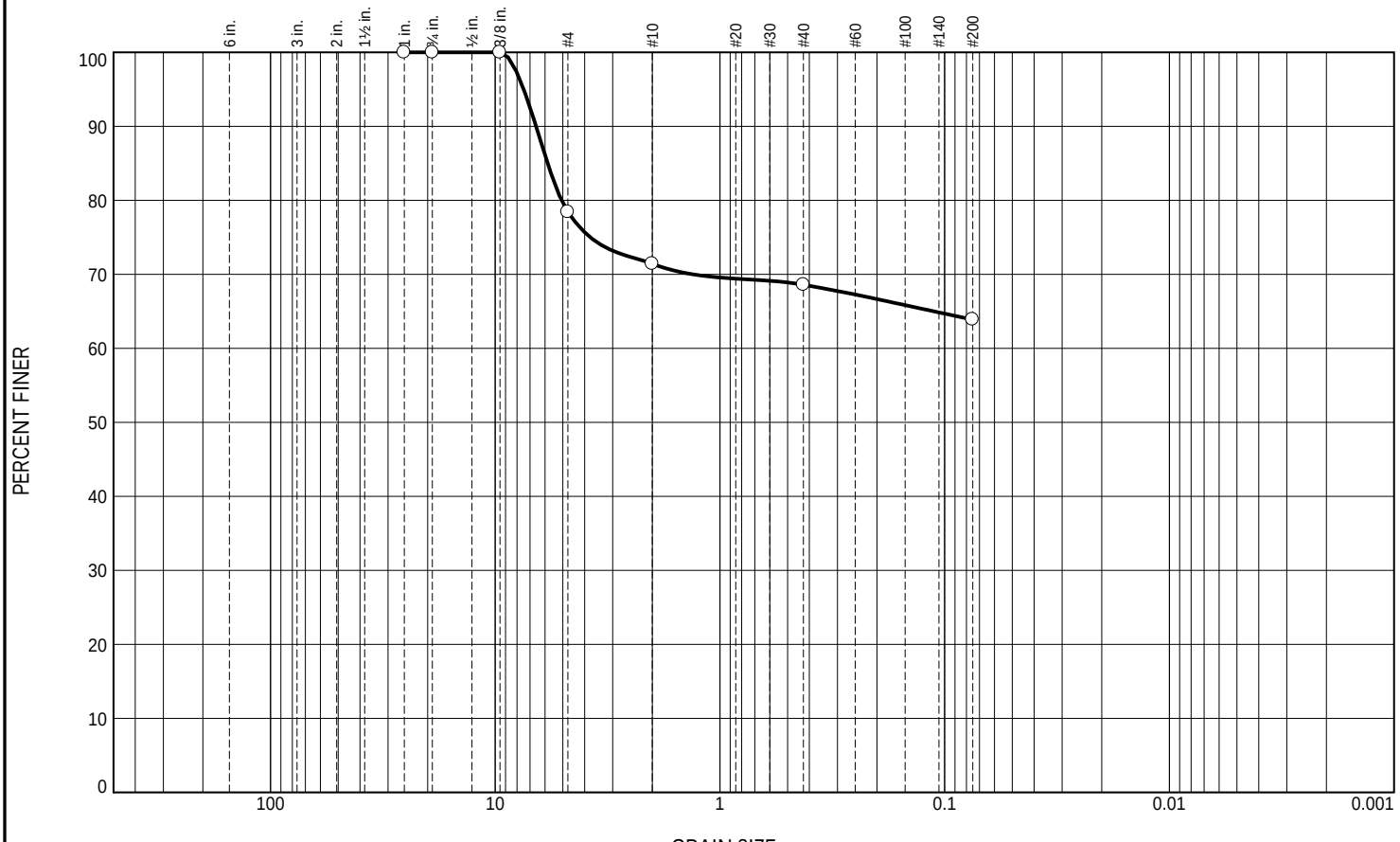
HILLIS-CARNES ENGINEERING ASSOCIATES

Pittsburgh, Pennsylvania

Checked By: SS

Particle Size Distribution Report

ASTM D422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	21.6	7.0	2.8	4.7	63.9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	29	19	5.8403							

Material Description	Test Date	USCS	NM
○ Gravelly LEAN CLAY	02/05/2025	CL	13.5

Project No. U24177 Client: County of Washington Pennsylvania

Project: Washington County Public Safety Facility

○Source of Sample: B-9 Depth: 0.5, 3 Sample Number: S-1, S-2

Remarks:

HILLIS-CARNES ENGINEERING ASSOCIATES

Pittsburgh, Pennsylvania

Tested By: DS Checked By: SS

PARTICLE-SIZE DISTRIBUTION OF SOILS USING SIEVE ANALYSIS- ASTM D6913-17

Client	Hillis-Carnes Engineering	Boring	B-12
Client Project	U24177 Washington County Public Service Facility	Depth	7.0'-9.0'
Project No.	25-00782	Sample	ST-1
		Lab Sample	25-00782-01

Sample Color: **DARK YELLOWISH BROWN**
USCS Group Name: **SANDY LEAN CLAY**
USCS Group Symbol: **CL** USDA: **NA** AASHTO: **A-7-6 (13)** *Wet Prep: R74-16*[1]

MECHANICAL SIEVE

Total Sample	
Total Sample Wet Wt, gm (-3")	836
Sample Split on Sieve	No. 4
Coarse Washed Dry Sample, gm	48
Wet Wt Passing Split, gm	788
Dry Wt. Passing Split, gm	682
Total Sample Dry Wt, gm	730

Split Sample - Passing No. 4	
Tare No.	227
Tare + WS., gm	400.63
Tare + DS., gm	371.22
Tare, gm	181.87
Water Content of Split Sample	**15.5%**
Wt. of DS., gm	189.35
Wt. of +#200 Sample, gm	61.63

Sieve Size	Nominal Opening, mm	Dry Wt, gm	Split Normalized % Retained	Split Normalized % Finer	Project Specifications
3"	75	0	0.0%	100.0%	
2"	50	0	0.0%	100.0%	
1-1/2"	37.5	0	0.0%	100.0%	
1"	25	0	0.0%	100.0%	
3/4"	19	0	0.0%	100.0%	
3/8"	9.5	11.52	1.6%	98.4%	
No. 4	4.75	36.14	4.9%	93.5%	
No. 10	2	16.19	8.0%	85.5%	
No. 20	0.85	15.19	7.5%	78.0%	
No. 40	0.425	10.88	5.4%	72.6%	
No. 60	0.25	6.87	3.4%	69.2%	
No. 100	0.15	6.25	3.1%	66.1%	
No. 140	0.106	3.5	1.7%	64.4%	
No. 200	0.075	2.75	1.4%	63.0%	

USCS SOIL CLASSIFICATION

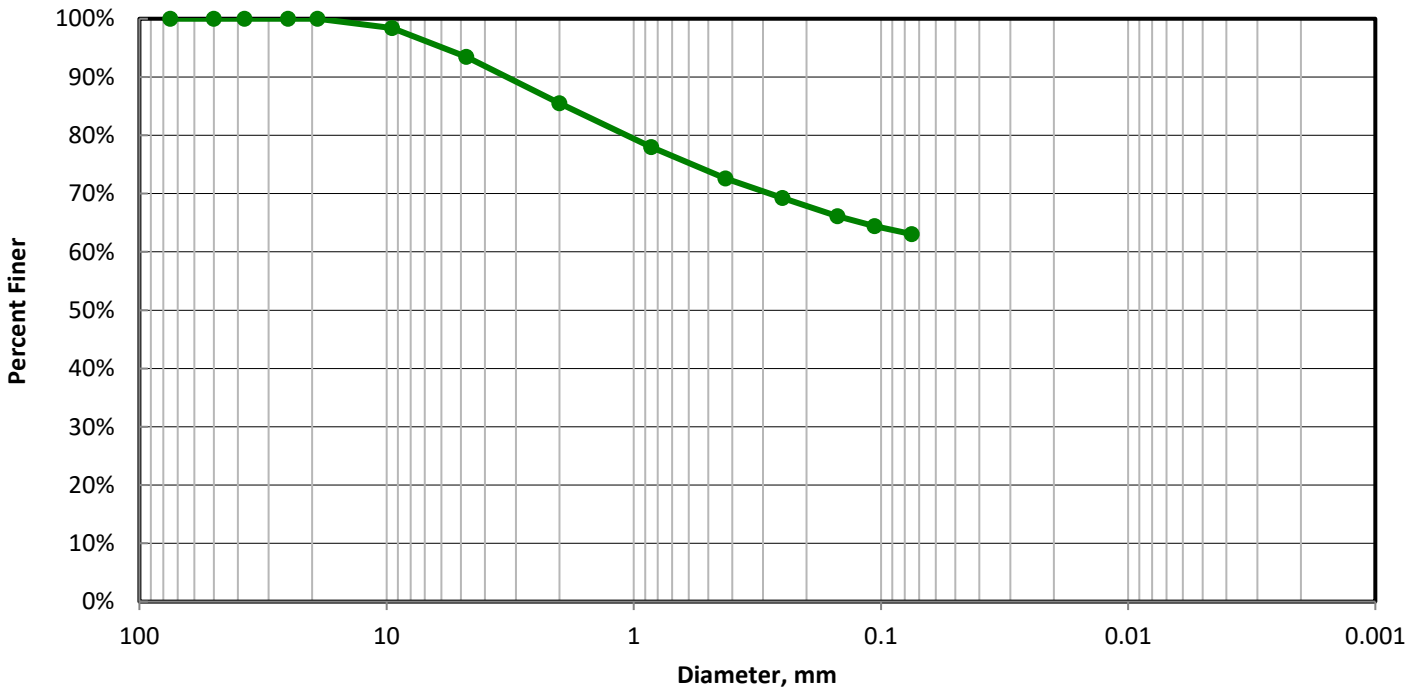
Corrected For 100% Passing a 3" Sieve

% Gravel (-3" & +#4)	**6.5**	Silt=NA Clay=NA	
Coarse=0; Fine=6.5		D60, mm	NA
% Sand (-#4 & +#200)	**30.4**	D30, mm	NA
Coarse=8; Medium=12.9; Fine=9.6		D10, mm	NA
% Fines (-#200)	**63.0**	Cc	NA
% Plus #200 (-3")	**37.0**	Cu	NA

USCS Description: SANDY LEAN CLAY

USCS Group Symbol	Atterberg Limits Group Symbol
CL	CL - LEAN CLAY

Auxiliary Information	Wt Ret, gm	% Retained	% Finer
12" Sieve - 300 mm	0	0.0	100.0
6" Sieve - 150 mm	0	0.0	100.0
3" Sieve - 75 mm	0	0.0	100.0



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LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS
ASTM D4318-17e1

Client	Hillis-Carnes Engineering	Boring	B-12
Client Project	U24177 Washington County Public Service Facility	Depth	7.0'-9.0'
Project No.	25-00782	Sample	ST-1
		Lab Sample	25-00782-01

Soil Description: DARK YELLOWISH BROWN LEAN CLAY
(-#40 Fraction)

AS-RECEIVED W.C.

Tare Number	227
Wt. Tare & WS, gm	400.63
Wt. Tare & DS, gm	371.22
Wt. Tare, gm	181.87
Water Content, %	15.5

SAMPLE SUMMARY

Liquid Limit (LL), %	**44**
Plastic Limit (PL), %	**19**
Plasticity Index (PI)	**25**
USCS Group Symbol (*-#40 Fraction*)	**CL**
USCS Group Name (*-#40 Fraction*)	**LEAN CLAY**
Sample Color:	**DARK YELLOWISH BROWN**

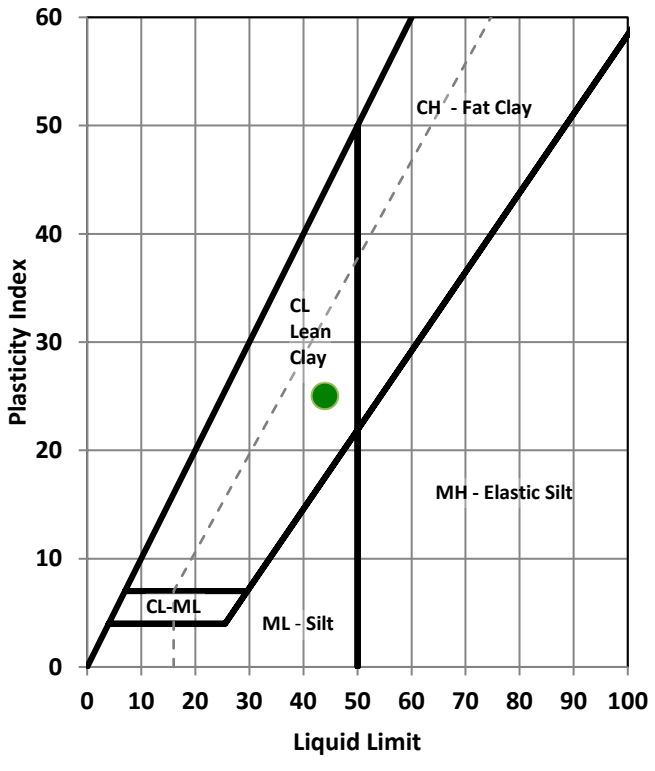
PLASTIC LIMIT

Points Run	3 Points		
Tare Number	304	337	334
Wt. Tare & WS, gm	17.41	17.36	17.33
Wt. Tare & DS, gm	16.45	16.39	16.39
Wt. Tare, gm	11.35	11.33	11.24
Water Content, %	18.8	19.2	18.3

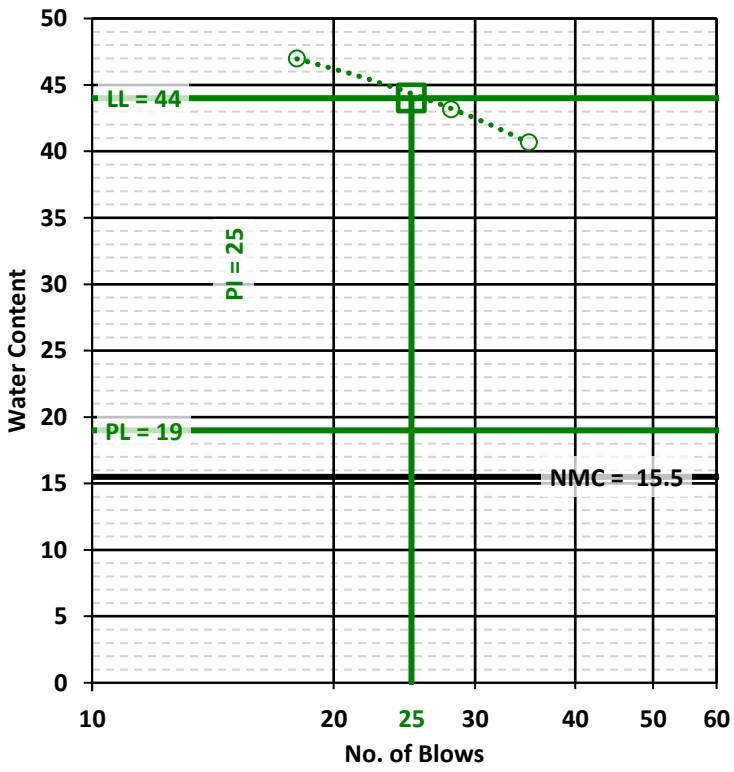
LIQUID LIMIT

	3 Points		
	417	703	338
	16.55	17.38	16.77
	14.68	15.52	15.09
	10.70	11.21	10.96
	47.0	43.2	40.7
# of Blows	18	28	35

PLASTICITY CHART



FLOW CURVE



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PARTICLE-SIZE DISTRIBUTION OF SOILS USING SIEVE ANALYSIS- ASTM D6913-17

Client	Hillis-Carnes Engineering	Boring	B-13
Client Project	U24177 Washington County Public Service Facility	Depth	4.5'-6.5'
Project No.	25-00782	Sample	ST-1
		Lab Sample	25-00782-02

Sample Color: **YELLOWISH BROWN**
USCS Group Name: **SANDY LEAN CLAY WITH GRAVEL**
USCS Group Symbol: **CL** USDA: **NA** AASHTO: **A-7-6 (17)** *Wet Prep: R74-16*[1]

MECHANICAL SIEVE

Total Sample	
Total Sample Wet Wt, gm (-3")	695
Sample Split on Sieve	No. 4
Coarse Washed Dry Sample, gm	93
Wet Wt Passing Split, gm	602
Dry Wt. Passing Split, gm	502
Total Sample Dry Wt, gm	595

Split Sample - Passing No. 4	
Tare No.	904
Tare + WS., gm	321.11
Tare + DS., gm	283.75
Tare, gm	97.3
Water Content of Split Sample	**20.0%**
Wt. of DS., gm	186.45
Wt. of +#200 Sample, gm	40.20

Sieve Size	Nominal Opening, mm	Dry Wt, gm	Split Normalized % Retained	Split Normalized % Finer	Project Specifications
3"	75	0	0.0%	100.0%	
2"	50	0	0.0%	100.0%	
1-1/2"	37.5	0	0.0%	100.0%	
1"	25	8.2	1.4%	98.6%	
3/4"	19	16.19	2.7%	95.9%	
3/8"	9.5	36.52	6.1%	89.8%	
No. 4	4.75	32.07	5.4%	84.4%	
No. 10	2	10.97	5.0%	79.4%	
No. 20	0.85	9.73	4.4%	75.0%	
No. 40	0.425	5.69	2.6%	72.4%	
No. 60	0.25	3.53	1.6%	70.8%	
No. 100	0.15	4.07	1.8%	69.0%	
No. 140	0.106	2.89	1.3%	67.7%	
No. 200	0.075	3.32	1.5%	66.2%	

USCS SOIL CLASSIFICATION

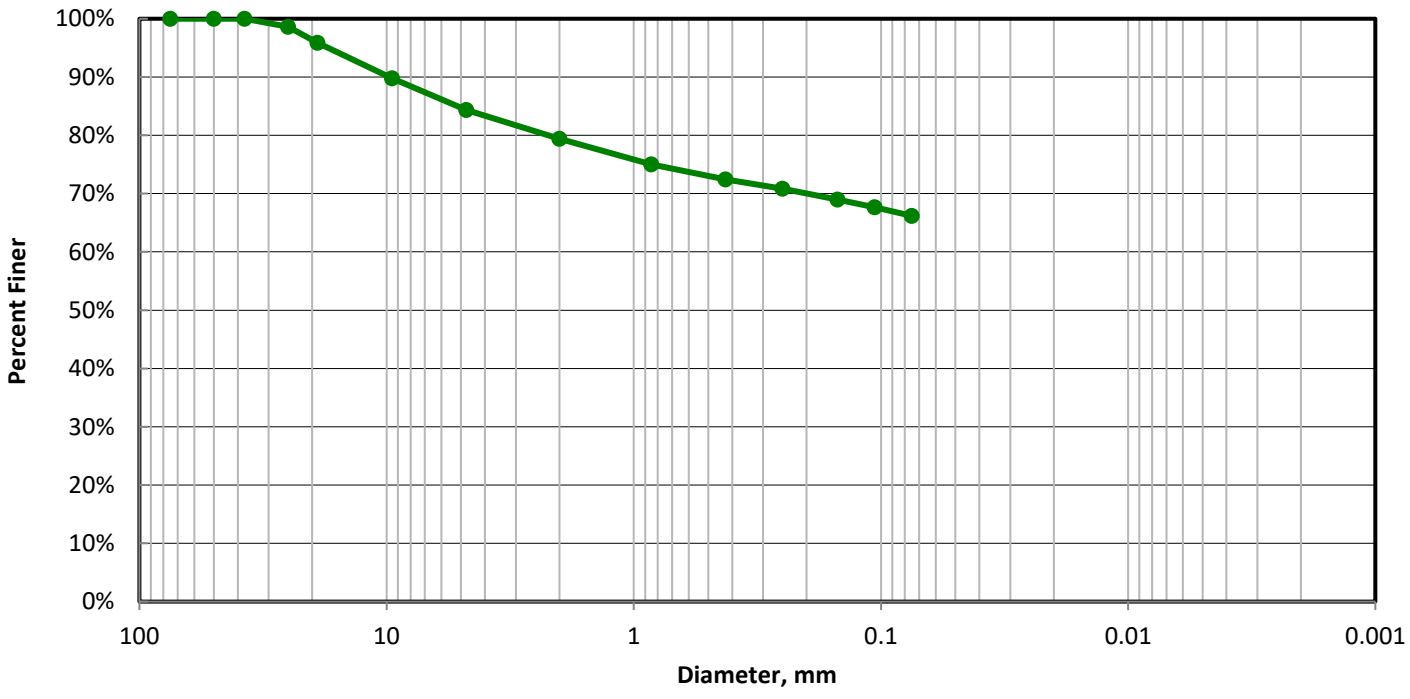
Corrected For 100% Passing a 3" Sieve

% Gravel (-3" & +#4)	**15.6**	Silt=NA Clay=NA	
Coarse=4.1; Fine=11.5		D60, mm	NA
% Sand (-#4 & +#200)	**18.2**	D30, mm	NA
Coarse=5; Medium=7; Fine=6.2		D10, mm	NA
% Fines (-#200)	**66.2**	Cc	NA
% Plus #200 (-3")	**33.8**	Cu	NA

USCS Description
SANDY LEAN CLAY WITH GRAVEL

USCS Group Symbol	Atterberg Limits Group Symbol
CL	CL - LEAN CLAY

Auxiliary Information	Wt Ret, gm	% Retained	% Finer
12" Sieve - 300 mm	0	0.0	100.0
6" Sieve - 150 mm	0	0.0	100.0
3" Sieve - 75 mm	0	0.0	100.0



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LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS
ASTM D4318-17e1

Client	Hillis-Carnes Engineering	Boring	B-13
Client Project	U24177 Washington County Public Service Facility	Depth	4.5'-6.5'
Project No.	25-00782	Sample	ST-1
		Lab Sample	25-00782-02

Soil Description: YELLOWISH BROWN LEAN CLAY
(-#40 Fraction)

AS-RECEIVED W.C.

Tare Number	904
Wt. Tare & WS, gm	321.11
Wt. Tare & DS, gm	283.75
Wt. Tare, gm	97.30
Water Content, %	20.0

SAMPLE SUMMARY

Liquid Limit (LL), %	**48**
Plastic Limit (PL), %	**19**
Plasticity Index (PI)	**29**
USCS Group Symbol (*-#40 Fraction*)	**CL**
USCS Group Name (*-#40 Fraction*)	**LEAN CLAY**
Sample Color:	**YELLOWISH BROWN**

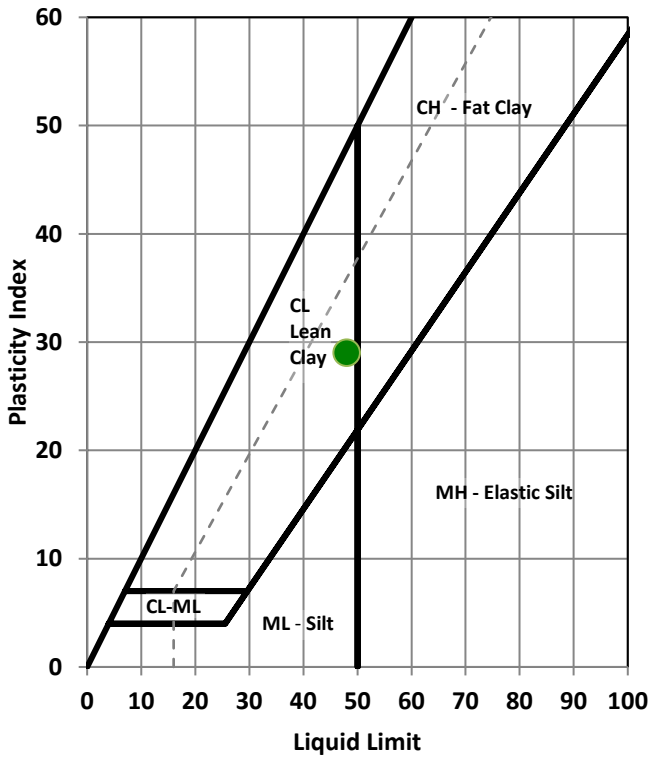
PLASTIC LIMIT

Points Run	3 Points		
Tare Number	707	450	409
Wt. Tare & WS, gm	18.50	16.85	16.72
Wt. Tare & DS, gm	17.51	15.92	15.76
Wt. Tare, gm	12.45	10.79	10.67
Water Content, %	19.6	18.1	18.9

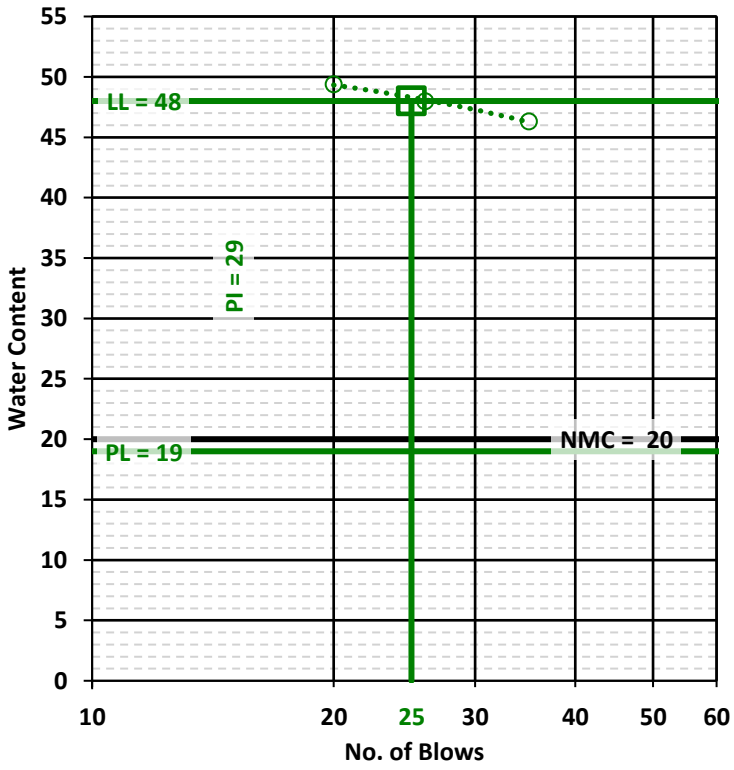
LIQUID LIMIT

	3 Points		
	462	411	471
	16.91	16.95	16.95
	14.89	14.92	15.01
	10.80	10.69	10.82
	49.4	48.0	46.3
# of Blows	20	26	35

PLASTICITY CHART



FLOW CURVE



Performed By: RH | Input Validation: MA | Reviewed By: BLS | Date Tested: 2/21/25

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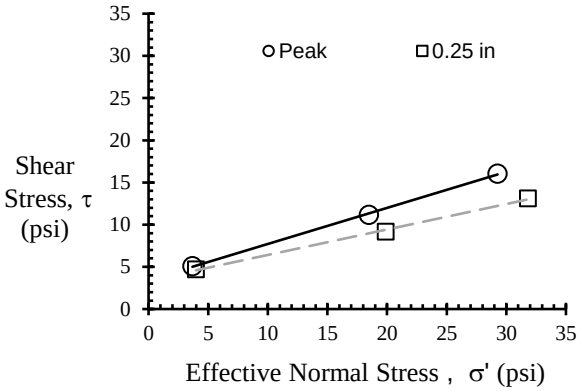
GEOTECHNICAL TESTING SERVICES
A TRI ENVIRONMENTAL COMPANY

Direct Shear Test Under Consolidated Drained Conditions (ASTM D3080)

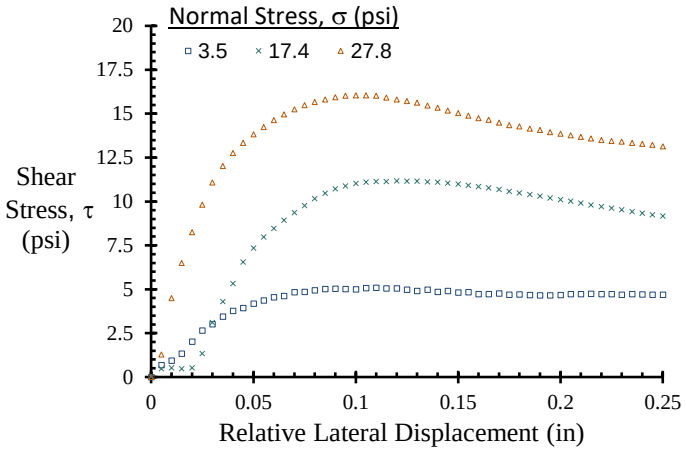
Client:	Hillis-Carnes Engineering	Boring	B-12
Client Project:	U24177 Washington County Public Service Facility	Depth	7.0' - 9.0'
Project No.	25-00782	Sample	ST-1
Visual Description:	DARK YELLOWISH BROWN SANDY LEAN CLAY	Lab No.	25-00782-01

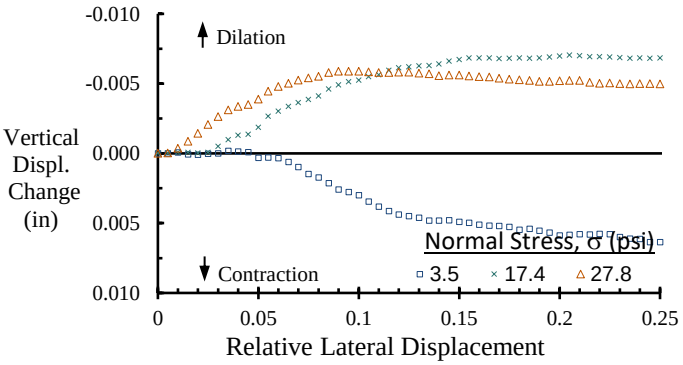
Strength Envelope Linear Regression		
Criterion	C' (psi)	ϕ' (deg)
Peak	3.4	23.1
0.25 in	3.4	16.8



Specimen Number		1	2	3
Initial Condition	Diameter (in)	2.50	2.50	2.50
	Height (in)	1.00	1.00	1.00
	Water Content (%)	17.3	17.3	17.3
	Dry Density (pcf)	107.2	105.5	109.2
Consol	Normal Stress (psi)	3.5	17.4	27.8
	Duration (min)	1000	1000	708
	Height (in)	1.0	1.0	1.0
Displacement rate (in/min)		1E-03		
Peak	Displacement, in	0.11	0.12	0.10
	Normal Stress (psi)	3.7	18.5	29.3
	Shear Stress (psi)	5.1	11.2	16.0
0.25 in	Normal Stress (psi)	4.0	19.9	31.8
	Shear Stress (psi)	4.7	9.2	13.1

Note: Area Correction Has Been Applied





Richard S. Lacey, P.E. 2/25/2025

Analysis & Quality Review/Date

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

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103 Coraopolis Road, Coraopolis, PA, 15108

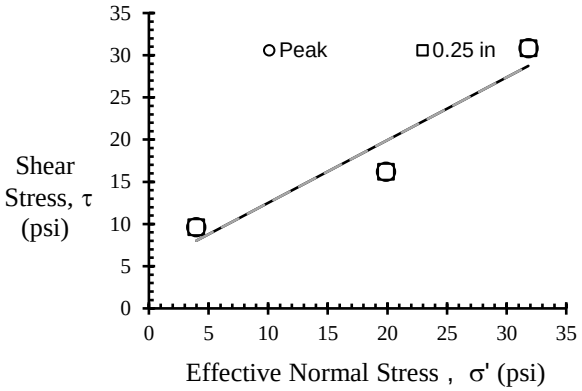
GEOTECHNICAL TESTING SERVICES
A TRI ENVIRONMENTAL COMPANY

Direct Shear Test Under Consolidated Drained Conditions (ASTM D3080)

Client: Hillis-Carnes Engineering
Client Project: U24177 Washington County Public Service Facility
Project No. 25-00782
Visual Description: YELLOWISH BROWN SANDY LEAN CLAY WITH GRAVEL

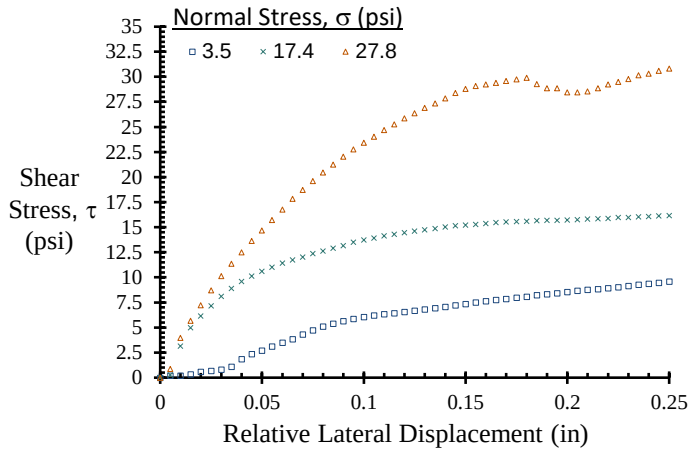
Boring B-13
Depth 4.5' - 6.5'
Sample ST-1
Lab No. 25-00782-02

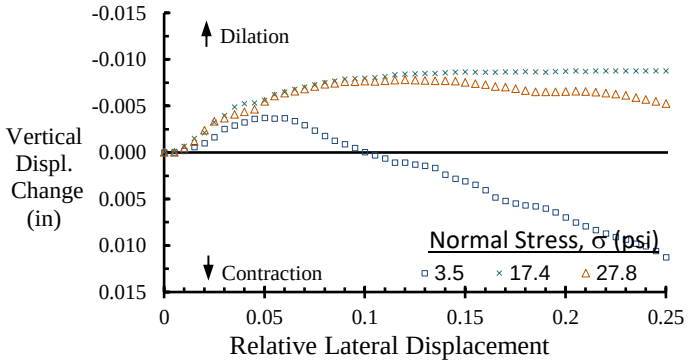
Strength Envelope Linear Regression		
Criterion	C' (psi)	ϕ' (deg)
Peak	5.1	36.6
0.25 in	5.1	36.6



Specimen Number		1	2	3
Initial Condition	Diameter (in)	2.50	2.50	2.50
	Height (in)	1.00	1.00	1.00
	Water Content (%)	21.0	21.0	21.0
	Dry Density (pcf)	99.4	101.7	105.2
Consol	Normal Stress (psi)	3.5	17.4	27.8
	Duration (min)	1000	708	708
	Height (in)	1.0	1.1	1.0
Displacement rate (in/min)		1E-03		
Peak	Displacement, in	0.25	0.25	0.25
	Normal Stress (psi)	4.0	19.9	31.8
	Shear Stress (psi)	9.6	16.2	30.8
0.25 in	Normal Stress (psi)	4.0	19.9	31.8
	Shear Stress (psi)	9.6	16.2	30.8

Note: Area Correction Has Been Applied





Richard S. Lacey, P.E. 2/25/2025
Analysis & Quality Review/Date

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

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103 Coraopolis Road, Coraopolis, PA, 15108

Unconfined Compressive Strength of Intact Rock Core Specimens

ASTM D7012-14e1 Method C / D4543-19

Client	Hillis-Carnes Engineering	**Boring**	B-3
Client Project	U24177 Washington County Public Service Facility	**Depth**	15.2' - 15.7'
Project Number	25-00782	**Sample**	RC2
		Lab ID Number	25-00782-03
Description	Light Grayish Brown Limestone		
As-Received Condition	Useable L/D > 2		
Sample Preparation	Diamond saw blade cut, surface ground flat		

ASTM D 4543; Section 4.2 & 5.6	
Length, in	4.52
Mid Height Diameter #1, in	1.995
Mid Height Diameter #2, in	1.995
Average Mid. Height Diameter, in.	2.00
Sample Area, in^2	3.13
L/D Ratio (2.0-2.5)	**2.27**

ASTM D 4543; Section 9.1.1 S1 Straightness of Specimen Length		
Maximum Gap, in	<0.02	*Tolerance (<0.02 in)*

ASTM D 4543; Section 9.2.1 FP-2 (Flatness and Parallelism)				
~Distance along Diameter	**Reading, 0.0001"**			
	End 1 D1	**End 1 D2**	**End 2 D1**	**End 2 D2**
-0.875	111	40	113	39
-0.75	91	31	91	31
-0.625	76	27	75	26
-0.5	58	20	56	21
-0.375	40	16	39	17
-0.25	28	11	28	12
-0.125	15	6	15	6
0	0	0	0	0
0.125	-14	-6	-14	-6
0.25	-26	-11	-25	-11
0.375	-39	-17	-38	-18
0.5	-54	-20	-53	-21
0.625	-76	-26	-76	-26
0.75	-90	-31	-90	-31
0.875	-111	-39	-113	-39
1	-123	-45	-124	-45
Flatness Pass/Fail	Pass	Pass	Pass	Pass
End Parallelism Angles				
Angular difference between End 1 and End 2 - D1			0.00	<0.25* Pass
Angular difference between End 1 and End 2 - D2			0.00	<0.25* Pass

ASTM D 4543; Section 9.3.2 P-2 (End Perpendicularity)		
	Top	**Bottom**
Maximum Gap, in	0.0015	0.0015
Angle, *	0.02	0.02
Angle Error (<0.25*)	<0.25* Pass	<0.25* Pass

Test Parameters	
Test Temperature	Room
Moisture Condition	As-Received
Sample Weight, gms	615.94
Sample Volume, cc	232
Wet Density, pcf	166
Time to Failure, min	12.00
Loading Rate, psi / sec	35
Load Application in Relation to Lithology:	Unable to Determine
Peak Load, lbs	**86,252**
Unconfined Compressive Strength, psi	**27,593**

Specimen Failure Photo

Performed By: ES Input Validation: ES Reviewed By: BS Date Tested 2/19/2025

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Unconfined Compressive Strength of Intact Rock Core Specimens

ASTM D7012-14e1 Method C / D4543-19

Client	Hillis-Carnes Engineering	**Boring**	B-6
Client Project	U24177 Washington County Public Service Facility	**Depth**	8.7' - 9.3'
Project Number	25-00782	**Sample**	RC1
		Lab ID Number	25-00782-04
Description	Light Grayish Brown Limestone		
As-Received Condition	Useable L/D > 2		
Sample Preparation	Diamond saw blade cut, surface ground flat		

ASTM D 4543; Section 4.2 & 5.6	
Length, in	4.52
Mid Height Diameter #1, in	1.995
Mid Height Diameter #2, in	2
Average Mid. Height Diameter, in.	2.00
Sample Area, in^2	3.13
L/D Ratio (2.0-2.5)	**2.26**

ASTM D 4543; Section 9.1.1 S1 Straightness of Specimen Length		
Maximum Gap, in	<0.02	*Tolerance (<0.02 in)*

Test Parameters	
Test Temperature	Room
Moisture Condition	As-Received
Sample Weight, gms	618.44
Sample Volume, cc	232
Wet Density, pcf	166
Time to Failure, min	14.30
Loading Rate, psi / sec	35
Load Application in Relation to Lithology:	Unable to Determine
Peak Load, lbs	**102,706**
Unconfined Compressive Strength, psi	**32,774**

ASTM D 4543; Section 9.2.1 FP-2 (Flatness and Parallelism)				
~Distance along Diameter	**Reading, 0.0001"**			
	End 1 D1	**End 1 D2**	**End 2 D1**	**End 2 D2**
-0.875	10	28	10	27
-0.75	7	23	8	23
-0.625	5	18	5	18
-0.5	2	15	3	15
-0.375	1	11	2	12
-0.25	1	7	0	7
-0.125	0	3	1	3
0	0	0	0	0
0.125	-1	-2	0	-3
0.25	-2	-6	0	-7
0.375	-1	-10	-2	-10
0.5	-3	-14	-3	-13
0.625	-4	-17	-4	-17
0.75	-6	-22	-7	-23
0.875	-9	-28	-9	-27
1	-12	-32	-12	-32
Flatness Pass/Fail	Pass	Pass	Pass	Pass
End Parallelism Angles				
Angular difference between End 1 and End 2 - D1			0.00	<0.25* Pass
Angular difference between End 1 and End 2 - D2			0.00	<0.25* Pass

Specimen Failure Photo

ASTM D 4543; Section 9.3.2 P-2 (End Perpendicularity)		
	Top	**Bottom**
Maximum Gap, in	0.0015	0.0015
Angle, *	0.02	0.02
Angle Error (<0.25*)	<0.25* Pass	<0.25* Pass

Performed By: ES Input Validation: ES Reviewed By: BS Date Tested 2/19/2025

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Unconfined Compressive Strength of Intact Rock Core Specimens

ASTM D7012-14e1 Method C / D4543-19

Client	Hillis-Carnes Engineering	**Boring**	B-7
Client Project	U24177 Washington County Public Service Facility	**Depth**	34.2' - 34.8'
Project Number	25-00782	**Sample**	RC1
		Lab ID Number	25-00782-05
Description	Light Grayish Brown Limestone		
As-Received Condition	Useable L/D > 2		
Sample Preparation	Diamond saw blade cut, surface ground flat		

ASTM D 4543; Section 4.2 & 5.6	
Length, in	4.494
Mid Height Diameter #1, in	2
Mid Height Diameter #2, in	2
Average Mid. Height Diameter, in.	2.00
Sample Area, in^2	3.14
L/D Ratio (2.0-2.5)	**2.25**

Test Parameters	
Test Temperature	Room
Moisture Condition	As-Received
Sample Weight, gms	605.14
Sample Volume, cc	231
Wet Density, pcf	163
Time to Failure, min	10.30
Loading Rate, psi / sec	35
Load Application in Relation to Lithology:	Unable to Determine
Peak Load, lbs	**76,126**
Unconfined Compressive Strength, psi	**24,232**

ASTM D 4543; Section 9.1.1 S1 Straightness of Specimen Length		
Maximum Gap, in	<0.02	*Tolerance (<0.02 in)*

ASTM D 4543; Section 9.2.1 FP-2 (Flatness and Parallelism)				
~Distance along Diameter	**Reading, 0.0001"**			
	End 1 D1	**End 1 D2**	**End 2 D1**	**End 2 D2**
-0.875	14	28	13	28
-0.75	12	23	11	23
-0.625	9	19	8	18
-0.5	5	15	6	14
-0.375	5	11	4	10
-0.25	3	7	3	7
-0.125	2	4	2	4
0	0	0	0	0
0.125	-2	-4	-1	-4
0.25	-3	-7	-3	-8
0.375	-5	-11	-4	-11
0.5	-6	-14	-5	-15
0.625	-8	-17	-8	-18
0.75	-12	-21	-12	-22
0.875	-14	-28	-13	-28
1	-17	-30	-15	-32
Flatness Pass/Fail	Pass	Pass	Pass	Pass
End Parallelism Angles				
Angular difference between End 1 and End 2 - D1			0.01	<0.25* Pass
Angular difference between End 1 and End 2 - D2			0.00	<0.25* Pass

Specimen Failure Photo

ASTM D 4543; Section 9.3.2 P-2 (End Perpendicularity)		
	Top	**Bottom**
Maximum Gap, in	0.002	0.0015
Angle, *	0.03	0.02
Angle Error (<0.25*)	<0.25* Pass	<0.25* Pass

Performed By: ES Input Validation: ES Reviewed By: BS Date Tested 2/24/2025

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Unconfined Compressive Strength of Intact Rock Core Specimens

ASTM D7012-14e1 Method C / D4543-19

Client	Hillis-Carnes Engineering	**Boring**	B-12
Client Project	U24177 Washington County Public Service Facility	**Depth**	23.0' - 23.5'
Project Number	25-00782	**Sample**	RC1
		Lab ID Number	25-00782-06
Description	Light Gray Limestone		
As-Received Condition	Useable L/D > 2		
Sample Preparation	Diamond saw blade cut, surface ground flat		

ASTM D 4543; Section 4.2 & 5.6	
Length, in	4.686
Mid Height Diameter #1, in	1.995
Mid Height Diameter #2, in	1.995
Average Mid. Height Diameter, in.	2.00
Sample Area, in^2	3.13
L/D Ratio (2.0-2.5)	**2.35**

Test Parameters	
Test Temperature	Room
Moisture Condition	As-Received
Sample Weight, gms	653.69
Sample Volume, cc	240
Wet Density, pcf	170
Time to Failure, min	1.25
Loading Rate, psi / sec	35
Load Application in Relation to Lithology:	Unable to Determine
Peak Load, lbs	**9,652**
Unconfined Compressive Strength, psi	**3,088**

ASTM D 4543; Section 9.1.1 S1 Straightness of Specimen Length		
Maximum Gap, in	<0.02	*Tolerance (<0.02 in)*

ASTM D 4543; Section 9.2.1 FP-2 (Flatness and Parallelism)

~Distance along Diameter	Reading, 0.0001"			
	End 1 D1	End 1 D2	End 2 D1	End 2 D2
-0.875	4	16	3	16
-0.75	3	13	3	13
-0.625	1	11	1	12
-0.5	0	9	0	9
-0.375	1	4	1	4
-0.25	0	1	0	1
-0.125	0	0	0	0
0	0	0	0	0
0.125	0	0	0	0
0.25	0	-2	0	-2
0.375	-1	-5	-1	-5
0.5	0	-9	0	-9
0.625	-1	-10	-2	-10
0.75	-3	-13	-2	-12
0.875	-4	-16	-3	-16
1	-5	-18	-5	-19
Flatness Pass/Fail	Pass	Pass	Pass	Pass

End Parallelism Angles		
Angular difference between End 1 and End 2 - D1	0.00	<0.25* Pass
Angular difference between End 1 and End 2 - D2	0.00	<0.25* Pass

Specimen Failure Photo

ASTM D 4543; Section 9.3.2 P-2 (End Perpendicularity)		
	Top	Bottom
Maximum Gap, in	0.0015	0.0015
Angle, *	0.02	0.02
Angle Error (<0.25*)	<0.25* Pass	<0.25* Pass

Performed By: ES Input Validation: ES Reviewed By: BS Date Tested 2/24/2025

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Unconfined Compressive Strength of Intact Rock Core Specimens

ASTM D7012-14e1 Method C / D4543-19

Client	Hillis-Carnes Engineering	**Boring**	B-13
Client Project	U24177 Washington County Public Service Facility	**Depth**	28.2' - 28.8'
Project Number	25-00782	**Sample**	RC4
		Lab ID Number	25-00782-07
Description	Light Gray Limestone		
As-Received Condition	Useable L/D > 2		
Sample Preparation	Diamond saw blade cut, surface ground flat		

ASTM D 4543; Section 4.2 & 5.6	
Length, in	4.466
Mid Height Diameter #1, in	1.997
Mid Height Diameter #2, in	1.995
Average Mid. Height Diameter, in.	2.00
Sample Area, in^2	3.13
L/D Ratio (2.0-2.5)	**2.24**

Test Parameters	
Test Temperature	Room
Moisture Condition	As-Received
Sample Weight, gms	613.46
Sample Volume, cc	229
Wet Density, pcf	167
Time to Failure, min	10.00
Loading Rate, psi / sec	35
Load Application in Relation to Lithology:	Unable to Determine
Peak Load, lbs	**78,192**
Unconfined Compressive Strength, psi	**24,989**

ASTM D 4543; Section 9.1.1 S1 Straightness of Specimen Length		
Maximum Gap, in	<0.02	*Tolerance (<0.02 in)*

ASTM D 4543; Section 9.2.1 FP-2 (Flatness and Parallelism)				
~Distance along Diameter	**Reading, 0.0001"**			
	End 1 D1	**End 1 D2**	**End 2 D1**	**End 2 D2**
-0.875	10	20	10	20
-0.75	9	17	10	17
-0.625	7	15	7	15
-0.5	4	12	4	11
-0.375	3	10	3	10
-0.25	3	7	2	6
-0.125	0	4	0	4
0	0	0	0	0
0.125	0	-4	0	-4
0.25	-2	-8	-2	-7
0.375	-3	-11	-3	-11
0.5	-5	-12	-5	-12
0.625	-8	-15	-8	-15
0.75	-10	-17	-10	-17
0.875	-11	-21	-10	-20
1	-13	-25	-12	-23
Flatness Pass/Fail	Pass	Pass	Pass	Pass
End Parallelism Angles				
Angular difference between End 1 and End 2 - D1			0.00	<0.25* Pass
Angular difference between End 1 and End 2 - D2			0.00	<0.25* Pass

Specimen Failure Photo

ASTM D 4543; Section 9.3.2 P-2 (End Perpendicularity)		
	Top	**Bottom**
Maximum Gap, in	0.0015	0.0015
Angle, *	0.02	0.02
Angle Error (<0.25*)	<0.25* Pass	<0.25* Pass

Performed By: ES Input Validation: ES Reviewed By: BS Date Tested 2/24/2025

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Hillis-Carnes Engineering
534 Alpha Drive
Pittsburgh, PA 15238
Attn: Mr. Steve Simonette
412-206-0195
412-522-7830
ssimonette@hcea.com

Received; 2/13/2025
Sampled by: client

RESULTS

PO **POPIT120784** **U22177 Washington County Public Service Facility**

			DRY			
			Total	Forms of Sulfur		
wt. lbs	CTL	SAMPLE	Sulfur	Pyritic	Organic	Sulfate
received	ID	ID	(wt%)	(wt%)	(wt%)	(wt%)
0.7	346421	B-3, S-5 (12'-13.5') 2/13/2025	0.093	----	----	----
0.6	346422	B-5, S-4 (9'-10.5') 2/13/2025	0.349	0.01	0.33	0.01
0.5	346423	B-7, S-8 (21'-22.5') 2/13/2025	0.472	0.24	0.14	0.10
0.6	346424	B-8, S-3 (6'-7.5') 2/13/2025	0.784	0.27	0.49	0.02
0.6	346425	B-8, S-4 (9'-10.5') 2/13/2025	0.095	----	----	----
8.0	346426	B-10, S-1 (0.5'-2') 2/13/2025	0.151	0.05	0.02	0.08
0.6	346427	B-11, S-1 (0.5'-2') 2/13/2025	0.482	0.00	0.08	0.40
0.6	346428	B-11, S-2 (3'-4.5') 2/13/2025	1.890	1.40	0.31	0.19
5.0	346429	B-12, S-7 (18'-19.5') 2/13/2025	0.191	0.01	0.15	0.03
0.6	346430	B-13, RC3 (23'-23.2') 2/13/2025	0.226	0.03	0.17	0.03

Dry Basis
Total Sulfur ASTM D 4239/ISO 15178
Forms of Sulfur ASTM D 8214
PA DEP Overburden sampling & testing

Approved By: *P.Conti Otroba,Chemist*
Chemist

HILLIS-CARNES
ENGINEERING ASSOCIATES

Infiltration Test Report

Project Name	Washington County Public Service Facility
Project Number	U24177
Test ID	**INF-1**
Date Performed	2/11/2025
Test Method	Cased borehole (Maryland Stormwater Design Manual Appendix D.1)
Performed By	S. Simonette
Test Depth	2 feet bsg
Estimated Ground Elevation	1096 feet
Drawing Used	

Interval	Time	Cumulative Time	Change	INF Rate	Comments
1	30	30	0.00 0.25	0.50	Casing installed 02/10/25, 24-hour pre-soak
2	30	60	0.00 0.25	0.50	
3	30	90	0.00 0.25	0.50	
4	30	120	0.00 0.25	0.50	
5	30	150	0.00 0.25	0.50	Test Terminated

HILLIS-CARNES
ENGINEERING ASSOCIATES

Infiltration Test Report

Project Name	Washington County Public Service Facility
Project Number	U24177
Test ID	**INF-2**
Date Performed	1/31/2025
Test Method	Cased borehole (Maryland Stormwater Design Manual Appendix D.1)
Performed By	S. Simonette
Test Depth	4 feet bsg
Estimated Ground Elevation	1098 feet
Drawing Used	

Interval	Time	Cumulative Time	Change	INF Rate	Comments
1	30	30	0.00 0.25	0.50	Casing installed 01/30/25, 24-hour pre-soak
2	30	60	0.00 0.25	0.50	
3	30	90	0.00 0.25	0.50	
4	30	120	0.00 0.25	0.50	
5	30	150	0.00 0.25	0.50	Test Terminated

HILLIS-CARNES
ENGINEERING ASSOCIATES

Infiltration Test Report

Project Name	Washington County Public Service Facility
Project Number	U24177
Test ID	**INF-3**
Date Performed	2/4/2025
Test Method	Cased borehole (Maryland Stormwater Design Manual Appendix D.1)
Performed By	S. Simonette
Test Depth	4 feet bsg
Estimated Ground Elevation	1098 feet
Drawing Used	

Interval	Time	Cumulative Time	Change	INF Rate	Comments
1	30	30	0.00 0.25	0.50	Casing installed 02/03/25, 24-hour pre-soak
2	30	60	0.00 0.25	0.50	
3	30	90	0.00 0.25	0.50	
4	30	120	0.00 0.25	0.50	
5	30	150	0.00 0.25	0.50	Test Terminated

HILLIS-CARNES
ENGINEERING ASSOCIATES

Infiltration Test Report

Project Name	Washington County Public Service Facility
Project Number	U24177
Test ID	**INF-4**
Date Performed	2/1/2025
Test Method	Cased borehole (Maryland Stormwater Design Manual Appendix D.1)
Performed By	S. Simonette
Test Depth	1 foot bsg
Estimated Ground Elevation	1098 feet
Drawing Used	

Interval	Time	Cumulative Time	Change	INF Rate	Comments
1	30	30	0.00 1.81	3.62	Casing installed 01/31/25, 24-hour pre-soak
2	30	60	0.00 1.81	3.63	
3	30	90	0.00 1.81	3.63	
4	30	120	0.00 1.81	3.63	
5	30	150	0.00 1.81	3.63	Test Terminated