



Engineering
& Design

Report of Stormwater Infiltration Evaluation

October 25, 2022

Proposed Stormwater Management System

501 Washington Lane

Borough of Jenkintown, Montgomery County, Pennsylvania

Prepared for:

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Project No. 22001641A

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Introduction

This report presents the results of the stormwater infiltration evaluation performed in support of the proposed infiltration basin to be constructed at 501 Washington Lane Jenkintown, Pennsylvania. Our services were conducted in accordance with our proposal addendum 22001641A (dated July 7, 2022), and your subsequent written authorization. Specifically, this report presents a summary of field observations related to the subsurface soil and groundwater conditions, as well as the results of infiltration testing completed within the proposed stormwater basin limits.

Based on the marked up plan provided by our civil design group at Colliers Engineering & Design (CED) titled ALTA/NSPS Land Title Survey and prepared by Blue Marsh Associates, Inc. (dated March 11, 2022), we understand that an underground stormwater infiltration basin is proposed on the southwest portion of the site, at the approximate location shown on the attached Figure 2 – Exploration Location Plan. The basin has a proposed bottom of basin elevation of EL 277.00±, which is about 4 feet to 6 feet below the ground surface elevations at the time of the field exploration. A total of two test borings (TB-1 and TB-2) were advanced to explore the subsurface conditions for the basin. Two infiltration tests (IT-1 and IT-2) were performed to evaluate the permeability of the subsoils.

Site and Project Description

The subject site is located on an approximately 0.50-acre property at the northeast corner Cedar Street and Washington Lane, Jenkintown, PA, as shown on the Site Location Map (Figure 1). This site is bounded by commercial properties to the north; by Washington Lane followed by Old York Road and commercial properties to the east; by Cedar Street followed by residential properties to the south and west.

The subject site is currently developed with a 3- to 4-story commercial building, asphalt paved parking areas, a dumpster enclosure, and various underground utilities. A storm inlet grate was observed in the entrance drive located in the southwest portion of the proposed development area.

The site where the proposed stormwater basin is planned generally has grades that slope downward from northeast to southwest, from elevation ±283 to ±280. Utility mark-outs, including underground water, storm sewer, electric, and gas, were observed within and around the perimeter of the site. Other un-marked below-grade utilities may also exist at the site.

The current design concept includes a new below-grade stormwater infiltration basin to be constructed below the asphalt parking area in the southwest portion of the site. According to preliminary information provided, the underground infiltration basin size has yet to be determined; however, the basin bottom elevation is currently planned to be at approximately elevation 277 feet.

Scope of Services

To evaluate the subsurface conditions within the influence of the proposed stormwater management area, and to subsequently provide consultation regarding anticipated subsurface infiltration rates and design estimated seasonal high-water levels (ESHWL), we performed the following scope of services:

- a) Engaged the services of a drilling contractor to advance two test borings for exploration of subsurface soil and groundwater conditions within the proposed stormwater management area;
- b) Provided full-time technical observation of the test boring services;
- c) Obtained representative continuous soil samples from the test borings for classification purposes to depths of up to 20 feet below existing grades;
- d) Evaluated the field data and prepared test boring logs showing the types of soils observed, depths to groundwater;
- e) Performed in-situ field infiltration testing using the cased borehole test method (bentonite casing method) to evaluate groundwater infiltration rates for the subgrade soils; and,
- f) Provided this *Report of Stormwater Infiltration Evaluation* that reviews soil infiltration rates and groundwater considerations for the proposed basin design.

Subsurface Exploration

Subsurface conditions for this stormwater infiltration evaluation were explored through the completion of two test borings, identified herein as TB-1 and TB-2. The test borings were performed by Soil Borings Inc. of Haddonfield, New Jersey, at the locations shown on the Exploration Location Plan, Figure 2. The test locations were field located by Colliers Engineering & Design, Inc. (CED) and cleared for below-grade utilities by Ground Penetrating Radar Systems, LLC. The drilling was performed under the full-time technical supervision of CED. Elevations of the test locations were estimated using the ALTA/NSPS Land Title Survey, prepared by Blue Marsh Associates, Inc., dated March 11, 2022 (NAVD88 Datum).

The test borings were advanced using hollow-stem drilling techniques. Soil samples for strata identification and analyses were obtained from each of the test borings by means of a 2-inch OD split barrel sampler. This spoon is typically driven 18 inches or 24 inches by blows from a 140-pound hammer which free falls 30 inches (the Standard Penetration Test, ASTM D 1586). The boring logs are presented in the Appendix with descriptions of the soil horizons encountered and depth to encountered groundwater. The penetration resistance of the drive sampler has been recorded on the test boring log adjacent to the sample locations as the number of hammer blows required for each 6 inches of sampler penetration or fraction thereof. The Standard Penetration Test values (N) are determined by totaling the blow counts required for the middle 12 inches of sampler penetration and are expressed as blows per foot. Upon completion, the test borings were backfilled with the cuttings and patched with asphalt cold patch.

The test borings were performed under the full-time technical observation of CED. Representative soil samples were collected and visually identified in accordance with the Burmister and Unified Soil Classification System (USCS). Details pertaining to the subsurface conditions encountered are presented on the test boring logs in Appendix A.

Soil samples obtained during this investigation will be retained by CED for 60 days from issuance of this report. At the end of this time, they will be discarded unless we receive other instructions from American Campus Communities.

Subsurface Conditions

Regional Geology

The site for the proposed development is located within the Piedmont Physiographic Province. Based on geologic information from published sources, the site is mapped to be within the lower Paleozoic Wissahickon Formation (Xw). The Wissahickon Formation consists primarily of "oligoclase-mica schist, some hornblende gneiss, some augen gneiss, and some quartz-rich and feldspar-rich members due to various degrees of granitization." Locally, the site is underlain by fill material, followed by a weathered profile comprised of residual soils and decomposed/altered rock of the underlying parent Oligoclase Mica Schist bedrock. The materials that were encountered in the test borings are described in the following paragraphs.

Subsurface Description

Based on the results of the test borings, the generalized subsurface conditions at the site may be described below, in order of depth. Please refer to the corresponding test boring logs in the Appendix for specific information at each test location.

- **Surface Materials:** Asphalt pavement was encountered at the surface of the two test borings completed during the exploration program (TB-1 and TB-2). The asphalt pavement ranged from about 2.5 inches to 3.5 inches and averaged 3 inches in thickness. The asphalt pavement was underlain by an aggregate subbase (sand and gravel mixture) at test boring locations TB-1 and TB-2, measuring approximately 4 inches in thickness.

Existing Fill Materials: Fill was encountered beneath the asphalt and subbase materials at both test boring locations performed within the proposed stormwater basin footprint, extending to depths of approximately 2 feet below the existing grades. The fill material consists of a loose, brown, dark brown, black, and yellowish-brown, mixture of coarse- to fine- sands with moderate to high percentages of silt/clay and lesser amounts of medium- to fine- gravel (USCS: Silty to Clayey Sand with Gravel). The fill was identified based on the observed irregularities in color, composition, and relative density, which suggest the soils were likely placed as part of previously completed grading efforts for the existing site facilities.

SPT values for the fill layer range from 3 blows per foot (bpf) to 4 bpf, averaging about 3 bpf. The loose SPT values encountered in this stratum are likely the result of poorly compacted backfill materials during construction of the existing facilities parking lot.

- **Stratum A – Residual Soils:** Underlying existing fill materials are residual soils comprised of medium- to fine- sands with moderate to high percentages of silt/clay and lesser amounts of medium- to fine- gravel (USCS: Silty to Clayey Sand with Gravel and Poorly Graded Sand with Silt/Clay, slightly micaceous). The Stratum A soils were encountered in test borings TB-1 and TB-2, extending to depths of about 17 feet to 19 feet below ground surface, respectively.

SPT 'N'-values within the Stratum A materials ranged from 2 bpf to 28 bpf, indicating a broad range of very loose to medium dense conditions. On average, the relative density of the Stratum A materials was generally loose within the upper 15 feet to 19 feet, transitioning to medium dense to dense approaching the decomposed/altered rock interface.

- **Stratum B – Decomposed/Altered Rock:** Decomposed and altered rock (a.k.a. saprolite or weathered rock) was encountered in test borings TB-1 and TB-2 beneath the Stratum A soils, extending to the test boring completion depths. Decomposed to altered rock is the weathered, very dense, typically friable material that retains the relic rock structure, but can be augured through with some difficulty. The decomposed/altered rock at this site consists of dense to very dense micaceous sand with moderate amounts of silt and lesser amounts of friable rock fragments (USCS: Micaceous Silty Sand, trace friable rock fragments).

The SPT blow counts recorded within the sampled decomposed portions of Stratum B indicated dense to very dense conditions. No rock coring was performed within the altered rock stratum. However, when altered rock is cored, it typically results in relatively low rock Recovery Ratios and Rock Quality Designation (RQD) values (about 30 percent or less).

Groundwater Conditions

Groundwater was not encountered in test borings performed in the proposed basin area. Evidence of redox (i.e. oxidation / reduction due to varying states of saturation or water seepage through a soil stratum) was not observed in either of the test borings performed within the proposed basin.

Fluctuations in groundwater levels can occur due to several factors, including variations in precipitation, seasonal changes, and site development activities, which can alter surface water drainage paths.

Soil Infiltration Evaluation

Two infiltration tests (IT-1 and IT-2) were performed at the locations shown on the attached Figure 2 – Exploration Location Plan. The tests were performed using the cased borehole infiltration test method seated in the soils at or near the anticipated basin bottom elevation. The results of the infiltration testing are summarized below in Table 2. Please also refer to the attached Stormwater Infiltration Testing Logs.

TABLE 2 SUMMARY OF INILTRATION TEST RESULTS							
Basin Bottom (EL)	Infiltration Test ID	GS EL (ft)*	GW EL (ft)	ESHWL EL (ft)	Inf. Test EL (ft)	Inf Rate (in/hr)**	Soil Stratum
(277)	IT-1	281	NE	NE	276.7	0.75	Stratum A
	IT-2	283	NE	NE	277.0	2.25	Stratum A

*Ground surface are interpolated from the project plans and should be considered approximate.

**Infiltration rates do not include a factor of safety.

Discussion

The soils at the infiltration test depths (bottom of basin) were relatively consistent. However, the rates were somewhat variable. The slower infiltration rate observed at IT-1 (southwest end of the basin) is likely the result of a poorly graded sand with moderate to high percentages of fine-grained soils observed at the test depth. Conversely, the faster infiltration rate observed at IT-2 (southeast end of the basin) was likely a product of poorly graded sand with moderately low percentages of fine-grained soils observed at the test depth.

We recommend that the basin be designed based on the more conservative rate measured at IT-1, after applying an appropriate factor of safety. The soils at the proposed basin bottom will likely consist of loose silty or clayey granular Stratum A soils. The faster draining loose zones of poorly graded sand with silt are expected to be relatively thin and at greater depths, where present. As a result, infiltration within the basin will likely be more represented by the silty or clayey sands identified at test location IT-1.

Closing

We emphasize that the conclusions summarized in this report are based on the results of the test boring explorations and field infiltration testing. Additional infiltration testing may be required once final design and basin size is prepared to meet local code requirements.

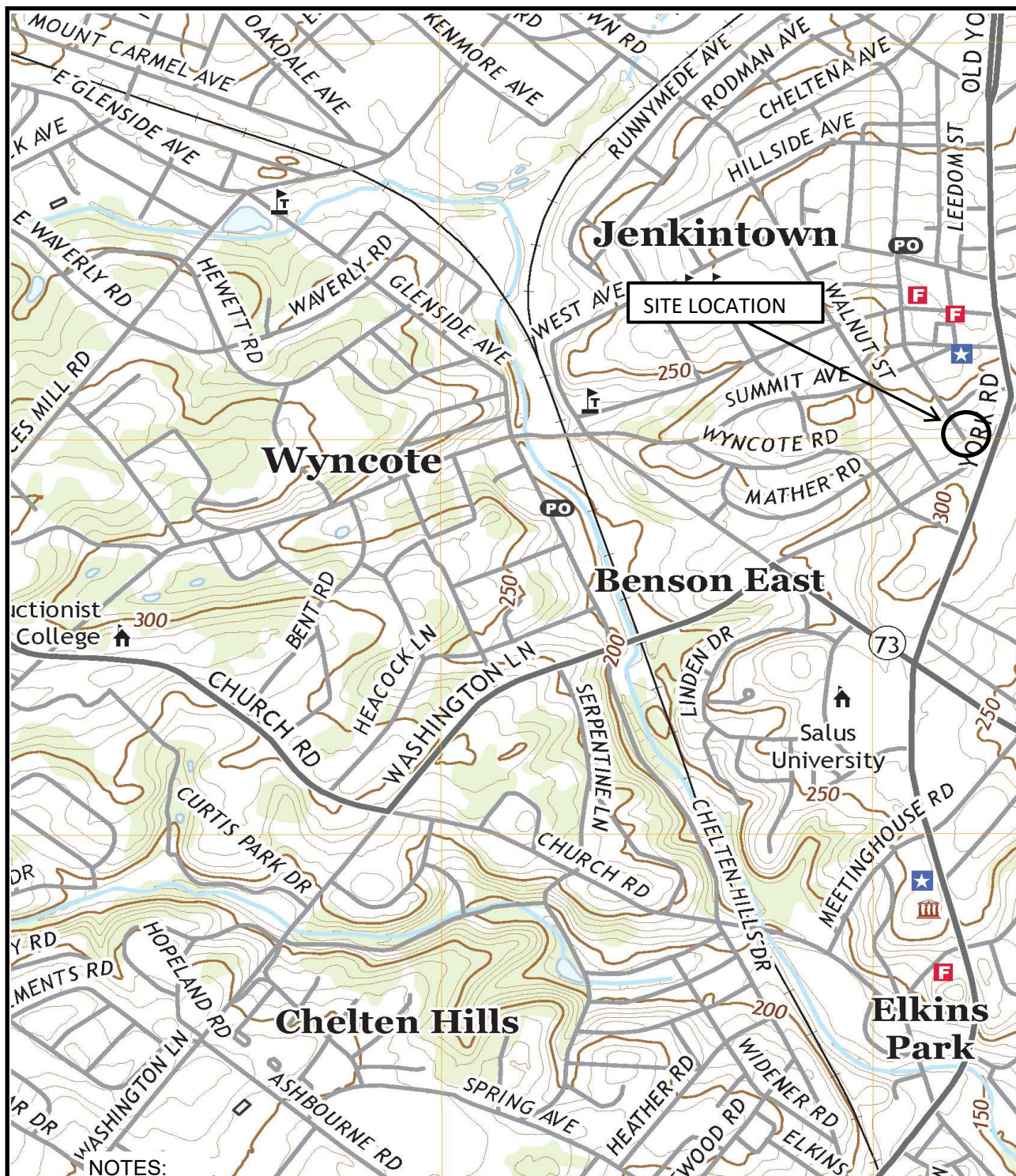
Successful construction of the project will require competent field observation of the construction operations. Earthwork, including clearing and grubbing, subgrade identification, grading, and fill placement, should be observed by a competent individual familiar with the recommendations contained in this report, to confirm that the underlying soils are not artificially disturbed or compacted. We are available to perform construction observation services, if requested. Furthermore, we recommend a pre-construction meeting be attended by the construction team, stormwater design professionals, and field observation team to review construction procedures and outline requirements to be implemented and/or avoided during construction of the stormwater facilities and subgrade preparation.

The recommendations contained in this report are contingent upon the actual field conditions being consistent with those encountered during our field exploration. Should any variation in the anticipated conditions be encountered, or should site regrading be proposed, CED should be notified to determine what impact the changed conditions may have upon the presented recommendations.

Limitations

Services performed by CED during this project have been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended in the services provided.

Figures



**Engineering
& Design**

Title:

SITE LOCATION MAP

Project:

***Proposed Stormwater Management
501 Washington Lane***

Borough of Jenkintown, Pennsylvania

Drawn By:

*

Checked By:

MJK

Project No.:

22001641A

Scale:

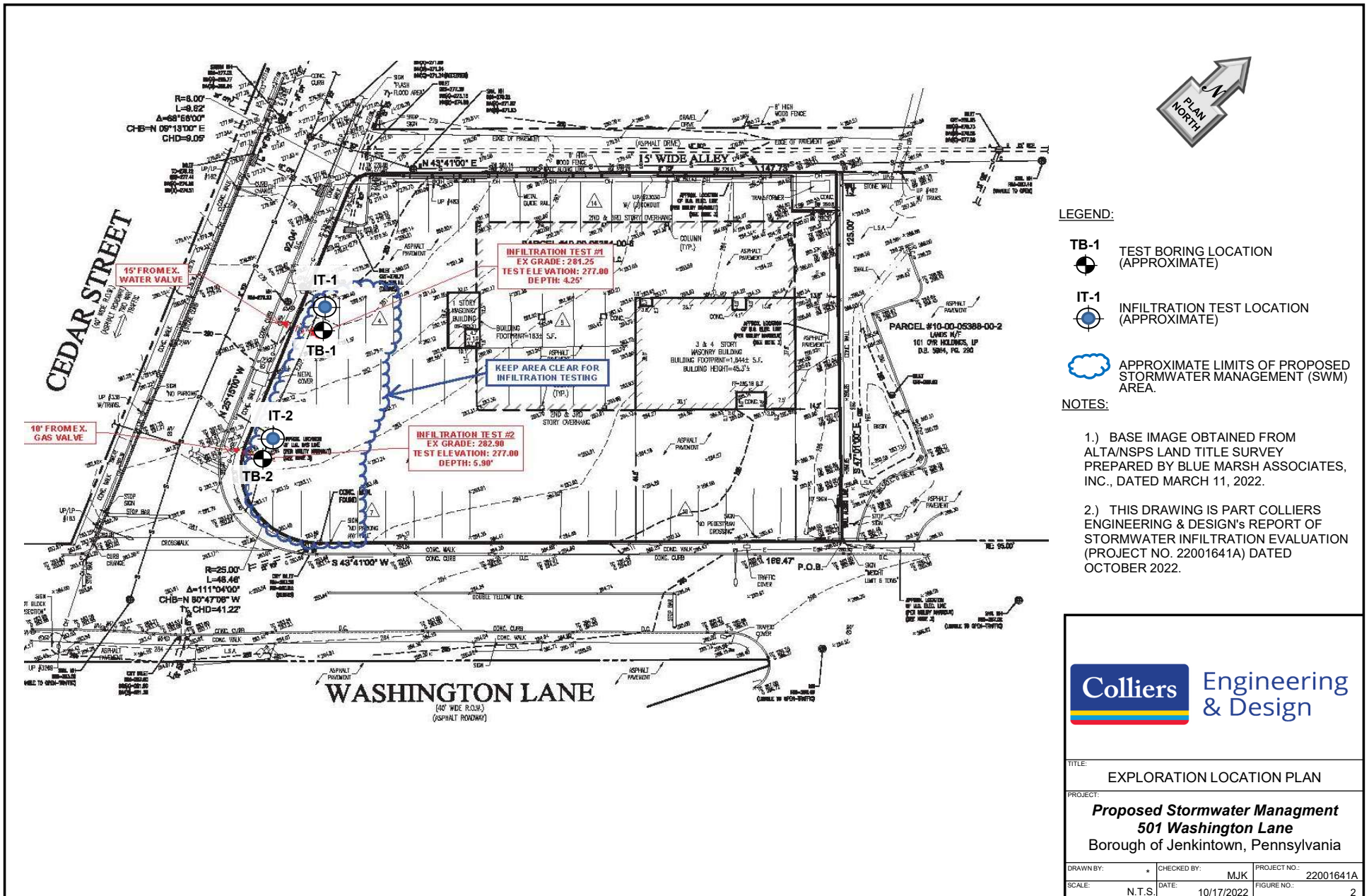
N.T.S.

Date:

10/17/2022

Figure No.:

1



Appendix A

Test Boring Logs



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PROJECT: 501 Washington Lane SWM

LOCATION: 501 Washington Lane
Jenkintown, PA

PROJECT NO. 22001641A

TEST BORING: TB-1

PAGE 1 OF 1

GROUND ELEVATION (ft): 281
ELEV. FROM: Interpolated
GROUNDWATER ELEV. (ft):

CONTRACTOR: Soil Borings, Inc.

DRILLER: Anthony Scafidi

DRILLING EQUIPMENT: Mobile B57 Truck Rig

METHOD: HSA ☒ Mud Rotary ☐ Other ☐

HAMMER: CH ☐ Safety ☐ Automatic ☒

RODS: AW ☒ NW ☐ Other ☐

GROUNDWATER: DEPTH (ft) DATE
FIRST ENCOUNTERED ☒ NE 10/6/2022
END OF DRILLING (0 hrs.) ☒ NE 10/6/2022

ASTM D-1586

DATE STARTED 10/6/2022

DATE FINISHED 10/6/2022

FIELD OBSERVER: T. Hill

CHECKED BY: M. Kwiatkowski

DEPTH BELOW SURFACE (ft.)	SAMPLE NUMBER	BLOWS PER 6 INCHES				RECOVERY (in)	POCKET PENETROMETER (tsf)	MOISTURE (%)	WATER SYMBOL	PROFILE		IDENTIFICATION OF SOILS / REMARKS
		DEPTH (ft.)	0-6"	6-12"	12-18"	18-24"				DEPTH ELEV.		
5	S-1	-	1	2	1	3	<0.25			2.0 279.0	Fill	S-1: Asphalt +/- 2.5 inches; Base +/- 4 inches Brown, Dark Brown, Black, cmf SAND, little (+) mf Gravel, little Silt, (Fill) (Moist)
	0.0'-2.0'					11						S-2: Orange-Brown, mf(+) SAND, some (-) Clayey Silt, trace f Gravel, (Moist)
	S-2	2	1	1	2	6						S-3: Orange-Brown, Gray, cmf SAND, little (+) Clayey Silt, trace f Gravel, slightly micaceous, (Moist)
	2.0'-4.0'					21						S-4: Yellowish Brown, Brown, SILT & CLAY, little (-) f Sand, trace mf Gravel, (Very Moist)
10	S-3	3	3	3	2	0						S-5: NO RECOVERY *Possible push of large gravel.
	4.0'-6.0'					21						S-6: Yellowish Brown, mf(+) SAND and Silt, slightly micaceous, (Moist)
	S-4	1	1	2	1	18						S-7: Yellowish Brown, mf(+) SAND, some (+) Silt, slightly micaceous, (Moist)
	6.0'-8.0'					22						S-8: Yellowish Brown, Tan, mf SAND, little (+) Silt, slightly micaceous, (Moist)
15	S-5	2	2	2	3	23						S-9: Yellowish Brown, Tan, micaceous cmf SAND, little Silt, (Moist)
	8.0'-10.0'					10						S-10: Yellowish Brown, Tan, Gray, micaceous mf SAND, little (+) Silt, trace (-) friable rock fragments, (Moist)
	S-6	4	4	6	8							
	10.0'-12.0'											
20	S-7	10	13	15	17							
	12.0'-14.0'											
	S-8	9	6	12	20							
	14.0'-16.0'											
25	S-9	11	14	20	44							
	16.0'-18.0'											
	S-10	43	50/4"	-	-							
	18.0'-18.8'											
30												
35												
40												

NOTES: Boring backfilled and patched upon completion for safety considerations.

TEST BORING: TB-1

PAGE 1 OF 1



LOCATION: 501 Wshington Lane
Jenkintown, PA
PROJECT NO. 22001641A

GROUND ELEVATION (ft): 283
ELEV. FROM: Interpolated
GROUNDWATER ELEV. (ft):

RODS: AW	X	NW	Other
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ASTM D-1586

CHECKED BY: M. Kwiatkowski

DEPTH BELOW SURFACE (ft.)	SAMPLE NUMBER	BLOWS PER 6 INCHES				RECOVERY (in)	POCKET PENETROM. (tsf)	MOISTURE (%)	WATER SYMBOL	PROFILE	IDENTIFICATION OF SOILS / REMARKS				
	DEPTH (ft.)	0-6"	6-12"	12-18"	18-24"					DEPTH ELEV.					
5	S-1	-	2	2	2	9	0.75			Fill 2.0 281.0	S-1: Asphalt +/- 3.5 inches; Base +/- 4 inches Brown, Yellowish Brown, mf(+) SAND, some Clayey Silt, trace mf Gravel, (Fill) (Moist)				
	0.0'-2.0'					13					S-2: Brown, Tan, mf(+) SAND, some (+) Clayey Silt, trace (-) f Gravel, slightly micaceous, (Moist)				
	S-2	1	2	3	2	17					S-3: Brown, Tan, mf(+) SAND, some Silt, slightly micaceous, (Moist)				
	2.0'-4.0'					18					S-4: Yellowish Brown, Brown, Clayey SILT, some (-) mf Sand, trace f Gravel, (Very Moist)				
10	S-3	2	2	2	3	20					Stratum A	S-5: Brown, Orange-Brown, Gray, micaceous mf(+) SAND, some (+) Silt, (Very Moist)			
	4.0'-6.0'					22						S-6: Brown, Orange-Brown, mf(+) SAND, some (+) Clayey Silt, slightly micaceous, (Moist)			
	S-4	1	2	2	3	18						S-7: Yellowish Brown, Tan, mf(+) SAND, some Clayey Silt, trace friable rock fragments, slightly micaceous, (Very Moist)			
	6.0'-8.0'					22						S-8: Brown, Gray, micaceous mf SAND, little (+) Silt, trace friable rock fragments, (Moist)			
15	S-5	2	2	3	4	22						Stratum B	END OF TEST BORING AT 20.0 FEET		
	8.0'-10.0'					22									
	S-6	3	3	3	4	22									
	10.0'-12.0'					22									
20	S-7	2	2	3	5	22								Stratum B	END OF TEST BORING AT 20.0 FEET
	13.0'-15.0'					22									
	S-8	3	7	10	15	22									
	18.0'-20.0'					22									
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290						22			Stratum B	END OF TEST BORING AT 20.0 FEET					
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295						22					Stratum B	END OF TEST BORING AT 20.0 FEET			
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345						22	Stratum B	END OF TEST BORING AT 20.0 FEET							
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						22									
350						22			Stratum B	END OF TEST BORING AT 20.0 FEET					

NOTES: Boring backfilled and patched upon completion for safety considerations.

Appendix B

Field Infiltration Test Logs

Infiltration Testing Log

Project Name: 501 Washington Lane - SMW **Date:** 10/6/2022
Project Address: 501 Washington Lane Borough of Jenkintown, PA **Weather:** Sunny / 70's
Testing Company: Colliers Engineering & Design **Tester's Name:** Timothy Hill
Phone Number: **Email Address:**
Test Number: IT-1 **Test Pit/Boring Hole Number:** TB-1 **Test Method:** Cased Borehole
Test Depth (feet): 4.3 **Surface Elevation (feet):** 281 **Instrument Diameter (inches):** 4 inches

Soil Characterization

Depth (feet):	Soil Texture:	Limiting Layers Type and Depth (feet):
0 to 2	Silty Sand with Gravel, (FILL) (Moist)	N/A
2 to 17.0	Silty/Clayey Sand with Gravel to Poorly Graded Sand with Silt, slightly micaceous (Moist to Very Moist)	N/A
17.0 to 18.8	Micaceous Silty Sand, trace friable rock fragments, (Moist)	Weathered Rock at 17.0 feet

Presoak

Time:	Time Interval:	*Measurement, (inches):	Drop in water level, (inches):
13:25	0	50.5	
13:55	30 minutes	51.125	0.625
14:25	30 minutes	51.5	0.375

* Note: Measurements taken from top of casing.

Infiltration Testing

Time:	Time Interval (30 minute):	Water Height (from top of casing), (inches):	Drop in Water Height, (inches):	Infiltration rate (inches per hour):	Remarks:
14:27	0	49.875			
14:57	30	50.25	0.375	0.75	
15:27	30	50.75	0.5	1.00	
15:57	30	51.125	0.375	0.75	
16:27	30	51.5	0.375	0.75	
16:57	30	51.875	0.375	0.75	
Stabilized Infiltration Testing Rate (inches per hour):				0.75	

Infiltration Testing Log

Project Name: 501 Washington Lane - SMW **Date:** 10/6/2022
Project Address: 501 Washington Lane Borough of Jenkintown, PA **Weather:** Sunny / 70's
Testing Company: Colliers Engineering & Design **Tester's Name:** Timothy Hill
Phone Number: **Email Address:**
Test Number: IT-2 **Test Pit/Boring Hole Number:** TB-2 **Test Method:** Cased Borehole
Test Depth (feet): 6 **Surface Elevation (feet):** 283 **Instrument Diameter (inches):** 4 inches

Soil Characterization

Depth (feet):	Soil Texture:	Limiting Layers Type and Depth (feet):
0 to 2	Silty Sand to Clayey Sand, trace Gravel, (FILL) (Moist)	N/A
2 to 19.0	Silty/Clayey Sand with Gravel to Poorly Graded Sand with Silt/Clay, slightly micaceous (Moist to Very Moist)	N/A
19.0 to 20.0	Micaceous Silty Sand, trace friable rock fragments, (Moist)	Decomposed to Weathered Rock at 19.0 feet

Presoak

Time:	Time Interval:	*Measurement, (inches):	Drop in water level, (inches):
14:41	0	70.375	
15:11	30 minutes	74.25	3.875
15:13	0**	71.375	
15:43	30 minutes	73.375	2.00

* Note: Measurements taken from top of casing.

** Refill for second presoak interval.

Infiltration Testing

Time:	Time Interval (10 minute):	Water Height (from top of casing), (inches):	Drop in Water Height, (inches):	Infiltration rate (inches per hour):	Remarks:
15:45	0	70.75			
15:55	10	71.375	0.625	3.75	
16:05	10	71.875	0.5	3.00	
16:15	10	72.25	0.375	2.25	
16:17	0***	70.75			*** Refill to continue test.
16:27	10	71.125	0.375	2.25	
16:37	10	71.5	0.375	2.25	
16:47	10	71.875	0.375	2.25	
Stabilized Infiltration Testing Rate (inches per hour):				2.25	



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