GEOTECHNICAL EXPLORATION REPORT

PUBLIC WORKS BUILDING
LES GETZ MEMORIAL PARK
SWISSVALE BOROUGH, ALLEGHENY COUNTY, PENNSYLVANIA

PS&R Project No. 20-250

Prepared at the request of:

Swissvale Borough
C/o
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MAY 14, 2020

PS&R

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Geotechnical Exploration Report
Public Works Building
Memorial Field
Swissvale Borough, Allegheny County, Pennsylvania

1.0 General Summary

This report presents the results of Pennsylvania Soil and Rock, Inc.'s (PS&R) geotechnical investigation for the proposed Public Works Facility to be located on the south western side of Les Grez Memorial Park in Swissvale Borough, Allegheny County, Pennsylvania. The objectives of this investigation were to determine the nature, character and thickness of the soil, decomposed rock and/or rock within the project area; to evaluate the stability of the materials for re-use as fill. The information was evaluated and used to develop geotechnical recommendations for foundation design with respect to the encountered subsurface conditions. A total of 3 building sites identified as Site A, Site B and Site C were evaluated as part of this Geotechnical Exploration Report.

The scope of the investigation included a site reconnaissance, a test-drilling program to evaluate the existing subsurface conditions, laboratory testing, analysis of the data collected and preparation of this Geotechnical Investigation Report. The report was completed in general accordance with our proposal dated April 23, 2020.

A total of six (6) Standard Penetration Test (SPT) borings were completed to characterize the existing subsurface conditions at three distinct potential building areas (Site A, B-1 and B-2, Site B, B-3 and B-4 and Site C, B-5 and B-6) across the proposed project areas.

There was no topsoil noted at the surface at the boring locations. The subsurface profile across the property generally consisted of fill, colluvium, residual soils, decomposed rock and bedrock. Fill was encountered in each of the borings. Residual soils and/or decomposed rock were noted below the fill. The fill generally consisted of varying amounts of clay, silt, rock fragments, brick, slag and cinders with a highly variable relative consistency and moisture content. The colluvium soils generally consisted of red clay, with trace rock fragments. The residual soils generally consisted of red or brown clay and silty clay. The decomposed rock and bedrock consisted of shale, claystone and sandstone.

Groundwater was present in three of the test borings, B-1, B-2 and B-6 after completion of drilling. Long term water levels were not obtained due to the limited time the boreholes were open. Based on the groundwater levels at several boring locations, it should be anticipated that springs, seeps and surface water could be encountered during the completion of earthwork operations and could also be encountered during foundation construction. In addition, there is a potential for seeps and springs to form/develop during and after the completion of the building construction. All seeps and springs that develop during and after the completion of building construction should be addressed immediately upon observation to maintain the long-term stability of the site.

The overburden materials (both soil and decomposed rock) encountered at the test locations are not suitable for re-use as engineered fill without significant drying and removal of unsuitable debris. Therefore where fill is required for over-excavations and backfills in the building footprint, it is anticipated that a suitable source of imported fill will be needed.

Although similar conditions were encountered at all of the boring locations, consideration should be given to constructing the building at the location where Borings B-3 and B-4 were drilled at site B. Building site B is located furthest away from the existing fill slope, no fill was encountered in Boring B-3 and the boreholes did not fill with groundwater in the short time they were open.

Due to presence of variable consistency fill in the building footprint (regardless of the building site chosen), the entire structure will need to have foundations that are extended to bedrock to eliminate the potential for differential settlement. As an alternative it may be possible to undercut the footprint of the foundations and backfill with suitable fill if a source of fill can be located. If the over-excavation option is chosen, the building can be constructed on shallow foundations designed for 2,000 psf bearing. In addition due to the variability of the fill throughout the building footprint regardless of how the foundations are constructed the upper 3

feet of soils below proposed subgrade will need to be over-excavated and re-worked to create an engineered fill mat to support the floor slab.

2.0 Site Location and Project Description

The Swissvale Public Works Building will be situated at the south eastern limit of the Les Getz memorial Park located within the USGS Pittsburgh East Quadrangle in Allegheny County, PA. The Park is located on the south side of Church Street as depicted on Figure 1, *Site Location Map*. The site is currently developed as a Park and it is our understanding that the Park was originally a valley and a significant amount of fill was placed in the 1950's to fill in the valley and create the park. Based on Lidar Mapping and Google Earth imagery the elevation in the area where the building is being proposed is at approximate Elevation 830 feet.

A public works building consisting of a pole barn garage / warehouse structure, with masonry lower walls approximately 3-4 feet in height and wood framing above is being proposed for the site. Three separate building locations are currently being considered at the site and were the focus of the study.

The preceding discussion represents our understanding of the proposed project and is an important part of our engineering interpretation. If this understanding is not correct or if project conditions change, we should be given the opportunity to review our recommendations.

3.0 Site Soils & Geology

Soils. The USDA Websoil Survey as shown in Figure 2*, Site Soils Map* indicates the site soils mapped across the property include:

- UCB – Urban Land - Culleoka Complex, gently sloping
- UCE – Urban Land - Culleoka Complex, steep

Urban lands are not rated for site limitations since the land was modified by past grading activity. Limitations identified by our investigation can be mitigated by properly implementing the design developed from the geotechnical investigation.

Geology. The site lies within the Pittsburgh Low Plateau section of the Appalachian Plateaus Physiographic Province. The area is characterized by hilly topography which has been developed by stream incision into relatively flat-lying rock.

According to Geologic Map 42, "Greater Pittsburgh Region Geologic Map" (Wagner, Et. al. Commonwealth of Pennsylvania, 1975), and the Mineral Resource Report 89 "Coal Resources of Allegheny County, PA" (Dodge, 1985) the site is located on the right flank of the Amity Antcline. local dip of the rock strata at the site is southeast at about 50 feet per mile or 0.5

feet per 100 feet. The near surface rock at the site is Lower Permian/Upper Pennsylvanian Aged rock of the lower portion of the Upper Conemaugh Group; Cassleman Formation. The interval exposed at the site includes the strata approximately 50 feet above the Ames limestone. Typically, this stratum consists of cyclic sequences of shale and limestone, with minor claystone and coal seams. The rock of the Conemaugh Group are the most landslide prone of the region. Ancient landslides are especially common in this stratigraphic sequence which can be extremely unstable when disturbed by construction activity.

Mining. According to Mineral Resource Report 89 "Coal Resources of Allegheny County, PA" (Dodge 1985), the Pittsburgh Coal occurs at an elevation above the site, at approximate Elevation 1120 ft. Based on the site elevation of approximately 830 ft, the Pittsburgh coal is approximately 280 ft above the site. No other significant coal seams are mapped to be deep mined below the site or outcropped within the site elevations. The deep mined areas and the structure contours for the Pittsburgh Coal seam are depicted on Figure 3, *Mineral Resources Map.*

Landslide Hazards. A review of open file map 79-1314 (D-1), "Landslide and Related Features of the Pittsburgh East, PA Quadrangle," (Pomeroy, 1979) indicates that old landslides, and landslide prone soils are present at the site. It should be noted that the soils as mapped may have been altered when fill was placed to develop the park. The relevant portion of the Landslides and Related Features Map is included as Figure 4 *Landslide Hazard Map*.

4.0 Subsurface Exploration

A total of six Standard Penetration Test (SPT) borings were drilled and sampled by Test Boring Services, Inc. to obtain the data necessary to characterize the subsurface conditions across the site. Two borings were drilled at each proposed building location as depicted on drawing GE500, *Plan and Location of Borings.*

Standard Penetration Tests (SPTs) were conducted using a CME-55 track-mounted drill rig in conjunction with soil sampling at 3-foot vertical intervals. The SPTs were performed in accordance with ASTM D-1586 using a 2-inch outside diameter, 18-inch long sampler driven with a 140-pound hammer free falling 30 inches. The number of blows for each 6-inch increment of penetration or partial penetration was recorded. The test borings were extended to depths of 12.1 feet below existing grade at boring B-3 to 21.3 feet below grade at boring B-2. Each boring was terminated on or in bedrock. Bedrock is generally defined at the depth where less than 6 inches of penetration is achieved for 50 blows of a 140 lb sampling hammer dropping 30 inches. Each borehole was backfilled with soil and rock cuttings upon completion.

A representative of PS&R monitored the drilling on a full-time basis and classified the samples obtained. In addition to SPT sampling, a bulk sample of the overburden soils at boring B-5 was collected for laboratory testing.

5.0 Drilling Results

The subsurface profile across the property generally includes, overburden soils (existing fill, colluvium and residual soils), decomposed rock and bedrock. No topsoil was encountered at the surface at the test boring locations due to previous grading and disturbance.

Fill was present in each of the borings except boring B-3 and ranged in thickness from 9.0 feet at Borings B-4, B-5 and B-6 to 12.3 feet at Boring B-1. The composition and consistency of the fill was generally variable. The fill was highly variable with varying amounts of clay, silt, rock fragments, brick, slag and cinders. The granular fill density generally ranges from loose to medium dense and the cohesive fill ranges from soft to very stiff. The Pocket Penetrometer readings in the fill ranged from 0.25 TSF to 2.0 TSF. The in-situ moisture content of the fill ranges from 5.6% to 35.4%. It appears that fill was placed in the past to develop a level area for the ball field and park.

Colluvium, or soils carried to their current location by the effects of gravity (i.e. old landslide material), was encountered below the fill at boring B-6. The colluvium extended from 9.0 ft – 12.0 ft below the current existing grade. The colluvium consisted of very stiff red clay with randomly oriented rock fragments. The in-situ moisture content of the colluvium was found to be moist at 20.7%.

Residual soils, which are defined as soils that are weathered from the underlying parent bedrock, were encountered at borings B-2, B-3, B-4, and B-5. The residual soils generally consisted of red or brown clay, silty clay. The clayey soils are generally stiff to very stiff and the highly decomposed rock is generally medium dense. The Pocket Penetrometer readings in the fill ranged from 1.0 TSF to 2.5 TSF. The in-situ moisture content of the residual soils varied from 17.0 to 24.4% with most moistures averaging around the upper teens.

The decomposed rock encountered at the test locations consists of claystone, sandstone, shale. Top of bedrock was encountered at the test boring locations ranging from 9.8 feet (B-3) to 15.7 feet (B-5) below the existing ground surface. The bedrock at the test locations was similar in composition to the decomposed rock and included shale, claystone and sandstone. .

A summary of the drilling results is included as Table 1 along with the test boring logs in Appendix A.

Groundwater. Water level measurements were made at the test boring locations at the times indicated on the field classification sheets for the borings and under the conditions indicated herein. Groundwater was present in three of the test borings, B-1, B-2 and B-6 after drilling. Long term water levels were not obtained due to the limited time the boreholes were open. Due to the encountered groundwater, it should be anticipated that seeps and springs could be

encountered during construction and will need to be temporary and permanently managed during earthwork operations. Means of collecting and managing seeps and springs are discussed in the *Conclusions & Recommendations* section of this report. It should also be noted that groundwater levels might fluctuate due to variations in rainfall, temperature, site grading and other factors not evident at the times these measurements were made. In addition, there is a potential for seeps and springs to form/develop during and after the completion of the development construction. Seeps and springs can negatively impact cut and fill slopes and result in slope instability. All seeps and springs that develop during and after the completion of development construction should be addressed immediately upon observation to help maintain the long-term stability of the slopes.

6.0 Laboratory Test Results

Twenty five (25) jar samples obtained during the field sampling work were tested for their in-situ moisture content. The jar samples were tested for their in-situ moisture content to further evaluate the consistency of the subsurface materials. The results of the moisture content tests are included on the boring logs.

One sample of the overburden soils from boring B-5 was tested for its Liquid and Plastic Limits in accordance with ASTM D-4318 and for its Standard Proctor moisture-density relationship per ASTM D698. The sample of the overburden soil from B-5 was found to classify as Lean Clay (CL), which concurs with the visual classification on the boring log.

The Standard Proctor was conducted if on site soils are to be placed as fill. The overburden soils for boring B-5 were found to have a maximum dry density of 114.4 pcf at an optimum water content of 12.7%. The as received water content was found to be 21.6% indicating that a significant amount of drying would be required to use the on site soils as fill.

7.0 Conclusions and Recommendations

Seismicity. Structural calculations which consider seismic effects should assume a Site Class D per the 2015 International Building Code (IBC), Section 1613 for the overburden soils and underlying bedrock encountered on the site. Considering this site classification and the location of the site, we recommend that an S_{DS} value of 0.095 and an S_{DI} value of 0.071 be used for seismic analyses. Tables 1613.3.5. (1) and (2) of the 2015 IBC suggests that the facility is best classified as Occupancy Category II. With this understanding, and in conjunction with the recommended S_{DS} and S_{DI} values, it appears that the project will fall under Seismic Design Category (SDC) B.

Mining. As previously indicated, the Pittsburgh Coal occurs at an elevation above the site. The next mineable coal is the Upper Freeport coal which is not shown to be deep mined at this time. Therefore, it is our professional opinion that deep mining of coal is not an issue at this site.

Landslide Hazards. A review of open file map 79-1314 (D-1), "Landslide and Related Features of the Pittsburgh East, PA Quadrangle," (Pomeroy, 1979) indicates that old landslides, and landslide prone soils are present at the site. It should be noted that the soils as mapped may have been altered when fill was placed to develop the park. Although a grading plan has not been provided, it is not anticipated that significant earthwork will be performed. We recommend that grading into slopes is minimized, and any retaining walls that are proposed are properly engineered and designed to consider on site soils.

Existing Fill. At each of the building areas (Site 1, B-1 and B-2, Site 2, B-3 and B-4 and Site 3, B-5 and B-6) existing uncontrolled fill was encountered. The fill encountered at each of the boring locations except boring B-3 and is approximately 9 to 12 feet in thickness. The results of the SPT tests conducted during drilling indicate that the fill in this area was placed without compactive effort and is saturated in some areas.

Consolidation of fine grained soil (clay) is a time dependent process. That is, once a new load is applied to the soil, settlement may continue for an extended time (months or years). Although the fill has been in place for over 50 years and settlement related to the fill itself is likely complete, the resulting weight of the new building although lightly loaded would induce additional settlement of the fill. While settlement of either a predominantly clayey or granular (sand and gravel) can readily be estimated, it is difficult to accurately predicted settle of a mixture of the two particularly with varying moisture contents, such as the soils present across the site. Based on anticipated foundation loads, the building cannot be founded on conventional shallow footings without experiencing settlement of the foundation. Therefore, we recommend that the building be founded on deep foundation system that bypasses the soil and rests on the bedrock regardless of which building site is selected.

Deep Foundations. Regardless of the location chosen PS&R recommends that the building be supported on drilled pier foundation (caisson) extended into competent bedrock. The caissons should be designed to resist compression associated with the dead and live design loads and lateral loading primarily associated with wind forces or live loads on the bridge. Recommended design parameters for end-bearing, lateral earth resistance and skin friction are as follows:

Depth from Ground Surface (Feet)	Design End-Bearing Pressure (tsf)	Design Lateral Earth Pressure (tsf)	Design Skin Friction Pressure (tsf) (Side Shear)
0 - 15	NEGLECT	NEGLECT	NEGLECT
15+	8.0	5.0	1.0

It is anticipated that the drilled pier (caisson) foundations will be on the order of 15-20 feet deep. Although depending on the size of the building the bedrock of the west side of the building may be encountered at a deeper depth due since a valley was filled to level the site and

the original valley dipped to the west from the east. The piers should be socketed a minimum of 1 pier diameter into the underlying bedrock. Installation of temporary casing may be required to maintain an open hole. The base of the caissons should be thoroughly cleaned of loose cuttings and the bearing strata verified by a geologist/engineer prior to placement of reinforcing steel or concrete. Ground water must be pumped or bailed from the caisson prior to placing any concrete. Concrete placement should occur immediately following completion of drilling of each caisson, as ground water has the potential to further deteriorate the claystone.

Foundation excavations should be monitored by a soils technician under the supervision of the geotechnical engineer to verify that an adequate and uniform bearing material is encountered across the structure areas and that proper transitions are created. Concrete for foundations should be placed as soon as possible after excavation and reinforcing steel placement. All foundation excavations should be free of loose, soft, wet, frozen, carbonaceous, or organic material at the time of concrete placement.

Shallow Foundation Option. As an alternative to installing deep foundations it may be possible to over-excavate the foundation bearing areas and placing compacted fill. In order to accomplish this the building foundation should be over-excavated to the residual soil/decomposed rock layer below. It is anticipated that the over-excavation could extend up to 12 feet in depth western limit of the proposed building sites. The over-excavation should extend a minimum 3 feet outside the foundation in all directions. Backfill the undercuts using suitable on-site or imported fill materials placed as outlined below in the *General Fill Placement* section below. Provided that a qualified soils technician be on site to test fill during placement, the structure may then be constructed on shallow foundations designed for 2,000PSF bearing.

Floor Slab Support. In order to support the floor slab and minimize the potential for settlement below the floor slab we recommend re-working the upper level fill below the building. Reworking the upper level fill would be achieved by undercutting the entire building footprint to a depth of 3 feet below floor subgrade elevation. PS&R recommends that once the upper 3 feet of fill is removed that the base of the over-excavation be proof rolled with a minimum 20 ton loaded triaxle truck under the observation of the geotechnical engineer or their representative. Any areas found to be unstable, that cannot be stabilized in-place, should be removed and replaced with suitable fill materials. If general instability is noted that cannot be stabilized in-place, a layer of filter fabric and a layer of biaxel grid (Tensar BX1200) or equivalent with 18 inches of 2A Limestone will be required. Once the base is stabilized the undercut should be backfilled using suitable on-site or imported fill materials placed as outlined below in the *General Fill Placement* section below.

General Fill Placement. Consideration will have to be given to utilizing imported fill in lieu of the on-site materials. ***The existing fill encountered at the test borings will not be suitable for reuse as engineered fill unless significant moisture conditioning (drying) is performed.***

Consideration will have to be given to utilizing imported fill in lieu of the on-site materials. Suitable soils for the fill should be organic and debris free soil with the following Unified Soil Classification Symbols (USCS): CL, SP, SW, SC, GP, or GW. Soil with the following USCS symbols are considered unsuitable: SM, ML, OL, CH, MH, OH, or PT. All efforts should be made to reduce any rock particles to a manageable size (i.e. maximum 6 inch nominal diameter). Smaller rock fragments and soils must be worked into any openings between the rock pieces after they are placed. Even with great care in the placement of fill containing rock, it must be noted that uniform compaction is often difficult to achieve and test, and may result in future settlement.

All cohesive fill materials placed as general fill to construct the site should be placed in uniform horizontal layers. Lift thickness should be adjusted based on the size of the compaction equipment. In general, all **cohesive fill materials** should be placed in maximum 8-inch thick loose lifts and compacted with a **sheepsfoot or segmented wheel roller**. For smaller, vibratory padfoot rollers, the maximum lift thickness may need to be reduced. All cohesive fill should be compacted until the in-place density is equal to or greater than 100 percent of the maximum standard Proctor dry density as determined by ASTM D698 methods. All fill materials should be moisture conditioned to within 3% percent of the optimum moisture content at the time of placement. The moisture content of the fill materials should be maintained as deemed necessary to aid in attaining the required compaction and to maintain overall stability (minimal pumping, yielding and/or rutting).

Predominately granular fill material and/or subbase materials should be placed in layers not exceeding 12 inches in loose thickness. Each lift of **granular fill** should be compacted with a **vibratory roller** until the in-place density of the material is equal to or greater than 100 percent of the maximum dry density as determined by ASTM D698 (Standard Proctor) methods. Where representative density test cannot be obtained, each lift should be compacted to a visual, non-deflect and stable condition.

Groundwater. Groundwater level measurements were taken in each of the test borings upon completion of drilling. The measurements are recorded on the field classification sheets in Appendix A. Groundwater appears to be a significant issue with respect to the proposed for development of the site.

If seepage is encountered in the excavation we recommended that a perimeter drain should be installed to intercept the seepage and extended to outlet or directed into the storm sewer. The drain should maintain positive flow and consist of 4 inch perforated HDPE pipe surrounded with AASHTO #57, and wrapped with a nonwoven filter fabric and contain a minimum of 12 inches of clean aggregate.

Building Sites. Three building sites were evaluated as part of this study. At each of the building site fill was encountered in one or more of the borings. At the building site where Borings B-3

and B-4 were drilled no fill was present at the east side of the building site (Boring B-3). No water was present in the borings at this site at the completion of drilling while significant groundwater water was encountered at the building site with Borings B-1 and B-2 and the site with B-5 and B-6. Additionally, since landslide related features were mapped in the general area, we recommend against locating the building close to the slope building site with Borings B-1 and B-2. Considering these factors, we recommend that consideration be given to locating the building at the proposed site where Borings B-3 and B-4 are located. We have summarized the results of the test borings at each building location site in the following table.

Summary of Building Sites

Site	Borings	Existing Fill Thickness	Ground Water Encountered	Slope Concern	Foundation Type	Floor Slab	Remarks
A	B-1 B-2	12 feet	YES	Yes	Deep Foundations, or (potential over-excavation)	Over-excavation of upper 3 feet	Slope concern and ground water
B	B-3 B-4	9 feet (B-4 only)	No	No	Deep Foundations, or (potential over-excavation)	Over-excavation of upper 3 feet	Appears to be most feasible site
C	B-5 B-6	9 feet	Yes	No	Deep Foundations, or (potential over-excavation)	Over-excavation of upper 3 feet	Groundwater

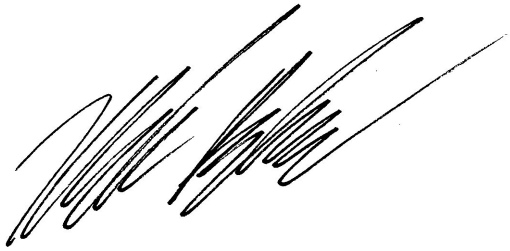
9.0 Closure & Design Review

This report has been prepared to aid Swissvale Borough in the design and construction of the proposed new public works building. Its scope is limited to the specific project and location described herein. Our services were provided in general accordance with the standards for such professional services which prevailed among other qualified practitioners within the project area practicing under similar circumstances on projects of comparable scope, size, and complexity during the term of our agreement. Plan and specification review and monitoring and testing during construction are an extension of these professional services although they may not have been specifically addressed by the original agreement and are subject to the same standard of care. *These extended services should be provided by PS&R to maintain continuity of the original intent of the recommendations and to reduce the possibility of conflicting interpretations or misinterpretations of the data presented in this report.* PS&R accepts no responsibility for uses

or interpretations of the data by the client, contractors, or other design professionals for any purpose whatsoever except as expressly described in this report or unless otherwise stated in writing, and then only for the stated purpose.

If you have any questions, or need any additional information regarding this report, please feel free to contact me at (412) 372-4000.

Respectfully Submitted,
Pennsylvania Soil and Rock, Inc.



Mark Brashear, P.E.
Project Engineer

Pennsylvania Soil and Rock, Inc.

FIGURES & DRAWINGS

Figure 1 – Site Location Map

Figure 2 – Site Soil Map

Figure 3 – Mineral Resources Map

Figure 4 – Landslide Hazard Map

Drawing GE500 – Plan and Location of Borings

APPENDICES

-Appendix A-

Table 1 – Summary of Drilling Data

Boring Log Descriptive Terminology

Test Boring Logs

-Appendix B-

Laboratory Test Results

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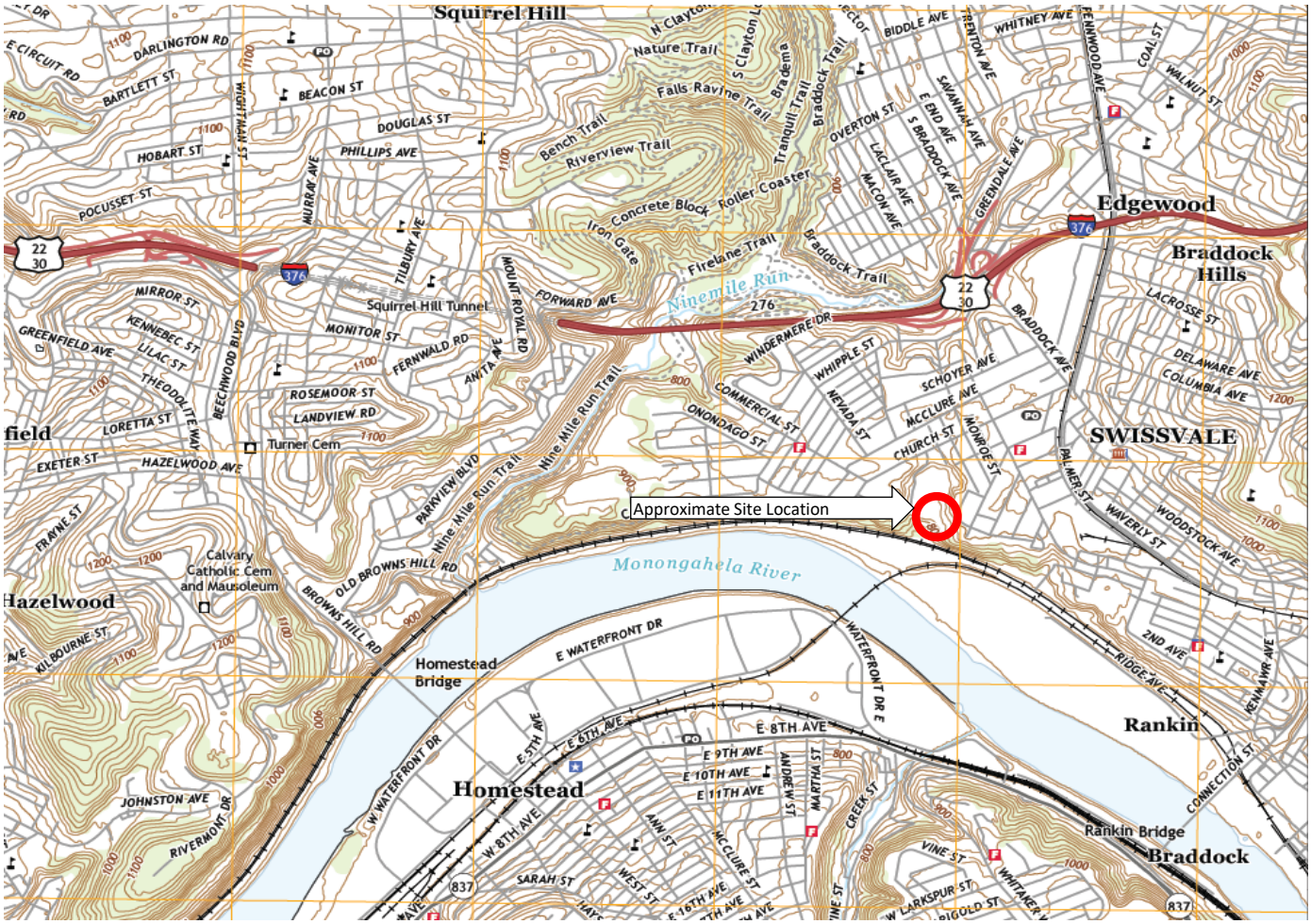

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Reference:
USGS Pittsburgh East
Quadrangle Map (Not to Scale)

FIGURE 1

Site Location Map

Public Works Building
Swissvale Borough, Allegheny County, Pennsylvania

PS&R Project No. 20-250

Mapped Site Soils:

UCB - Urban Land - Culleoka Complex, Gently Sloping

UCE - Urban Land - Culleoka Complex, steep

NORTH

Reference:
USDA WebSoil Survey.

FIGURE 2

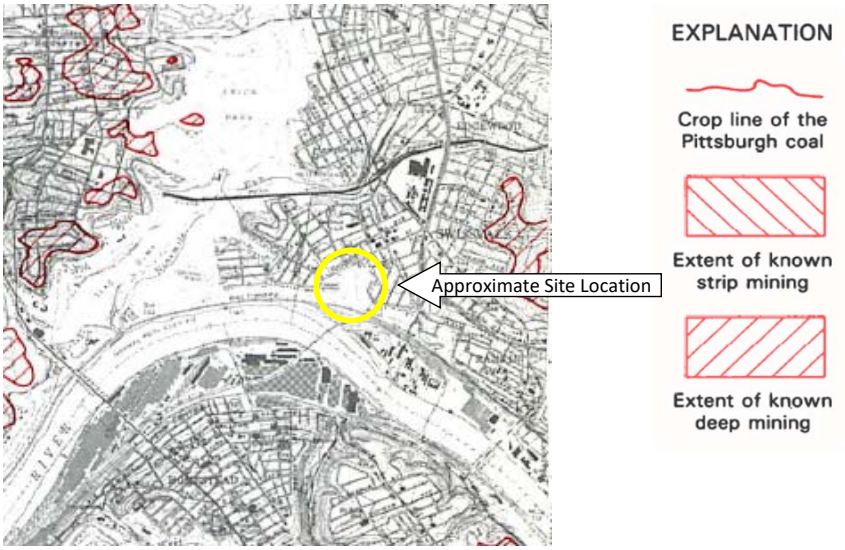
Site Soil Map

Public Works Building
Swissvale Borough, Allegheny County, Pennsylvania

PS&R Project No. 20-250

DRAWN	CHKD.	APPROVED	DATE	DWG. NO.
M.R.B.	M.R.B.	M.R.B.	4/30/2020	20-250-A2

PS&R



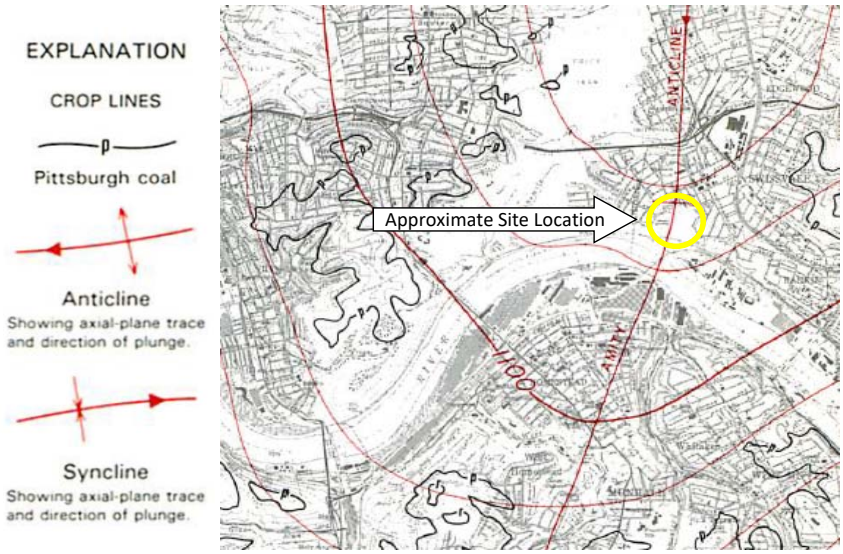


FIGURE 3

Mineral Resources Map

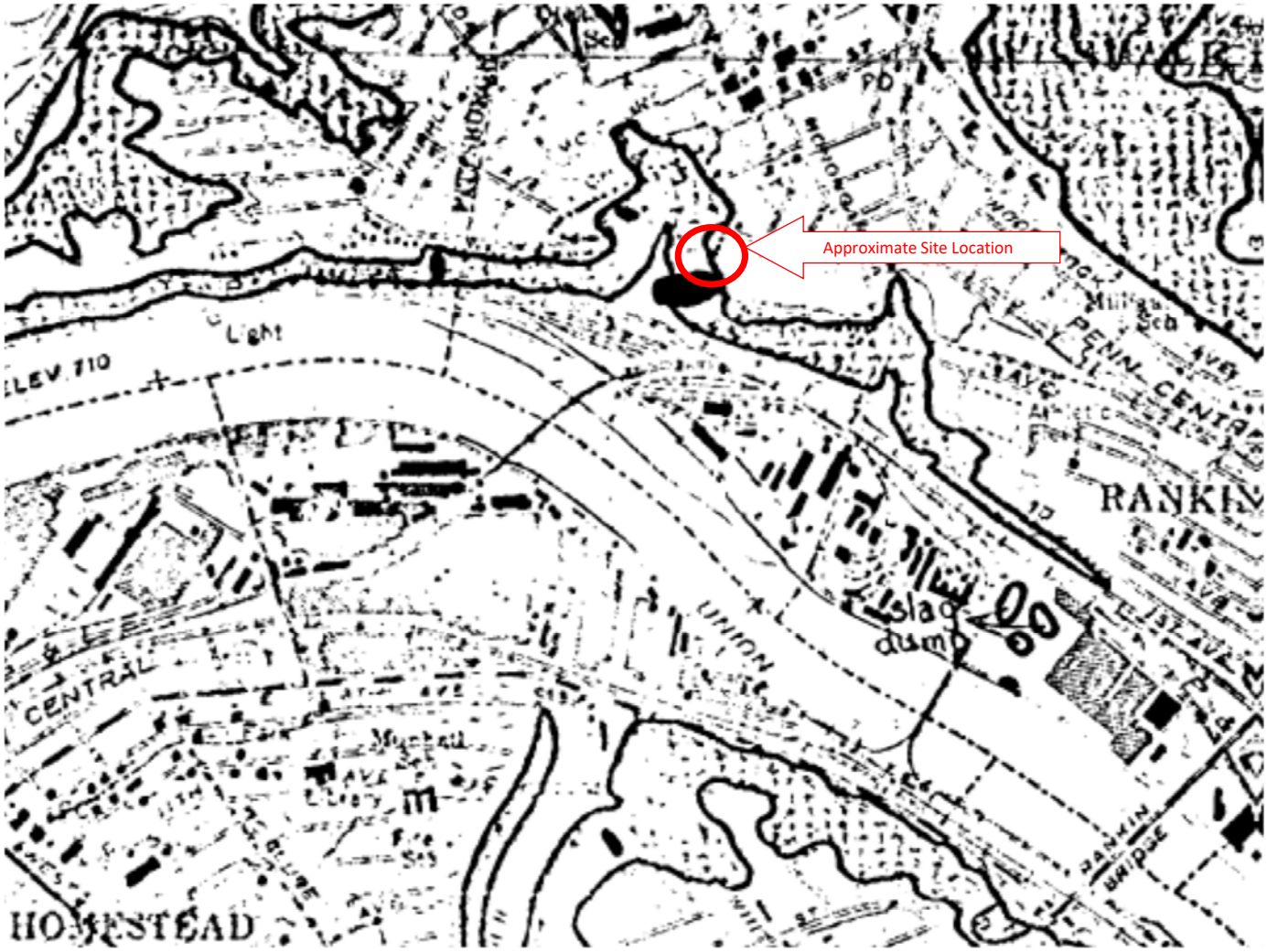
New Public Works Building, Swissvale Borough, Allegheny County, Pennsylvania

PS&R Project No. 20-250

Reference:
Mineral Resources Report 89
Coal Resources of Allegheny County, PA
Pittsburgh East Quadrangle, Dodge 1985

DRAWN	M.R.B.	CHKD.	M.R.B.	APPROVED	M.R.B.	DATE	3/17/2020	DWG. NO.	20-250-A3

PS&R



SOIL AND ROCK SUSCEPTIBLE TO LANDSLIDING
Soil and rock similar to that involved in landslides elsewhere in map area; primarily areas underlain by claystone, mudstone and shale associated with other rock types. Rock weathers rapidly on exposure forming clayey soil highly susceptible to sliding. Includes coves (U-shaped, shallow valleys) containing thick layers of clayey soil that are very susceptible to sliding where excavation breaks continuity of slope and where overloaded by artificial fill.

ACTIVE OR RECENTLY ACTIVE LANDSLIDE
Complex landslide composed of earthflow, debris slide, earth and rock slump. Identified from historical records, and from scars, debris and other field evidence. Ground extremely unstable; sliding accelerated by excavation, loading and changes in drainage conditions. May include areas with several active slides too small to be shown separately. Questioned where doubtful.

NORTH

Reference:
Landslides and Related Features of the Pittsburgh East, PA Quadrangle (Davies and Pomeroy, 1978)
USGS Open File Map 79-1314 (D-1)

FIGURE 4

Landslide Hazards Map

New Public Works Building, Swissvale Borough
Allegheny County, Pennsylvania

PS&R Project No. 20-250

PS&R DRAWN M.R.B. CHKD. M.R.B. APPROVED M.R.B. DATE 4/30/2020 DWG. NO. 20-250-A4

Path & Filename=X:\AutoCAD E Drive\2020\20-250 Swissvale Public Works\GE500 - Plan and Location of Borings.dwg
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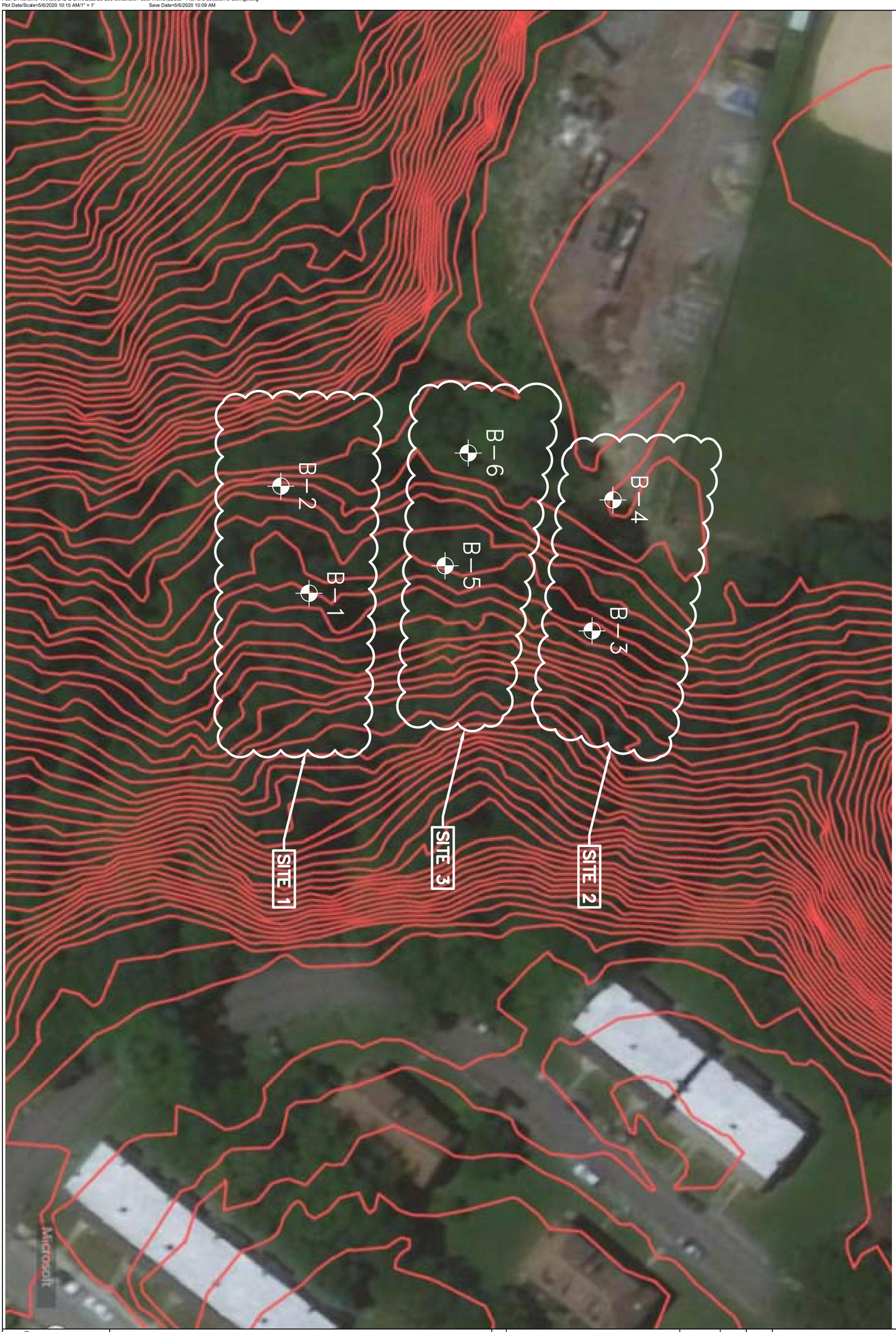

PLAN AND LOCATION OF BORINGS

Project Number: 20-250
Drawing Scale: NOT TO SCALE
Date Issued: 05/06/20
Drawn By: EAH
Checked By: MRB
Project Manager: MRB

GE500

PUBLIC WORKS BUILDING

SWISSVALE BOROUGH
ALLEGHENY COUNTY, PENNSYLVANIA

PREPARED FOR:

SWISSVALE BOROUGH

c/o GLENN ENGINEERING
14920 ROUTE 30, NORTH HUNTINGDON, PENNSYLVANIA 15642

NO.	REVISION DESCRIPTION	DATE	DRWN	CHKD

PS&R
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Pennsylvania Soil and Rock, Inc.

APPENDIX A

Table 1 – Summary of Drilling Data

Boring Log Descriptive Terminology

Test Boring Logs

Pennsylvania Soil and Rock Incorporated

Table 1
Summary of Drilling Data - Swissvale Public Works Building
Swissvale Borough, Allegheny County, Pennsylvania

Boring No.	Approximate Surface Elevation (ft)	Total Drill Depth (ft)	**Topsoil** Thickness (ft)*	**Overburden Soils** Thickness (ft)	**Overburden Soils** Avg. Soil N-value	**Decomposed Rock** Top of Decomp Rock Elevation	**Decomposed Rock** Thickness (ft)	**Bedrock** Top of Bedrock Elevation	**Bedrock** Depth to Bedrock (ft)	**Bedrock** RQD Range %	Water Levels (ft) 0-hr / 24-hr	**Notes**
B-1	830	12.3	0.0	12.3	16	817.7	0.0	817.7	12.3		1.6 / BF	12.3 ft fill
B-2	830	21.3	0.0	15.0	13	815.0	0.2	814.8	15.2		1.3 / BF	12.0 ft fill
B-3	830	12.1	0.0	9.0	13	821.0	3.1	817.9	12.1		Dry / Dry	
B-4	830	15.2	0.0	12.0	8.0	818.0	0.4	817.6	12.4		Dry / Dry	9.0 ft fill
B-5	830	15.7	0.0	12.0	18	818.0	3.7	814.3	15.7		Dry / Dry	9.0 ft fill
B-6	830	13.3	0.0	12.0	11	818.0	1.3	816.7	13.3		2.3 / BF	9.0 ft fill

* Little to no topsoil due to previous grading activity

PS&R Boring Log Descriptive Terminology

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Key to Soil Symbols and Terms

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	Well-graded gravels, gravel sand mixtures, little or no fines.
				GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	Silty gravels, gravel-sand-silt mixtures.
				GC	Clayey gravels, gravel-sand-clay mixtures.
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	Well-graded sands, gravelly sands, little or no fines.
				SP	Poorly graded sands, gravelly sands, little or no fines.
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	Silty sands, sand-silt mixtures.
				SC	Clayey sands, sand-clay mixures.
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
				OL	Organic silts and organic silty clays of low plasticity.
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
				CH	Inorganic clays of high plasticity, fat clays.
				OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS				PT	Peat and other highly organic soils.

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

Order of Descriptors

- Group Name
- Consistency or Relative Density
- Moisture Condition
- Color
- Particle size descriptor(s) (coarse grained soils only)
- Angularity of coarse grained soils
- Other relevant notes

Criteria For Descriptors

Consistency of Fine Grained Soils

Consistency	N-Value (uncorrected)
Very Soft	< 2
Soft	2 - 4
Medium Stiff	5 - 8
Stiff	9 - 15
Very Stiff	16 - 30
Hard	> 30

Apparent Density of Coarse Grained Soils

Relative Density	N-Value (uncorrected)
Very Loose	< 4
Loose	4 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

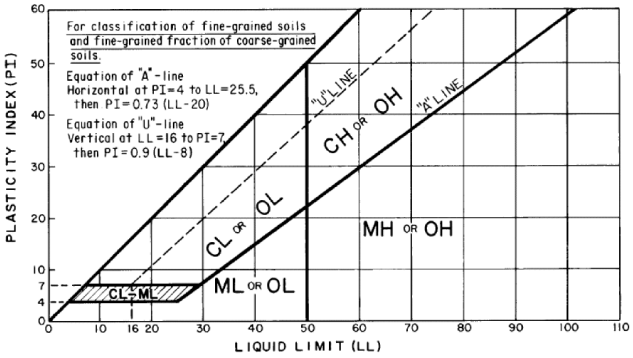
Moisture Condition

Dry -Absence of moisture, dusty, dry to the touch.
Moist -Damp, but no visible water.
Wet -Visible free water.

Definition of Particle Size Ranges

Soil Component	Size Range
Boulder	> 12 in (300 mm)
Cobble	3 in (75 mm) - 12 in (300 mm)
Gravel	No. 4 Sieve (4.75 mm) to 3 in (75 mm)
Sand	No. 200 (0.075 mm) to No. 4 Sieves (4.75 mm)
Silt	< No. 200 Sieve (0.075 mm)*
Clay	< No. 200 Sieve (0.075 mm)*

*Use Atterberg limits and chart below to differentiate between silt and clay.



Notes

SPT (Standard Penetration Test-ASTM D1586):
The number of blows of a 140 lb (63.6 kg) hammer falling 2.5 ft (750 mm) used to drive a 2 in (50 mm) O.D. Split Spoon sampler for a total of 1.5 ft (0.45 m) of penetration.
Written as follows:
first 0.5 ft (0.15 m) - second 0.5 ft (0.15 m) - third 0.5 ft (0.15 m) (ex: 1-3-9)
Note: if the number of blows exceeds 50 before 0.5 ft (0.15 m) of penetration is achieved, the actual penetration follows the number of blows in parentheses (ex: 12-24-50 (0.09 m), 34-50 (0.4 ft), or 100 (0.3 ft)).
WR denotes a zero blow count with the weight of the rods only.
WH denotes a zero blow count with the weight of the rods plus the weight of the hammer.

Soil Classifications are Based on the Unified Soil Classification System, ASTM D2487 and D2488. Also included are the AASHTO group classifications (M145). Descriptions are based on visual observation, except where they have been modified to reflect results of laboratory tests as deemed appropriate.

Angularity of Coarse-Grained Particles

Angular -Particles have sharp edges and relative plane sides with unpolished surfaces.
Subangular -Particles are similar to angular description, but have rounded edges.
Subrounded-Particles have nearly plane sides, but have no edges.
Rounded -Particles have smoothly curved sides and well-rounded corners and edges.

Example soil description: Sandy FAT CLAY, soft, wet, brown.

PS&R Boring Log Descriptive Terminology

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Key to Rock Symbols and Terms

Rock Type	Symbol	Rock Type	Symbol	Rock Type	Symbol
Argillite		Dolomite		Quartzite	
Basalt		Gneiss		Rhyolite	
Bedrock (other)		Granitic		Sandstone	
Breccia		Limestone		Schist	
Claystone		Siltstone		Shale	
		Conglomerate			

Order of Descriptors

- Rock Type
- Color
- Grain size (if applicable)
- Stratification/Foliation (as applicable)
- Weathering
- Field Hardness
- Other relevant notes

Criteria For Descriptors

Grain Size

Description	Characteristic
Coarse Grained	Individual grains can be easily distinguished by eye
Fine Grained	Individual grains can be distinguished with difficulty

Stratum Thickness

Thickly Bedded	3-10 ft (1-3 m)
Medium Bedded	1-3 ft (300 mm - 1 m)
Thinly Bedded	2-12 in (50-300 mm)
Very Thinly Bedded	< 2 in (50 mm)

Weathering

Highly Weathered	More than half of the rock is decomposed; rock is weakened so that a minimum 2 inch (50mm) diameter sample can be broken readily by hand across rock fabric
Moderately Weathered	Rock is discolored and noticeably weakened, but less than half is decomposed; a minimum 2 inch (50mm) diameter sample cannot be broken readily by hand across rock fabric
Slightly Weathered	Rock is slightly discolored, but not noticeably lower in strength than fresh rock

Example Rock Log

SANDSTONE, gray, fine grained, thickly bedded, slightly weathered, hard field hardness.

Rock Field Hardness

Very Soft	Can be carved with knife. Can be excavated readily with point of rock hammer. Can be scratched readily by fingernail.
Soft	Can be grooved or gouged readily by knife or point of rock hammer. Can be excavated in fragments from chips to several inches in size by moderate blows of the point of a rock hammer.
Medium Soft	Can be grooved or gouged 0.05 in (2 mm) deep by firm pressure of knife or rock hammer point. Can be excavated in small chips to pieces about 1 in (25 mm) maximum size by hard blows of the point of a rock hammer.
Moderately hard	Can be scratched with knife or pick. Gouges or grooves to 0.25 in (6 mm) can be excavated by hard blow of rock hammer. Hand specimen can be detached by moderate blows.
Hard	Can be scratched with knife or pick only with difficulty. Hard hammer blows required to detach hand specimen.
Very Hard	Cannot be scratched with knife or sharp rock hammer point. Breaking of hand specimens requires several hard blows of a rock hammer.

Notes:

Qu = Unconfined Compressive Strength obtained from laboratory testing at the given depth.

Miscellaneous Soil/Rock Symbols and Terms

- Concrete
- Asphalt
- Water
- Boulders and Cobbles
- Coal
- Fill
- Millings
- Topsoil

Explanation of Text Fields in Boring Logs:

Material Description: Lithologic Description of soil or rock encountered.
Remarks: Comments on drilling, including method, bit type, and problems encountered.
Notes: Legal Description, explanation of survey method used, and horizontal coordinates.

General Notes

- Descriptions on these boring logs apply only at the specific boring, and at the time the time the borings were made. These logs are not warranted to be representative of subsurface conditions at other locations or times.
- Water level observations apply only at the specific boring, and at the time the borings were made. Due to the variability of groundwater measurements given the type of drilling used, and the stratification of the soil in the boring, these logs are not warranted to be representative of groundwater conditions at other locations or times.
- Other terms may be used as descriptors, as defined by the profession.

-Soil and Rock descriptions are based on visual observation, except where they have been modified to reflect results of laboratory tests as deemed appropriate.

Operation Types: Auger, Casing Advancer, Core Barrel, Drive Casing

Sample Types: Split Spoon, Shelby, Bulk Sample, Grab Sample, Cone Penetrometer, Vane Shear, Special Samplers, Testpit

Client Name: **Swissvale Borough**			Project No: **20-250**
Project Name: **Public Works Building**			Boring No: **B-1**
Location: **Swissvale Borough, Allegheny County, Pennsylvania**			Elevation:
Date/Time Started: **04/28/20 - 09:25**	Date/Time Complete: **04/28/20 - 10:13**	GWL: **1.6'** at **0** hrs **Backfilled**	
Geologist/Engr. **D. Sanger**	Driller/Method: **TBS, Inc. / ****		Page: **1** of **1**

DEPTH (ft)	Sample Type & No.	Sample Blows Per 6" / Rock Rec. (Ft) / (Ft)	RQD (%)/REC (ft)	Visual Classification (Soil/Rock Description)	USCS Symbol of Rock Brokenness	Remarks
0.0						
1.5	S-1	1-2-3	1.0	gray-brown silty CLAY, black CINDERS, gray ROCK and CONCRETE fragments, loose, slightly moist		FILL
3.0						
4.5	S-2	30-15-8	1.2	brown CLAY and ROCK fragments, stiff, slightly moist, M.C. = 16.2%	cl-gc	- cobble from 3.0' to 3.4' *1.0 TSF - sampler wet
6.0						
7.5	S-3	24-7-12	1.0	brown-red CLAY and ROCK fragments, medium stiff, dry		*0.5 TSF - sampler wet
9.0						
10.5	S-4	14-11-18	1.0	brown-red silty CLAY and ROCK fragments, medium stiff, moist, M.C. = 18.1%		*0.5 TSF - sampler wet
12.0						
12.3	S-5	50/0.3	0.2	12.3' light gray CONCRETE, very dense, dry	gm	- sampler wet
						Top of Rock @ 12.3'
15.0						
15.4	S-6	50/0.4	0.4	brown decomposed SHALE, very dense, dry		- sampler wet
18.0						
18.1	S-7	50/0.1	0.1	18.1' gray decomposed sandy SHALE, very dense, dry		
				Boring Terminated @ 18.1'		

Notes: **Drilled using a Diedrich D-50 track mounted drill rig. Boring advanced using 3¼" hollow stem augers, SPT with automatic hammer.

*Pocket penetrometer reading

- M.C. = Moisture Content

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TEST BORING LOG

Client Name: **Swissvale Borough**			Project No: **20-250**
Project Name: **Public Works Building**			Boring No: **B-2**
Location: **Swissvale Borough, Allegheny County, Pennsylvania**			Elevation:
Date/Time Started: **04/28/20 - 08:30**	Date/Time Complete: **04/28/20 - 09:15**	GWL: **1.3'** at **0** hrs **Backfilled**	
Geologist/Engr. **D. Sanger**	Driller/Method: **TBS, Inc. / ****		Page: **1** of **1**

DEPTH (ft)	Sample Type & No.	Sample Blows Per 6" / Rock Rec. (Ft) / (Ft)	RQD (%)/REC (ft)	Visual Classification (Soil/Rock Description)	USCS Symbol of Rock Brokenness	Remarks
0.0						
1.5	S-1	5-3-2	0.7	brown and gray SILT, SAND, ROCK fragments, red BRICK, gray CONCRETE, loose, slightly moist	gm	FILL
3.0						
4.5	S-2	5-9-9	0.4	- medium dense, moist to wet, M.C. = 16.5%	ml	- sampler wet
6.0						
7.5	S-3	2-2-4	1.5	gray-brown SILT, few rock fragments, soft, moist		*0.25 TSF
9.0						
10.5	S-4	5-6-6	1.5	brown silty CLAY, few rock fragments, stiff to very stiff, dry, M.C. = 17.2%	cl	*2.0 TSF
12.0				12.0'		
13.5	S-5	13-9-17	1.5	brown CLAY, some brown-gray rock fragments, stiff, dry		RESIDUAL SOIL *1.0 TSF
15.0				15.0'		
15.2	S-6	50/0.2	0.1	15.2' brown-gray weathered SANDSTONE, very dense, dry	gm	DEC. ROCK
18.0				brown-gray SHALE, very dense, dry		Top of Rock @ 15.2'
18.8	S-7	34-50/0.3	0.8	- M.C. = 5.7%		
21.0						
21.3	S-8	50/0.3	0.3	21.3' - M.C. = 8.0%		
				Boring Terminated @ 21.3'		

Notes: ****Drilled using a Diedrich D-50 track mounted drill rig. Boring advanced using 3¼" hollow stem augers, SPT with automatic hammer.**

***Pocket penetrometer reading**

- M.C. = Moisture Content

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TEST BORING LOG

Client Name: **Swissvale Borough**			Project No: **20-250**
Project Name: **Public Works Building**			Boring No: **B-3**
Location: **Swissvale Borough, Allegheny County, Pennsylvania**			Elevation:
Date/Time Started: **04/28/20 - 10:28**	Date/Time Complete: **04/28/20 - 11:02**	GWL: **Dry** at **0** hrs **Backfilled**	
Geologist/Engr. **D. Sanger**	Driller/Method: **TBS, Inc. / ****		Page: **1** of **1**

DEPTH (ft)	Sample Type & No.	Sample Blows Per 6" / Rock Rec. (Ft) / (Ft)	RQD (%)/REC (ft)	Visual Classification (Soil/Rock Description)	USCS Symbol of Rock Brokenness	Remarks
0.0						
1.5	S-1	1-2-3	1.4	brown silty CLAY, few rock fragments, stiff, moist	cl	RESIDUAL SOIL *1.5 to 1.75 TSF
3.0						
4.5	S-2	7-7-9	1.5	brown-red CLAY, few small rock fragments, very stiff, slightly moist, M.C. = 17.0%		- sampler wet *2.5 TSF
6.0						
7.5	S-3	6-7-11	1.5	red CLAY, few small rock fragments, stiff, moist		*1.25 TSF
9.0				9.0'		
9.8	S-4	11-50/0.3	0.8	9.8' brown-gray decomposed CLAYSTONE, hard, dry, M.C. = 14.7%	cl-gc	DEC. ROCK *>4.0 TSF
12.0						Top of Rock @ 9.8'
12.1	S-5	50/0.1	0.1	12.1' gray decomposed sandy SHALE, very dense, dry	gm	
				Boring Terminated @ 12.1'		

Notes: **Drilled using a Diedrich D-50 track mounted drill rig. Boring advanced using 3¼" hollow stem augers, SPT with automatic hammer.

*Pocket penetrometer reading

- M.C. = Moisture Content

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TEST BORING LOG

Client Name:	Swissvale Borough	Project No:	20-250
Project Name:	Public Works Building	Boring No:	B-4
Location:	Swissvale Borough, Allegheny County, Pennsylvania	Elevation:	

Date/Time Started:	04/28/20 - 11:15	Date/Time Complete:	04/28/20 - 11:43	GWL:	Dry at 0 hrs Backfilled
Geologist/Engr.	D. Sanger	Driller/Method:	TBS, Inc. / **	Page:	1 of 1

DEPTH (ft)	Sample Type & No.	Sample Blows Per 6" / Rock Rec. (Ft) / (Ft)	RQD (%)/REC (ft)	Visual Classification (Soil/Rock Description)	USCS Symbol of Rock Brokenness	Remarks
0.0						
1.5	S-1	4-4-5	1.0	brown CLAY, gray ROCK fragments, black CINDERS, medium dense/stiff, dry		FILL *1.25 TSF in clay
3.0						
4.5	S-2	1-2-1	0.4	brown SILT and ROCK fragments, loose, wet, \ M.C. = 35.4%	ml	
6.0						
7.5	S-3	3-3-5	1.5	brown CLAY and ROCK fragments, stiff, slightly moist	cl	*1.5 TSF
9.0				9.0'		
10.5	S-4	5-6-7	1.5	red-brown CLAY, few rock fragments, very stiff, slightly moist to dry, M.C. = 24.4%		RESIDUAL SOIL *2.25 TSF
12.0				12.0'		
12.4	S-5	50/0.4	0.4	12.4' brown decomposed SHALE, very dense, dry	gm	DEC. ROCK
15.0				brown SHALE, very dense, dry		Top of Rock @ 12.4'
15.2	S-6	50/0.2	0.2	15.2' - M.C. = 5.3%		
				Boring Terminated @ 15.2'		

Notes: **Drilled using a Diedrich D-50 track mounted drill rig. Boring advanced using 3¼" hollow stem augers, SPT with automatic hammer.

*Pocket penetrometer reading

- M.C. = Moisture Content

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TEST BORING LOG

Client Name: **Swissvale Borough**			Project No: **20-250**
Project Name: **Public Works Building**			Boring No: **B-5**
Location: **Swissvale Borough, Allegheny County, Pennsylvania**			Elevation:
Date/Time Started: **04/28/20 - 11:46**	Date/Time Complete: **04/28/20 - 12:21**	GWL: **Dry** at **0** hrs **Backfilled**	
Geologist/Engr. **D. Sanger**	Driller/Method: **TBS, Inc. / ****		Page: **1** of **1**

DEPTH (ft)	Sample Type & No.	Sample Blows Per 6" / Rock Rec. (Ft) / (Ft)	RQD (%)/REC (ft)	Visual Classification (Soil/Rock Description)	USCS Symbol of Rock Brokenness	Remarks
0.0						
1.5	S-1	2-2-4	0.6	brown CLAY, brown-gray ROCK fragments, red BRICK fragments, gray CONCRETE, stiff, slightly moist to dry	CL	FILL *1.25 TSF, crumbled
3.0						
4.5	S-2	7-9-10	1.5	red BRICK fragments, dark brown to brown ROCK fragments, some clay, medium dense, slightly moist to dry, M.C. = 25.0%	gm-gc	
6.0						
7.5	S-3	4-2-4	0.4	brown clayey SILT and ROCK fragments, few brick fragments, soft, moist to slightly moist	ml	- sampler wet
9.0				9.0'		
10.5	S-4	8-9-13	1.0	red CLAY, few small rock fragments, very stiff, dry, M.C. = 19.5%	cl	RESIDUAL SOIL *3.25 TSF
12.0				12.0'		
13.5	S-5	10-14-22	1.5	red decomposed CLAYSTONE, dense, dry	gc	DECOMPOSED ROCK
15.0						
15.7	S-6	21-50/0.2	0.7	15.5' brown decomposed CLAYSTONE, very dense, dry	gm	
				15.7' brown decomposed sandy SHALE, very dense, dry, M.C. = 8.0%	gm	Top of Rock @ 15.7'
				Boring Terminated @ 15.7'		

Notes: **Drilled using a Diedrich D-50 track mounted drill rig. Boring advanced using 3¼" hollow stem augers, SPT with automatic hammer.

*Pocket penetrometer reading

- M.C. = Moisture Content

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TEST BORING LOG

Client Name: **Swissvale Borough**			Project No: **20-250**
Project Name: **Public Works Building**			Boring No: **B-6**
Location: **Swissvale Borough, Allegheny County, Pennsylvania**			Elevation:
Date/Time Started: **04/28/20 - 12:26**	Date/Time Complete: **04/28/20 - 12:50**	GWL: **2.3'** at **0** hrs **Backfilled**	
Geologist/Engr. **D. Sanger**	Driller/Method: **TBS, Inc. / ****		Page: **1** of **1**

DEPTH (ft)	Sample Type & No.	Sample Blows Per 6" / Rock Rec. (Ft) / (Ft)	RQD (%)/REC (ft)	Visual Classification (Soil/Rock Description)	USCS Symbol of Rock Brokenness	Remarks
0.0						
1.5	S-1	2-3-5	1.2	gray ROCK and CONCRETE fragments, red BRICK fragments, black CINDERS, brown CLAY, loose, slightly moist	gm-gc	FILL
3.0						
4.5	S-2	4-5-7	1.5	gray ROCK fragments in silt matrix, medium dense, dry, M.C. = 5.6%	gm	
6.0						
7.5	S-3	13-6-3	1.0	brown SILT and ROCK fragments, loose, wet, M.C. = 10.9%	ml	- sampler wet
9.0				9.0'		
10.5	S-4	5-8-8	1.2	red CLAY, few rock fragments, very stiff, moist M.C. = 20.7%		*2.5 TSF - sampler wet COLLUVIUM
12.0				12.0'		
13.3	S-5	35-28-50/0.3	1.3	brown decomposed SHALE, very dense, dry 13.3'	gm	DEC. ROCK - sampler wet
				Boring Terminated @ 13.3'		Top of Rock @ 13.3'

Notes: **Drilled using a Diedrich D-50 track mounted drill rig. Boring advanced using 3¼" hollow stem augers, SPT with automatic hammer.

*Pocket penetrometer reading

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TEST BORING LOG

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APPENDIX B

Laboratory Test Results

Pennsylvania Soil and Rock, Incorporated

Liquid and Plastic Limit

Project Name:	Swissvale Public Works Bldg	Designation Used:	D-4318
Project No:	20-250		
Sample No:	S-1	Material Description:	Brown and red CLAY
Testing by:	P. Fiset		
Date:	5/12/2020		

Plastic Limit

Can NO.	29	11			
Wt. Can & WS, g	27.50	27.69			
Wt. Can & DS, g	26.51	26.63			
Wt. Can, g	21.97	21.74			
Wt. DS, g	4.54	4.89			
Wt. Water, g	0.99	1.06			
Water Content %	21.81	21.68			

As Received Water Content

Can NO.	
Wt. Can & WS, g	
Wt. Can & DS, g	
Wt. Water, g	
Wt. Can, g	
Wt. DS, g	
Water Content %	

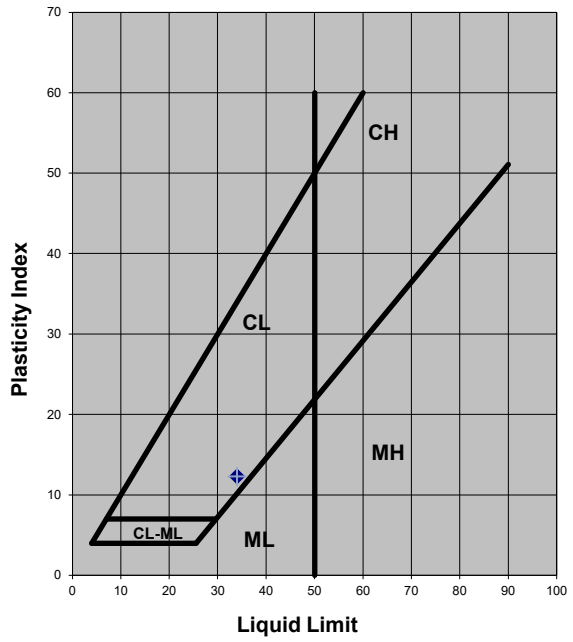
Liquid Limits

Can NO.	6	A2	A11		
Wt. Can & WS, g	39.95	43.73	41.13		
Wt. Can & DS, g	35.55	38.35	36.20		
Wt. Can, g	21.90	22.04	21.89		
Wt. DS, g	13.65	16.31	14.31		
Wt. Water, g	4.40	5.38	4.93		
Water Content %	32.23	32.99	34.45		
Number of Blows	35	28	20		

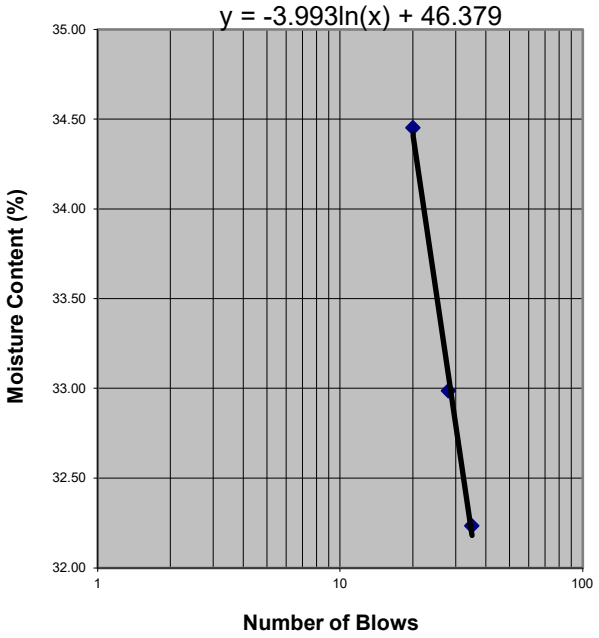
Sample Summary

Liquid Limit (LL), %	**34**
Plastic Limit (PL), %	**22**
Plasticity index (PI), %	**12**
USCS Symbol	**CL**
Sample Preparation	
Liquidity Index, %	
Clay Fraction (% 2 microns)	
Skempton's Activity (A)	

Plasticity Chart



Flow Curve



Pennsylvania Soil and Rock, Incorporated

Moisture-Density Relationship

Project Name:	Swissvale Public Works Building	Designation:	D698-12		
Project No.:	20-250	Tested By:	DI	Date:	05/01/20
Sample No.:	S-1	Checked By:	PCF	Date:	05/04/20
Material Location:	B-5 Auger Cuttings				
Material Description:	Brown and Red Clay, Rock and Brick Fragments				

WET DENSITY

Compaction Point	1	2	3	4
Wt. Mold + Ws (Lbs.)	21.240	21.890	22.200	21.910
Wt. Mold (Lbs.)	12.570	12.570	12.570	12.570
Wt. Ws (Lbs.)	8.670	9.320	9.630	9.340
Vol. Mold (ft^3)	0.075	0.075	0.075	0.075
Density γ (pcf)	115.6	124.3	128.4	124.5
WC (%)	7.9	11.3	13.6	15.1
Dry Density γ_d (pcf)	107.2	111.6	113.1	108.2

TEST SUMMARY

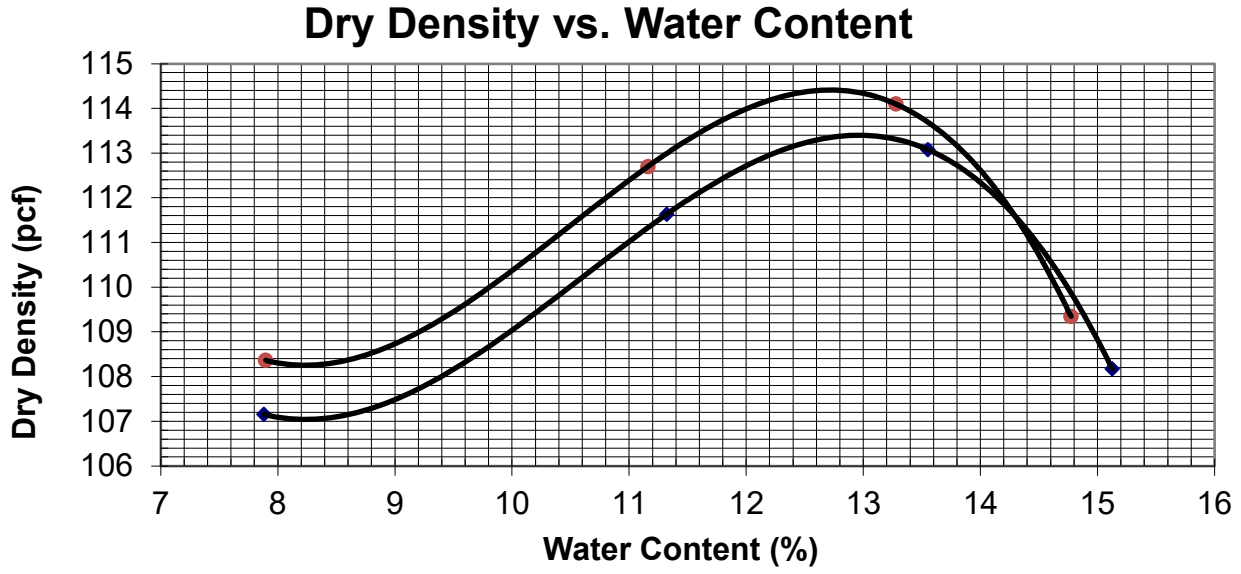
Compaction Effort	D698-12
Test Method	C
Mold Diameter (in)	6
Compacted Layers	3
Blows Per Layer	56
Rammer Weight / Fall	5.5(lb)/12(in)
Size of Material Used	-3/4(in) sieve
Mold Volume (ft^3)	0.075
Weight of Mold (Lbs.)	As Shown

WATER CONTENT

Tare No.	141	YY	168	D2
Wt. Tare + Ws (g)	225.00	215.10	220.80	378.60
Wt. Tare + Ds (g)	209.20	194.10	195.50	330.00
Wt. Tare (g)	8.70	8.60	8.80	8.70
Wt. Ds (g)	200.50	185.50	186.70	321.30
Wt. Water (g)	15.80	21.00	25.30	48.60
Water Content (%)	7.9	11.3	13.6	15.1

Oversized Particle Correction

Percent Retained on 3/4" sieve (%)	5.1
Percent Retained on 3/8" sieve (%)	NA
Percent Retained on #4 sieve (%)	NA
Material Corrected?	Yes



SAMPLE SUMMARY

FIELD CORRECTED VALUES				
Water Content (%)	7.9	11.2	13.3	14.8
Dry Density (pcf)	108.4	112.7	114.1	109.3
LABORATORY TEST VALUES				
Water Content (%)	7.9	11.3	13.6	15.1
Dry Density (pcf)	107.2	111.6	113.1	108.2

Oversize Material in Correction (%)	5.1
Field Optimum Water Content (%)	**12.7**
Field Maximum Dry Density (pcf)	**114.4**
As Received Water Content (%)	21.6
Lab Optimum Water Content (%)	**13.0**
Lab Maximum Dry Density (pcf)	**113.4**