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ENGINEERING REPORT

Additions and Renovations to Alumni Gymnasium and Strength & Conditioning Center Rider University Block 2801, Lot 24 Lawrence Township, Mercer County, New Jersey

Prepared For:
Rider University
2083 Lawrenceville Road
Lawrenceville, NJ 08648

Thomas E. O'Shea
New Jersey Professional Engineer #GE31228
VNHA #44760-400-21
September 17, 2021

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APPENDICES

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I. EXECUTIVE SUMMARY

Rider University (the Applicant/Owner) is proposing two new building additions and interior renovations to their existing Alumni Gymnasium on their campus situated on Block 2801, Lot 24 in Lawrence Township, Mercer County, New Jersey (the Project). The Project will be constructed in phases as follows:

- Phase 1 – Strength and Conditioning Center: Building addition to the existing Practice Facility
- Phase 2A – Entry Vestibule: Lobby addition to the existing Alumni Gym
- Phase 2B – Office Additions: Building additions to the existing Alumni Gym consisting of offices
- Phase 3 – New Generator: Electrical equipment upgrades to support Phase 2B

The above phases of work and independent of one another and may be constructed either sequentially or all at one time. In total, approximately 12,000 square feet of building additions are proposed across all phases. Other small improvements, including walkway reconfigurations and additions and utility realignments, are proposed within their associated phases.

To offset the impervious area increase associated with the building additions and sidewalks, a portion of an existing parking lot on the campus is being removed under Phase 1 that will be greater in area than the increase in impervious area created by the proposed improvements. Additionally, a new rain garden is proposed adjacent to the Phase 2B addition to further mitigate stormwater runoff leaving the site.

The proposed Project will disturb 1.06 acres of land overall. However, there will be a net reduction in impervious surfaces by approximately 150 square feet under the full construction of both phases of work. While the increase in impervious area is less than 0.25 acres, the limit of disturbance is greater than one acre, therefore the Project is classified as a "major development" under the Lawrence Township Land Use Ordinance (LUO) and the New Jersey Department of Environmental Protection (NJDEP) stormwater management rules (N.J.A.C. 7:8). The Project will also need to meet the Delaware and Raritan Canal Commission's (DRCC) rules and requirements set forth by N.J.A.C. 7:45 since over the entire property, there has been a cumulative increase in impervious surfaces of more than one quarter acre since 1980 and a total disturbance greater than one acre.

All phases of the Project drain to the same existing campus storm drainage system, specifically, a 24-inch reinforced concrete trunk storm sewer that is generally located west of the Project areas. In turn, the storm sewer flows to an outfall at Little Shabakunk Creek on the southwest side of campus.

To address stormwater management for the Project, a portion of the existing parking lot to the south of the existing Alumni Gym will be removed. The approximate 12,230-square-foot paved area proposed to be removed currently drains over land into the campus storm sewer system, which drains to the same campus trunk line previously described. The area of removed pavement, which is larger than the impervious surface area from the building additions, will be restored and replanted with meadow grasses to enhance vegetation and provide a further landscape buffer to the existing parking lot.

The existing area where the building additions will be constructed drain directly into the campus storm sewer system. The piped flow is generally conveyed to the west side of the Student Recreation Center into the campus trunk storm sewer. The improvements proposed will necessitate the relocation of some storm sewer piping, but general alignments and flow patterns will remain the same in the post-construction condition.

Since the parking lot runoff is not currently treated for water quality and the new building and sidewalk additions will not generate any significant pollutant-laden runoff, there will be a significant water quality improvement as a result of this Project.

This report has been prepared in concert with a set of plans entitled, "Preliminary/Final Major Site Plan of Additions & Renovations to Alumni Gymnasium and Strength & Conditioning Center," prepared by Van Note-Harvey Associates, Inc. (VNHA).

II. STORMWATER MANAGEMENT

A. Land Use/Land Cover Analysis

The existing and proposed hydrologic characteristics for the design of the stormwater management system are based upon the 2-, 10-, and 100-year frequency storm events. The calculations have been developed in conformance with the Township, NJDEP, and DRCC's stormwater management rules.

Refer to Table 1 below showing a comparison of impervious surface coverage associated with the Project:

Table 1: Project Impervious Area Comparison

	Existing Impervious		Proposed Impervious		Δ	
	(s.f.)	(ac.)	(s.f.)	(ac.)	(s.f.)	(ac.)
Main Project Area	53,586	1.23	65,670	1.51	+12,084	+0.28
Parking Lot Area	12,230	0.28	0	0.00	-12,230	-0.28
Total	**65,816**	**1.51**	**65,670**	**1.51**	**-146**	**-0.00**

This section of the report demonstrates the ability of the proposed stormwater management to mitigate the runoff anticipated from the Project site in its proposed condition.

EXISTING PROJECT SITE DESCRIPTION AND METHODOLOGY

A geotechnical investigation was performed at the Project site by Melick-Tully & Associates. The existing soils within the proposed project areas generally consist of sand and some silt in upper layers with more gravel and sand in lower layers. According to the USDA/SCS's Web Soil "Soil Survey of Mercer County, New Jersey," the Project site (and most of the Rider University campus) consists of Hydrologic Soil Group (HSG) Type 'D.' The Project site soils consist solely of Udorthents, stratified substratum, 0 to 8 percent slopes (initials UdstB). Per the Web Soil report, Udorthents consist of sand in the upper 10 inches of the soil profile, and gravelly coarse sand from 10 inches to 72 inches deep. Refer to Appendix A for a copy of the subsurface investigation report dated February 11, 2020, and Appendix B for the Web Soil USDA Soil Survey Report.

The entirety of the new building additions and sidewalks is being constructed on previously disturbed open space infill area. Existing runoff from the Phase 1 building addition area generally drains south across grass before traveling across an existing parking lot and being collected by the campus storm sewer system. Various inlets collect surface runoff in this parking lot where runoff is then conveyed to the campus trunk storm sewer. In the Phase 2 areas, runoff is split between pipe runs that flow in a westerly direction around the north side of the existing Alumni Gym and Student Recreation Center and pipe runs that head in a southerly direction, then west under an access drive and underneath the existing Alumni Gym building before heading south of the Student Recreation Center. These two pipe runs converge in the 24" RCP trunk storm sewer before draining southwest towards the stream outfall.

In the parking lot area, as noted in Section I, runoff generally sheet flows over the pavement before traveling west into inlets, which drain to the existing trunk storm sewer.

PROPOSED PROJECT SITE DESCRIPTION AND METHODOLOGY

The Project consists of phased building additions to the existing Alumni Gym, associated walkway improvements, the removal of a portion of an existing parking lot, and a new rain garden. The roof drainage from the new building additions will tie into the existing campus storm sewer system. Runoff from the new walks will travel overland before either draining into the inlets of the campus sewer system or infiltrating into the ground via overland flow across landscape areas.

A portion of an existing parking lot on the same property is proposed to be removed. As noted in Table 1 previously, the removal of impervious surfaces from the compensation area exceeds the impervious surface increase from the Project's construction. Both the Project area and the compensation area drain to the same campus storm drainage system. This restoration and replanting of meadow grasses is the primary stormwater management feature for the Project.

Compliance with the requirements for stormwater management can be demonstrated by proving that the stormwater runoff leaving the Project area in its proposed condition is less than the stormwater runoff leaving the site in its existing condition for the disturbed site area. Existing peak flow rates and the corresponding runoff hydrographs for the general point of discharge, described above, were calculated using the USDA/NRCS "Urban Hydrology for Small Watersheds" (TR-55) methodology, and were performed for the 2-year (3.3 in./24hr), 10-year (5.0 in./24hr), and 100-year (8.3 in./24hr) storm events, all New Jersey Region C Design Storm distributions. To determine the allowable runoff rates from the project site, the runoff from the existing open space that will become impervious surface was calculated and the allowable flow rates were derived from those amounts. The runoff from the proposed impervious surfaces was then calculated. The hydrographs show that at no point in time, the proposed hydrograph exceeds the existing hydrograph.

Though no stormwater best management practices (BMP) infrastructure would be required for this Project, to help address the requirements for green infrastructure BMPs, a small rain garden (small-scale bioretention system) is proposed to detain a small area of open space adjacent to the Phase 2B work. The rain garden will temporarily detain runoff from small storms in a soil medium and in 6 inches of ponding space above the bottom to nourish vegetation to be planted in the rain garden. For larger storm events, runoff will rise until flowing into a catch basin set 6 inches above the bottom which then ties into the campus storm sewer system.

B. Stormwater Quantity Control

As the Project will disturb more than one acre of land, it is defined as a "Major development" by Lawrence Township (LUO Section 522.A) and NJDEP (N.J.A.C. 7:8-5.4). As there has been a cumulative increase in impervious surfaces greater than 0.25 acres since 1980 over the entire property, Delaware and Raritan Canal Commission stormwater rules (N.J.A.C. 7:45-8.6) also apply. One method to meet stormwater quantity control under Township, NJDEP (N.J.A.C. 7:8-5.6(b)2), and DRCC (N.J.A.C. 7:45-8.6(a)2) stormwater management regulations is to demonstrate that the post-construction runoff hydrographs for the 2-year, 10-year, 100-year frequency storm events, do not exceed the pre-construction runoff hydrographs for the same storm events.

The existing and proposed land uses have been analyzed based on the current site conditions and proposed site improvements. The hydrology and corresponding runoff hydrographs for the drainage areas were calculated using Bentley's PondPack (V8i) hydrologic modeling computer software and the United States Department of Agriculture, the National Resource Conservation Service (USDA/NRCS) Technical Release 55 (TR-55) "Urban Hydrology for Small Watersheds" methodology and New Jersey Region C rainfall distributions. Existing and proposed hydrology was based on the Mercer County rainfall frequency data for the 2-year (3.3 in./24 hr.), 10-year (5.0 in./24 hr.), and 100-year (8.3 in./24 hr.) storm events. Refer to Appendix C for detailed calculations of the hydrologic routings prepared for this project.

There is a small decrease in the impervious coverage over the Site and no significant changes to the runoff patterns nor times of concentration from the project areas. Under the proposed condition, there would be a slight reduction in the total runoff as 0.28 acres of existing parking lot is being replaced with meadow grasses. As meadow has a slightly smaller curve number (CN), 78 versus a CN of 80 for open space, maintained lawns, less surface runoff will be generated from the restored pavement area which will be in a meadow condition. Also, if the restored area were more conservatively modeled with a CN of 80 for open space, the water quantity condition would be met as the post-construction hydrograph would not exceed at any point in time the pre-construction hydrograph.

Refer to the Drainage Area Maps in Section V for the study area used to model the pre- and post-construction conditions. The hydrograph table comparing pre- and post- construction outfall flows have been provided in Appendix C-1 as well as comparison hydrographs in Figures 1, 2, and 3 below showing no increase in runoff at any point during the storm event. A summary of the peak runoff rates and volumes has been provided in Table 2. Refer to Appendix C-2 for the hydrologic routings for the Project's model.

Table 2 – Peak Runoff Rates and Volumes

	Peak Runoff Rates (CFS)		**Total Hydrograph Volume (AC-FT)**	
	Existing	**Proposed**	*Existing*	**Proposed**
2-Year	*2.61*	**2.57**	*0.197*	**0.194**
10-Year	*4.34*	**4.29**	*0.330*	**0.326**
100-Year	*7.78*	**7.72**	*0.603*	**0.598**

Figure 1 – 2-year Storm Pre- and Post-Construction Hydrograph Chart

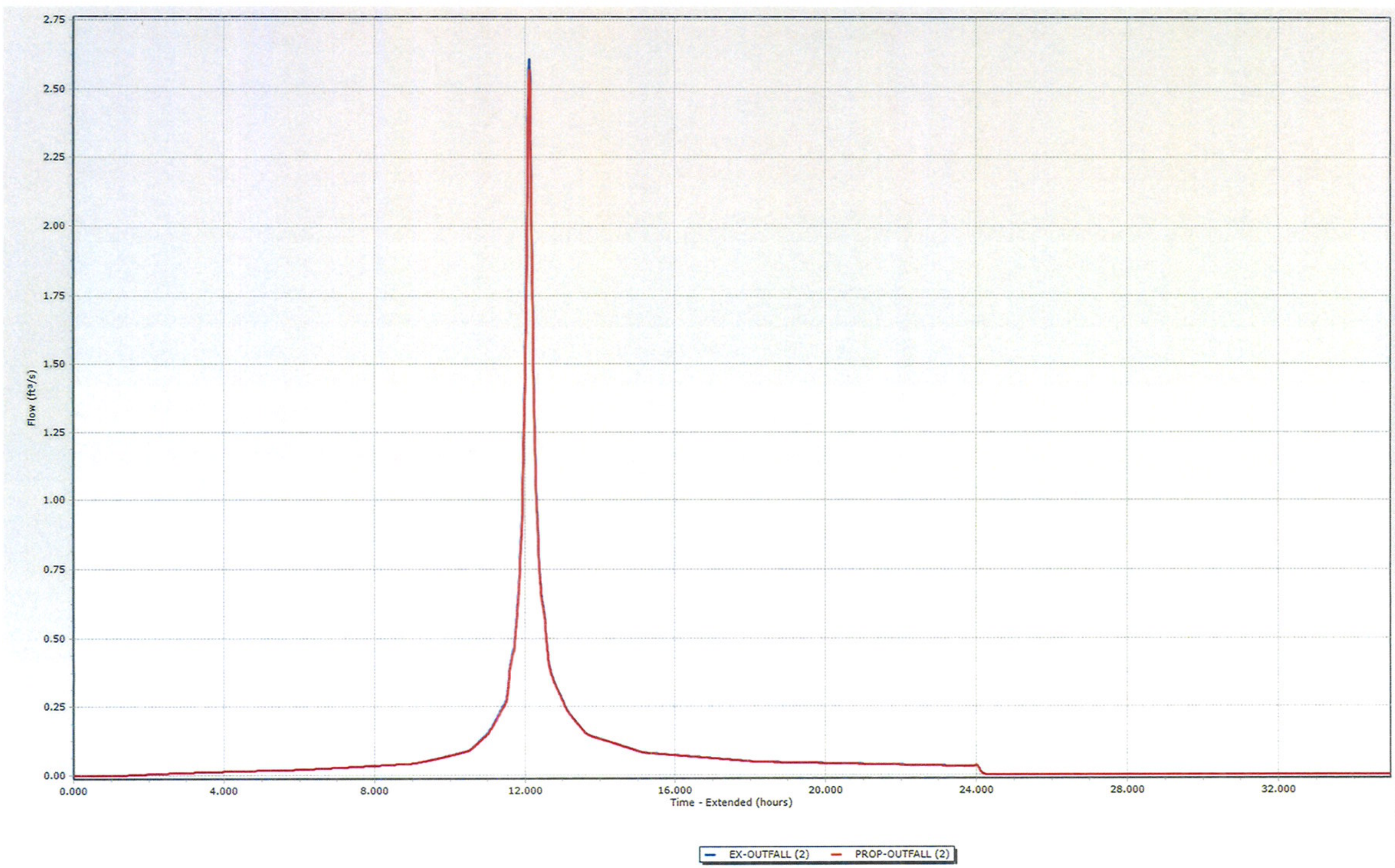


Figure 2 – 10-year Storm Pre- and Post-Construction Hydrograph Chart

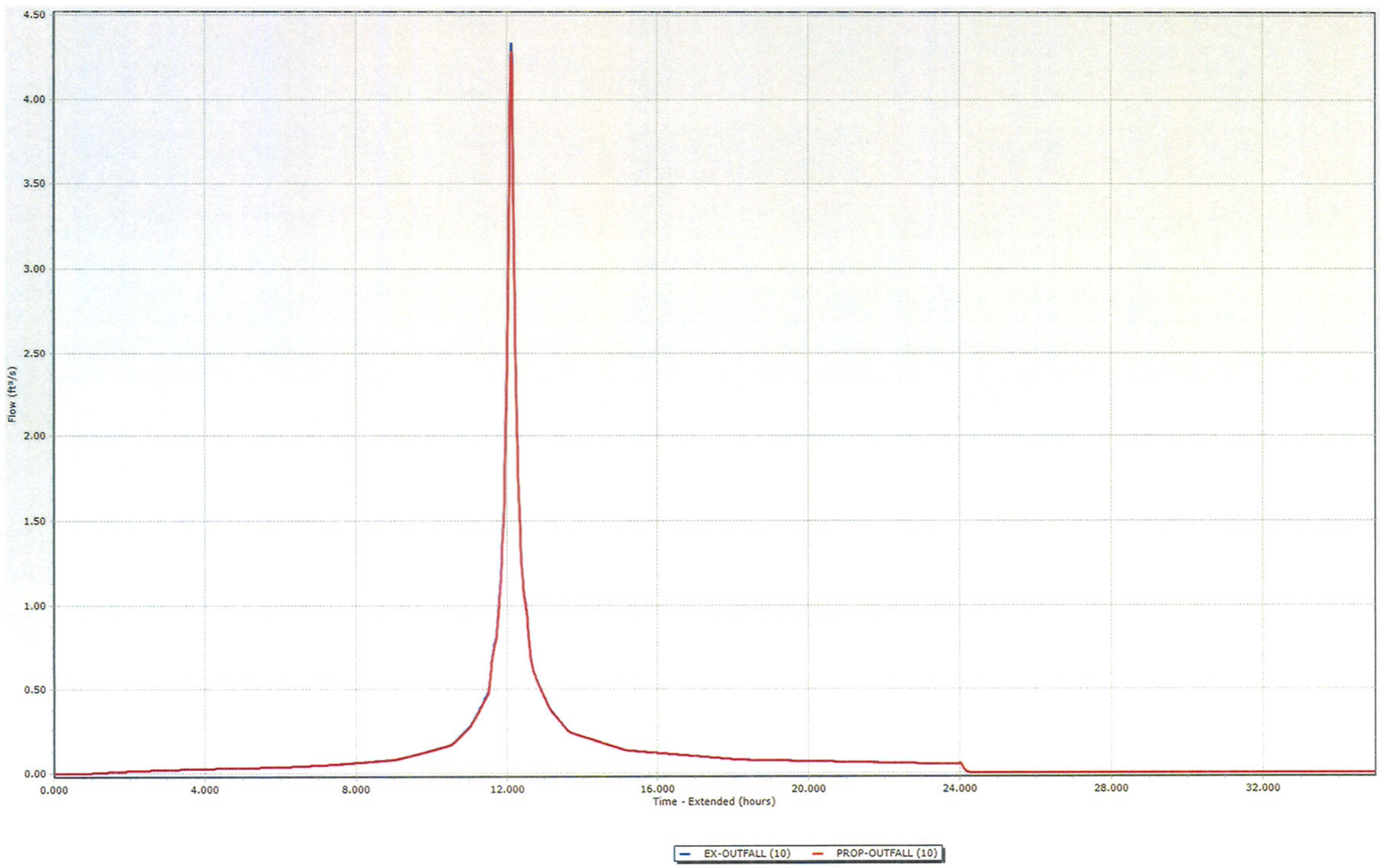
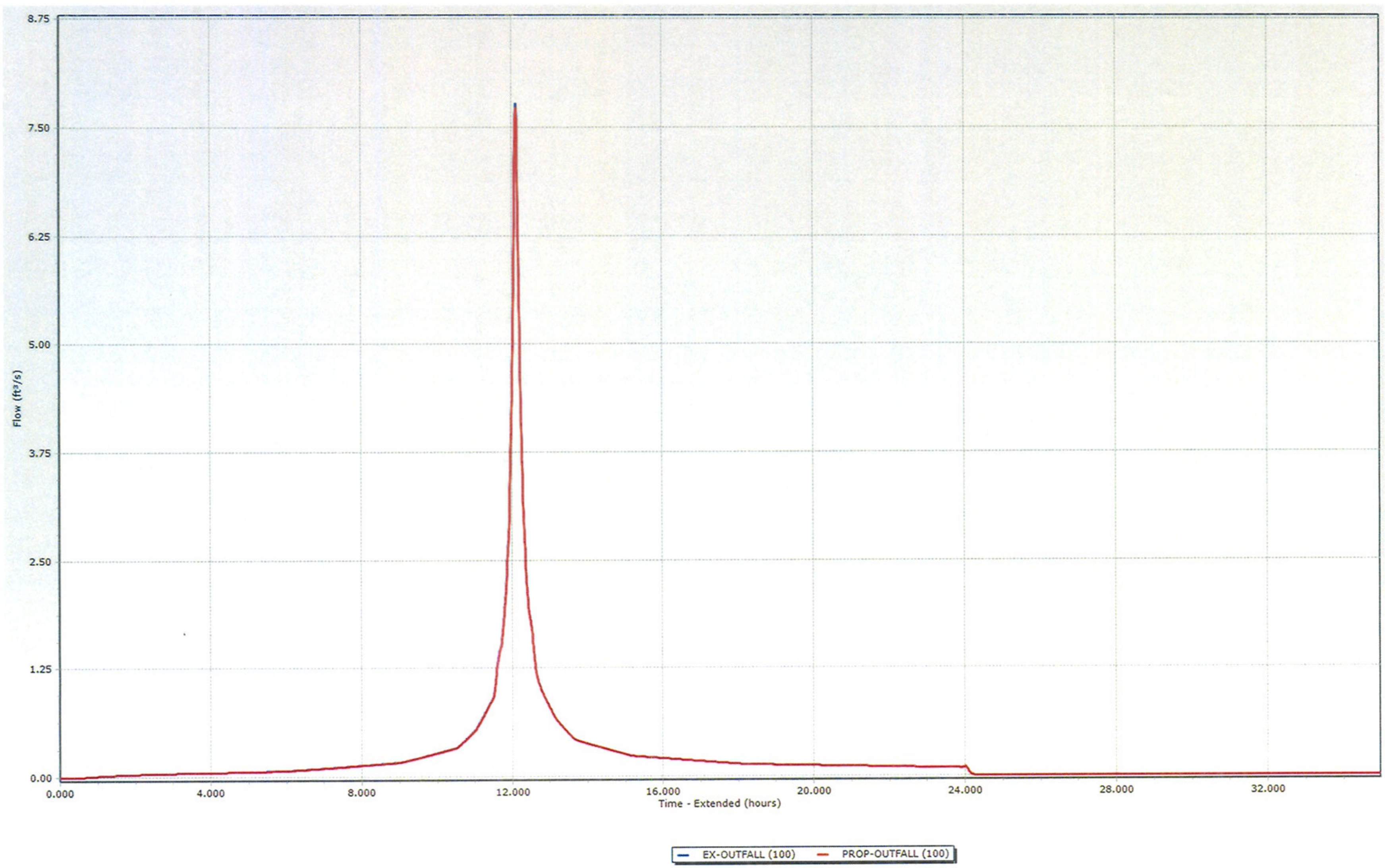


Figure 3 – 100-year Storm Pre- and Post-Construction Hydrograph Chart



As shown, the peak runoff rates and total hydrograph volumes leaving the site slightly decrease under proposed site conditions. Since the post-construction hydrograph does not exceed at any point in time the pre-construction hydrograph, the water quantity control requirement will be met.

The above analysis conservatively does not factor in the rain garden also proposed. The rain garden, which collects approximately 0.04 acres of open space areas, provides some additional benefit towards stormwater quantity control. Due to its small size, the rain garden has not been quantified in these calculations, however a smaller further reduction in peak runoff rates and hydrograph volumes should be expected if it were modeled.

The Township LUO references the state rules for meeting stormwater quantity control. It also has an additional rule stating that if flows increase by more than 1 cubic foot per second, a basin would be required. (Section 522.F(1)) As flows decrease under the Project, a basin is not required, however, as explained above, a small rain garden is provided.

C. Stormwater Quality Control

As stated in the previous section, this Project is defined as a "Major development" by the Township (LUO Section 522.A) and DRCC (N.J.A.C. 7:45-8.7) therefore stormwater quality control is required to be addressed for these bodies. However, per the N.J.A.C. 7:8-5.5(a), though this is defined as a "Major development" by the NJDEP, as there is no increase in regulated motor vehicle surfaces by 0.25 acres or more, the Project is not required to address water quality for the NJDEP.

Under this Project, no new motor vehicle surfaces are being created. Overall, 0.28 acres of existing motor vehicle pavement, currently directly connected to the campus storm sewer system with no detention or treatment, is being eliminated. According to NJDEP's njstormwater.org "Clean roof runoff and runoff from lawns, walkways, patios or decks do not need to be treated for TSS removal." Of the new impervious surfaces being created for this Project, all is either building roof areas or walkways. As these surfaces are non-vehicular surfaces, there is no direct water quality impact on the proposed stormwater runoff from the Project. Accordingly, there is no adverse impact to TSS loading in stormwater runoff as a result of this Project therefore there is no detrimental impact to the quality of stormwater leaving the Project site.

D. Groundwater Recharge

As stated previously, the Project is defined as a "Major development" by the Township (LUO Section 522.A), NJDEP (N.J.A.C. 7:8-5.7), and DRCC (N.J.A.C. 7:45-8.5) therefore the rules regarding groundwater recharge requirements apply.

According to the Web Soils Survey of the site (refer to Appendix B), the soils throughout the Project area are Udorthents, a soil type with a Hydrologic Soil Group (HSG) Type 'D.' Per the geotechnical bores performed at the Project site by Melick-Tully & Associates (refer to Appendix A), the soil borings are generally consistent with the definition provided in the Web Soils Survey therefore it was assumed that the soil types are indeed type 'D.'

An HSG 'D' soil yields zero (0) groundwater recharge using the New Jersey Groundwater Recharge Spreadsheet (NJ GSR-32), therefore there is no groundwater recharge that must be maintained at the site. A copy of the completed spreadsheet is included in Appendix D showing that the "post-development recharge deficit" is zero. Accordingly, groundwater recharge can be considered maintained under proposed conditions since little to no recharge occurs under existing conditions. No additional groundwater recharge measures are required for this Project. There will be, though not quantified here, some recharge provided through the removal of the portion of existing parking lot and within the rain garden against the side of the Alumni Gym addition.

E. Non-Structural Stormwater Management Strategies

In accordance with the DRCC (N.J.A.C. 7:45-8.4) requirements, non-structural stormwater management strategies must be incorporated into the proposed site design for "Major projects." The non-structural strategy rules have recently been repealed under the Township and NJDEP rules. To accomplish a better site design and further mitigate the impacts of proposed stormwater runoff, provisions have been made in the Project's design to incorporate a combination of non-structural, Low Impact Development (LID) measures.

To assist in determining that the non-structural stormwater management strategies have been incorporated into the site design "to the maximum extent practical," NJDEP has developed the New Jersey Non-Structural Stormwater Management Strategies Point System (NSPS) spreadsheet. The NSPS spreadsheet is a tool that quantifies the level of non-structural strategies utilized in the design of a site. For this analysis, the Project area as illustrated in the Impervious Area Maps, Section V, was used in the calculations. A copy of the NSPS spreadsheet is included in Appendix E of this report demonstrating that a sufficient use of non-structural strategies has been incorporated into the design of this site.

Below is a summary of how the nine (9) low impact development techniques outlined in the BMP manual have been addressed for this project:

1. *Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss;*

   This Project's proposed improvements are located outside of existing environmentally sensitive and constrained areas.

2. *Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces;*

   New impervious surfaces have been minimized to only include the new building addition and associated walks. A 0.28-acre portion of existing parking lot that ties directly into the existing campus storm sewer system is to be converted to a meadow planting area.

3. *Maximize the protection of natural drainage features and vegetation;*

   As it is a previously developed site, no natural channels and wetlands are located in the Project area.

4. *Minimize the decrease in the "time of concentration" from pre-construction to post-construction. "Time of concentration" is defined as the time it takes for runoff to travel from the hydraulically most distant point of the drainage area to the point of intersection within a watershed;*

   The existing times of concentrations are short as existing roof drains and the parking lot area tie directly to the campus storm sewer system. The new additions will continue tie into the storm sewer system. A portion of the existing parking lot is being converted

to meadow plantings therefore a small increase in time of concentration, though not quantified, will occur. A small rain garden in the Phase 2B area of the Project will also detain runoff from small storm events, again not quantified, will slightly increase the time of concentration for the overall Project site.

5. *Minimize land disturbance including clearing and grading;*

   The entire Project site has previously been disturbed. Disturbance areas have been limited to the new building, the new walks, the rain garden, and the removal of existing pavement.

6. *Minimize soil compaction;*

   Soil compaction will be limited to the areas of new work and disturbed open space areas will be decompacted in accordance with the township and state soil erosion decompaction standards.

7. *Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides;*

   Low maintenance vegetation will be incorporated into the design.

8. *Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas;*

   The Project is being constructed in a compact area with existing deep storm sewers therefore vegetated open channels are not feasible for this Project.

9. *Preventative source controls;*

   Campus-wide trash collection currently occurs at the University. Additionally, trash racks will be installed on the basin outlet structure to intercept any further debris (such as leaves and branches) from entering the storm sewer system.

F. Green Infrastructure

As the Project is defined as a "Major development" per the Township ordinances (LUO Section 522.A) and NJDEP rules (N.J.A.C. 7:8-5.2(a)), green infrastructure best management practices are to be incorporated into the Project to satisfy the stormwater management goals. The proposed primary stormwater management feature for the Project is the removal of approximately 0.28 acres of existing impervious motor vehicle surfaces from the Site and restoration and replanting of meadow grass at the same location. This feature is not a standard BMP type for treating runoff, however by virtue of regulated motor vehicle surfaces being removed provides a reduction in total suspended solids and is a low impact development technique by being nonstructural and minimizes land disturbance to the footprint of the pavement removal itself, this feature meets the intent of the green infrastructure rules.

The small rain garden proposed on the Site, adjacent to the Phase 2B addition, is a listed BMP in the Green Infrastructure rules table (Small-scale Bioretention System). The rain garden will provide a small amount of stormwater quantity control for the Project.

G. Soil Erosion and Sediment Control

Because the Project proposes land disturbance in excess of 5,000 square feet, it will require soil erosion and sediment control approval in accordance with the "Standards for Soil Erosion and Sediment Control in New Jersey" (SSESC).

At this time, a soil erosion application has not been prepared. However, an application will be made and measures to control soil erosion will include but not be limited to the following:

- Stone construction access/tracking pads shall be provided at construction entrance/access area. All sediment spilled, dropped, washed or tracked onto roadway shall be removed immediately.
- Temporary and permanent ground cover shall be provided for all disturbed areas as soon as possible after grading.
- Silt fence shall be placed along the toe of all disturbed areas preventing migration of silt and soil from the construction area.
- All inlets shall be provided inlet protection to prevent migration of silt and soil into storm sewers.
- The contractor shall take all appropriate soil erosion and sediment control measures to avoid sediment-laden water from discharging off site prior to its stabilization or into the existing storm sewers.

H. Review Agencies

1. Lawrence Township Planning Board
2. Lawrence Township Soil Erosion and Sediment Control Review
3. New Jersey Department of Environmental Protection
4. Delaware and Raritan Canal Commission (DRCC)

I. References

1. Blick, S.A., F. Kelly, and J.J. Skupien. March 2021. New Jersey Stormwater Best Management Practices Manual. New Jersey Department of Environmental Protection, Division of Watershed Management. Trenton, New Jersey.
2. New Jersey Department of Agriculture. July 2017. Standards for Soil Erosion and Sediment Control in New Jersey, 7th Edition. State Soil Conservation Committee. Trenton, New Jersey.
3. Township of Lawrence. Township of Lawrence Land Use Ordinance.
4. Melick-Tully & Associates, a Division of GZA. February 11, 2020. Subsurface Investigation – Rider University Proposed Additions to Alumni Gymnasium. South Bound Brook, New Jersey.

5. New Jersey Administrative Code. March 2, 2021. Title 7 Environmental Protection, Chapter 8 Stormwater Management, Subchapter 5 Design and Performance Standards for Stormwater Management Measures. Trenton, New Jersey.
6. New Jersey Administrative Code. March 2, 2021. Title 7 Environmental Protection, Chapter 45 Rules for the Review Zone of the Delaware and Raritan Canal State Park, Subchapter 8 Stormwater Runoff and Water Quality Impact Review. Trenton, New Jersey.

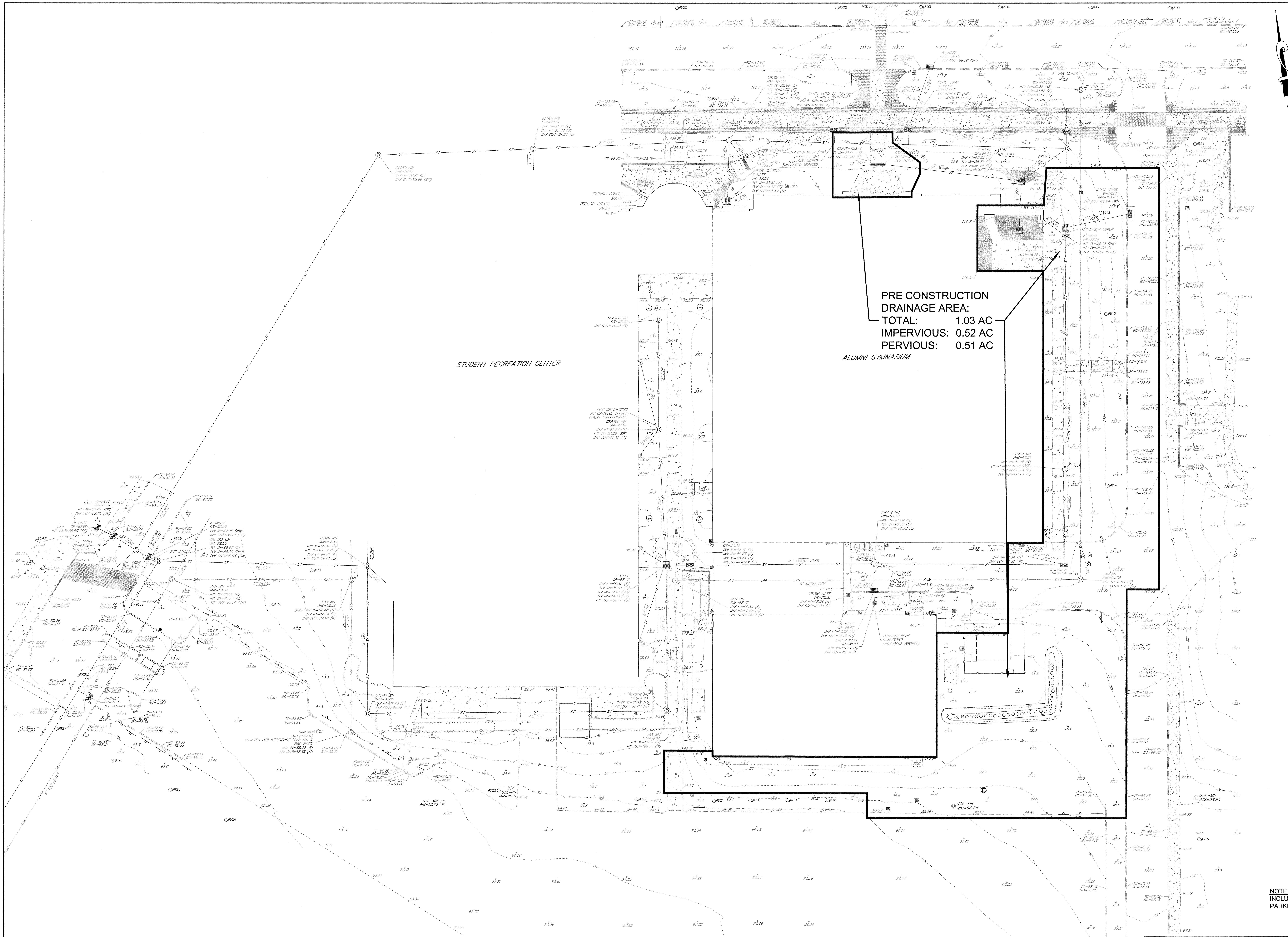
III. UTILITY SERVICES

Utility services for the site are generally available throughout the campus and currently serve the existing Alumni Gym. All new utility extensions will be made through the existing building.

The site is located in the service area of the following utility purveyors:

- Trenton Water Works (TWW)
- Ewing-Lawrence Sewerage Authority (ELSA) - Sanitary Sewer
- Public Service Electric and Gas Company (PSE&G) - Electric and Gas
- Communications – Comcast Cablevision / Verizon Communications – Telephone, Fiber Optic, and Cable Access TV

V. DRAINAGE AREA MAPS



NOTE: PRE CONSTRUCTION DRAINAGE AREA NOTED HEREON INCLUDES 0.28 AC. OF IMPERVIOUS SURFACES AT EXISTING PARKING LOT- REFER TO SHEET CE-2.

LAWRENCE TWP. TAX MAP DATA:

SHEET 28.02, 28.03 & 28.04
BLOCK 2801
LOT 24

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)
1 inch = 200 feet

REV.	DESCRIPTION	DATE	DFT.BY	CKD.BY

09/17/2021
DATE OF SIGN.

THOMAS E. O'SHEA
N.J. PROFESSIONAL ENGINEER LIC. NO. GE 31228

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PRE–CONSTRUCTION DRAINAGE AREA MAP
OF
ADDITIONS & RENOVATIONS TO
ALUMNI GYM & STRENGTH & CONDITIONING CENTER
PREPARED FOR
RIDER UNIVERSITY
SITUATED IN
LAWRENCE TOWNSHIP MERCER CO., N.J.
SCALE 1"=20' SEPTEMBER 17, 2021

DRAWN BY JRM DATE 08/17/21	FIELD BK	ORDER No.	FILE No.	SHEET No.
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NOTE: POST CONSTRUCTION DRAINAGE AREA NOTED HEREON INCLUDES 0.28 AC. OF NEW MEADOW PLANTINGS AT EXISTING PARKING LOT- REFER TO SHEET CE-2.

LAWRENCE TWP. TAX MAP DATA:

SHEET 28.02, 28.03 & 28.04
BLOCK 2801
LOT 24

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)
1 inch = 200 feet

REV.	DESCRIPTION	DATE	DFT.BY	CKD.BY

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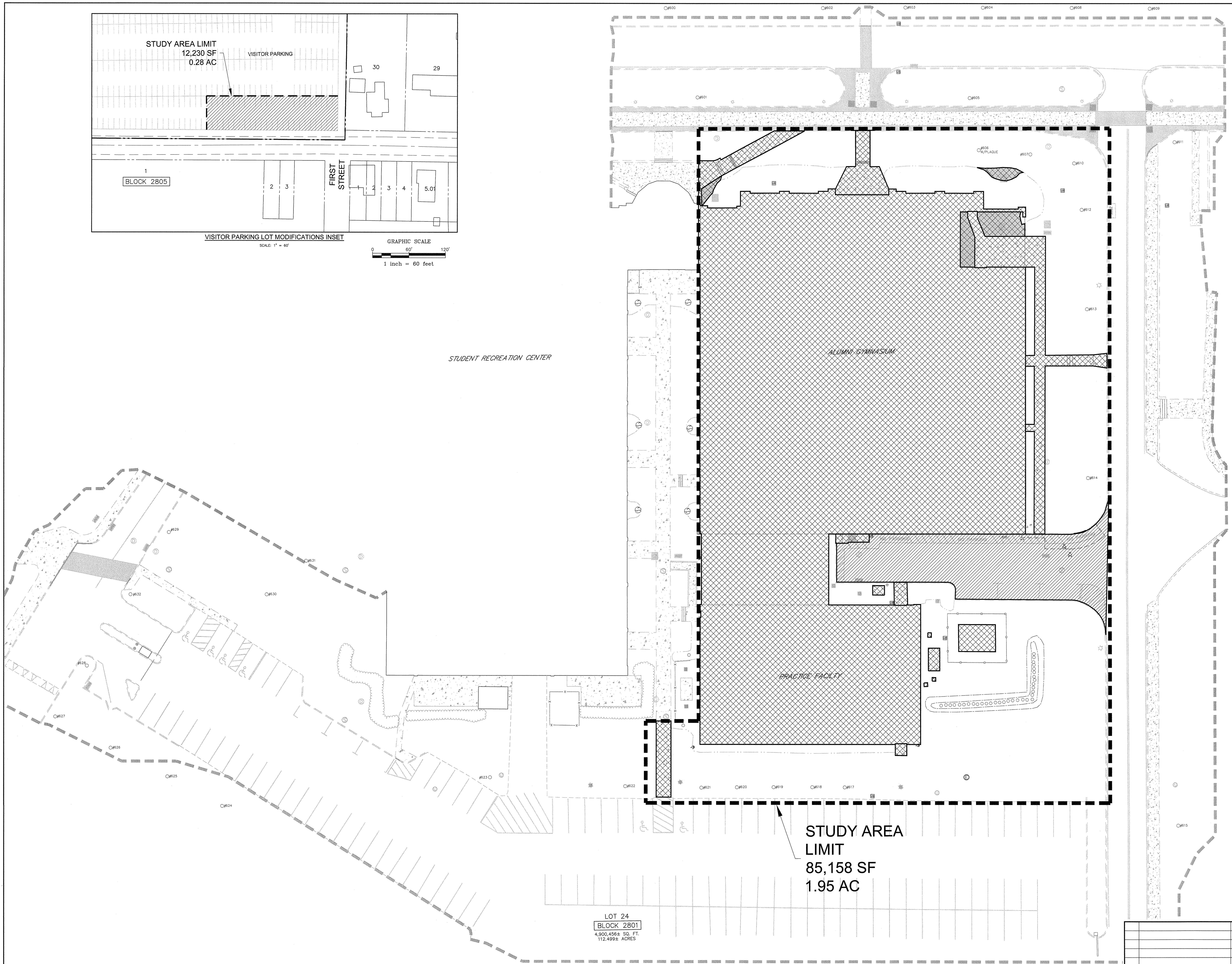

EXISTING IMPERVIOUS AREAS:

VEHICULAR	17,063 SF	0.37 AC
NON-VEHICULAR	48,753 SF	1.12 AC
IMPERVIOUS SURFACES TOTAL	65,816 SF	1.51 AC

LEGEND:

- IMPERVIOUS SURFACE (VEHICULAR)
- IMPERVIOUS SURFACE (NON-VEHICULAR)

LAWRENCE TWP. TAX MAP DATA:

SHEET 28.02, 28.03 & 28.04
BLOCK 2801
LOT 24

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 feet

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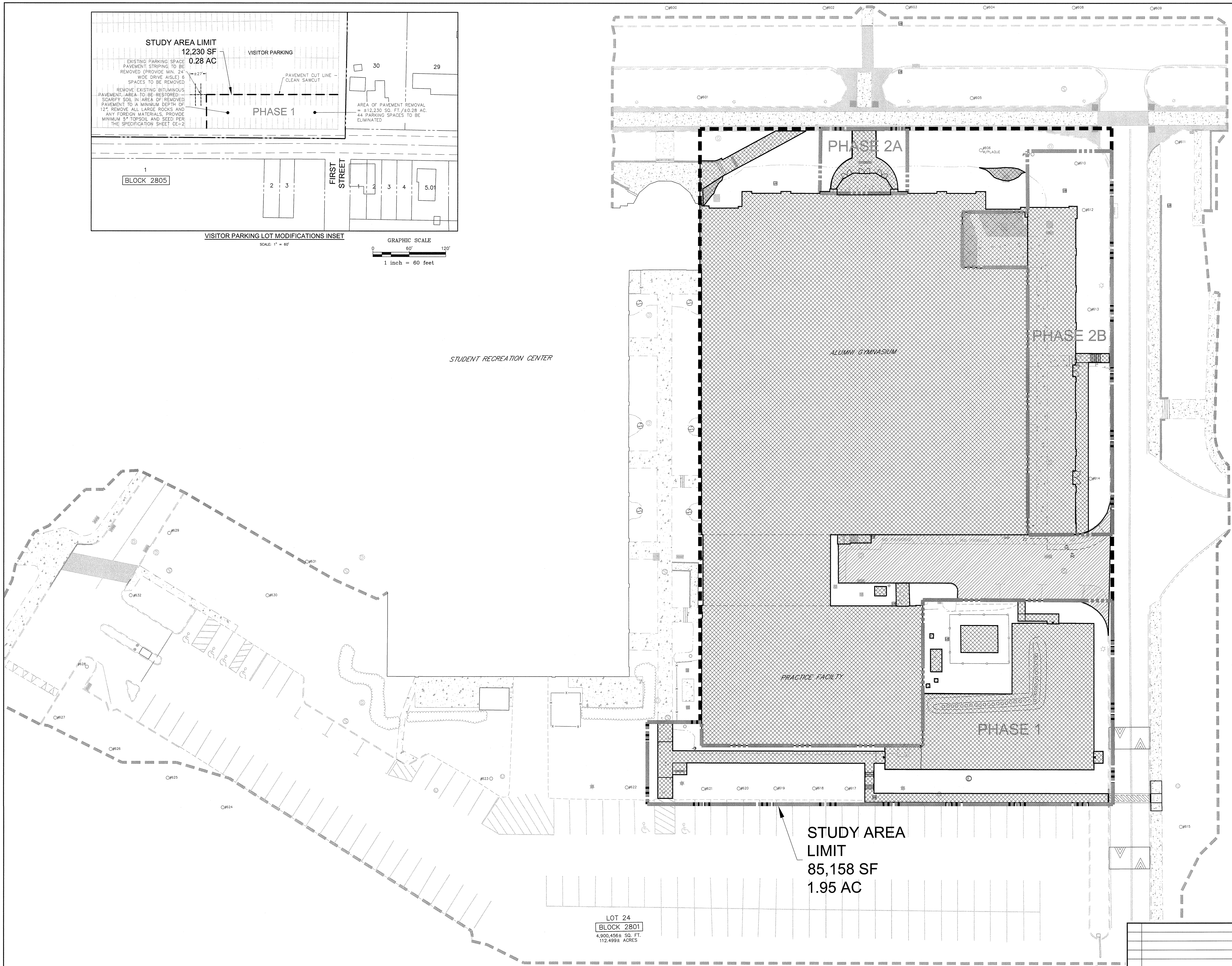

VISITOR PARKING LOT MODIFICATIONS INSET

SCALE: 1" = 60'

GRAPHIC SCALE

1 inch = 60 feet

EXISTING IMPERVIOUS AREAS:

VEHICULAR	16,584 SF	0.38 AC
NON-VEHICULAR	48,753 SF	1.12 AC
IMPERVIOUS SURFACES TOTAL	65,337 SF	1.50 AC

PROPOSED IMPERVIOUS AREAS:

VEHICULAR	4,838 SF	0.11 AC
NON-VEHICULAR	60,832 SF	1.40 AC
IMPERVIOUS SURFACES TOTAL	65,670 SF	1.51 AC

NET INCREASE CALCULATIONS:

PHASE 1 POST-CONSTRUCTION PROPOSED	60,682 SF	1.39 AC
– TOTAL PRE-CONSTRUCTION EXISTING	65,337 SF	1.50 AC
NET DECREASE IN IMPERVIOUS:	4,655 SF	0.11 AC
PHASE 2 POST-CONSTRUCTION PROPOSED	58,180 SF	1.34 AC
– TOTAL PRE-CONSTRUCTION EXISTING	65,337 SF	1.50 AC
NET DECREASE IN IMPERVIOUS:	7,157 SF	0.16 AC
FULL BUILD OUT (PHASES 1 & 2) POST-CONSTRUCTION PROPOSED	65,670 SF	1.51 AC
– TOTAL PRE-CONSTRUCTION EXISTING	65,816 SF	1.51 AC
NET INCREASE IN IMPERVIOUS:	–146 SF	0.00 AC

LEGEND:

IMPERVIOUS SURFACE (VEHICULAR)

IMPERVIOUS SURFACE (NON-VEHICULAR)

PHASE LIMIT

LAWRENCE TWP. TAX MAP DATA:

SHEET 28.02, 28.03 & 28.04
BLOCK 2801
LOT 24

GRAPHIC SCALE

(IN FEET)
1 inch = 20 feet

REV.	DESCRIPTION	DATE	DFT.BY	CKD.BY

09/17/2021
DATE OF SIGN.

THOMAS E. O'SHEA
N.J. PROFESSIONAL ENGINEER LIC. NO. GE 31228

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consulting engineers, planners & land surveyors
103 College Road East • Princeton, NJ 08540 • 609-987-2323
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www.vannoteharvey.com **Certificate of Authorization** No. 24GA28271300
van note-harvey associates - Since 1894 -

PROPOSED IMPERVIOUS AREAS
OF
ADDITIONS & RENOVATIONS TO
ALUMNI GYM & STRENGTH & CONDITIONING CENTER
PREPARED FOR
RIDER UNIVERSITY
SITUATED IN
LAWRENCE TOWNSHIP MERCER CO., N.J.
SCALE 1"=20' SEPTEMBER 17, 2021

DRAWN BY JRM DATE 08/17/21	FIELD BK	ORDER No.	FILE No.	SHEET No.
CHECKED BY BRP/MNK DATE 09/17/21	PAGE	44760-400-21	204-C-2	IMP-PROP

N:\P\44760\DWG\44760-IMP-PLT.DWG

APPENDIX A

SUBSURFACE INVESTIGATION REPORT

BY MELICK-TULLY AND ASSOCIATES

Melick-Tully
& Associates

A Division of GZA

REPORT
SUBSURFACE INVESTIGATION
RIDER UNIVERSITY
Proposed Additions to Alumni Gymnasium
And Practice Facility
2083 Lawrenceville Road
Lawrence Township, Mercer County, New Jersey

February 11, 2020
File No. 26.0091992.00

PREPARED FOR:
Rider University
c/o Spiezle Architectural Group
900 West Sproul Road, Suite 201
Springfield, PA 19064

Melick-Tully & Associates, A Division of GZA
117 Canal Road | South Bound Brook, NJ 08880
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Todd E. Horowitz, P.E., Associate Principal

February 11, 2020
File No. 26.0091992.00

Rider University
c/o Spiezle Architectural Group
900 West Sproul Road, Suite 201
Springfield, Pennsylvania 19064

Attention: Mr. John Wright, AIA
Associate Principal

Report
Subsurface Investigation
Proposed Alumni Gymnasium Additions
Lawrence Township, Mercer County, New Jersey
Rider University

Introduction

This report presents the results of a subsurface investigation performed by Melick-Tully and Associates, a Division of GZA GeoEnvironmental, Inc. (MTA) for the proposed additions to Alumni Gymnasium and Practice Facility located at Rider University in Lawrence Township, Mercer County, New Jersey. Rider University has a site address of 2083 Lawrenceville Road and the gymnasium is located in the southeast portion of the campus and is shown on the Site Location Map, Plate 1. Our work was performed in general accordance with our proposal dated January 3, 2020.

Proposed Construction

Information provided by Spiezle indicates that two separate additions would be constructed to the existing gymnasium. The gymnasium addition would be a single story 5,200 square foot addition located along the eastern side of the existing gym and consist of additional offices and locker rooms. The second addition would also be a single story, approximately 4,500 square foot weight room located at the southeast corner of the existing building. No grading information for the proposed additions have been provided but it is assumed that the new floors would be of slab-on-grade construction and designed to match that of the existing ground floor level of the gymnasium.

Purpose and Scope of Work

The purpose of our services was to:

1) explore the subsurface soil, rock and groundwater conditions as near as practical to the requested addition areas identified to us;

2) estimate the relevant geotechnical engineering properties of the encountered materials;

3) evaluate the site foundation requirements considering the anticipated structural loads and encountered subsurface conditions;

4) recommend an appropriate type of foundation for support of the proposed additions, and provide geotechnical-related foundation design and installation criteria, including an estimate of the Site Class as defined by the International Building Code 2018, New Jersey Edition, for seismic design purposes;

5) provide recommendations for the support and the need for subdrainage of the ground level floor slabs;

6) estimate the post-construction settlements of the recommended floor and foundation systems; and

7) discuss appropriate earthwork considerations consistent with the proposed construction and encountered subsurface conditions.

To accomplish these purposes, a subsurface exploration program consisting of five supervised test borings was performed, two in the gymnasium addition area and three in the proposed weight room addition. The borings were advanced in the building addition areas using hollow-stem auger drilling equipment mounted on an ATV rig and extended to depths of approximately 12 to 19 feet below the existing ground surface. The exploration locations were adjusted in the field based on access, conditions and utility locations and reviewed by Rider University personnel. The approximate locations of the explorations performed for this study are shown on the Plot Plan, Plate 2.

All field work was performed under the direct technical observation of a representative from MTA. Our representative located the explorations in the field relative to existing surface features, maintained continuous logs of the explorations as the work proceeded, and supervised the soil sampling operations. Soil samples suitable for identification purposes were extracted from the borings at closely spaced intervals in general accordance with the procedures of the Standard Penetration Test. The borings were generally drilled to auger and sampler refusal atop bedrock. No coring of rock was performed for this study.

Detailed descriptions of the encountered subsurface conditions are presented on the Logs of Borings, Plates 3A through 3E. The soil samples obtained from the test borings were visually described in general accordance with the Unified Soil Classification System shown on Plate 4.

All soil samples were brought to our office for further examination in our soil mechanics laboratory. A geotechnical laboratory testing program consisting of mechanical grain-size analyses and moisture content determinations was performed on selected samples to assist in their classification and evaluation. The results of the mechanical grain-size tests are presented on Plates 5A and 5B, Gradation Curves, while the results of the natural moisture content determinations are shown on the appropriate boring logs.

The results of our field explorations and laboratory testing program have provided the basis for our engineering analyses and design recommendations. The following discussions of our findings and recommendations are subject to the Limitations attached as an Appendix to this report.

Site Conditions

Surface Features: Both additions would be located on the eastern side of the existing gymnasium building in existing lawn areas. The two addition areas extend east towards a Rider University interior roadway and are separated by an asphalt driveway and loading area. The lawn area with sidewalks where the gymnasium addition is located extends about 45 feet from the building edge to the roadway, and approximately 180 feet along the length of the existing building. Sidewalks and numerous subsurface utilities are present in the lawn area where the gymnasium addition would be located. An asphalt parking lot is located south of the weight room addition.

Topographic information was not provided to us; however, the weight room addition lawn is relatively flat, while the lawn area for the gymnasium addition slopes upward from the existing gym to the roadway to the east.

Subsurface Conditions: All five of the borings were performed in lawn areas and encountered approximately 9 to 16 inches of topsoil at the ground surface. Clayey sandy silt or silty sand fill materials were encountered in Borings 202, 203 and 204 and extended to depths of 5.5, 3, and 5.5 feet below the ground surface respectively. A thin layer of clayey silt was encountered below the topsoil in Borings 201 and 205. The upper soils were underlain by medium dense to very dense silty sands or stiff clayey silt to about 10 to 12 feet below grade. The lower portions of these strata may represent decomposed, slightly weathered shale or sandstone. The silty sands and clayey silts were further underlain by weathered shale and sandstone bedrock generally present at depths on the order of 10 to 12 feet below grade. The shale and sandstone bedrock extended the remaining depth explored in each of the borings. The transition from soil to rock was sometimes gradual and variable, and the layers shown should be considered approximate only and will vary in the field.

Groundwater was not encountered in any of the borings performed for this study. Note that the presence of relatively restrictive clayey layers and local mottling also suggests that perched or trapped water can be present at higher levels. Groundwater conditions will also change seasonally due to variations in rainfall, temperature and other factors occurring since the time measurements were made.

Findings and Recommendations

General: Based on the results of the explorations performed for our study, it is our opinion that:

1) The proposed building additions could be supported atop conventional shallow spread foundations deriving their support from the undisturbed natural stiff to very stiff silts and clays or medium dense sandy soils. Foundations supported atop suitable natural soils may be designed for maximum net allowable bearing pressures of up to 3,000 pounds per square foot. Foundations which abut the existing structure should be established at the same level as the existing foundations, provided they reach the intended natural bearing stratum, so as not to impose new loads on the existing foundation system.

2) The existing fill and existing utilities and utility backfill would not be suitable for foundation or slab support and should be excavated for their full depth and replaced with structural fill. The proposed addition floor slabs could derive their support at-grade from the undisturbed natural soils or controlled compacted fill installed atop the native soils to achieve the floor subgrade levels. The floor slabs should be underlain by a layer of porous fill.

3) Groundwater was not observed during the time of the drilling of the borings and should not be a major construction issue for the anticipated shallow foundation excavations and slab-on-grade construction. Some seasonal or perched or trapped water as well as surface runoff accumulation could be encountered above these levels during construction. The contractor should be required to provide all dewatering necessary to maintain relatively dry excavations during construction.

4) The silty and clayey near surface soils, native and fill, would generally be poorly suited for reuse as structural fill, as they would be highly susceptible to moisture related stability and compaction problems. The silty and clayey soils would be better suited for use in non-structural landscaped areas. Excavated silty sands would provide an acceptable source of fill if at or conditioned to moisture contents suitable for compaction.

Further discussions of these items and others considered relevant to the proposed construction are presented in subsequent sections of this report.

Site Preparation and Earthwork: The topsoil should be stripped from below and at least 5 feet beyond the building addition areas, and all surface improvements including concrete sidewalks and planting beds, trees should be removed. All subsurface utility piping and structures and related fill or backfill should be completely removed and the utilities rerouted beyond the proposed addition limits. Where rerouted, the utilities should be moved an adequate distance so that the future utility excavation does not undermine the proposed addition foundations and so the new foundations do not impose load on the utilities. Any cutoff or abandoned utilities or porous bedding layers that may transmit water toward the additions should be cutoff and sealed. Any existing utilities to remain should be accommodated in the design.

Fill materials were encountered in Borings 202, 203 and 204 ranging from 3 to 5.5 feet below the ground surface and should be expected to be present elsewhere due to the prior construction activity. We recommend existing fill, where present, be removed for its full depth and replaced with controlled compacted fill from below and 5 feet beyond the addition areas so as to allow support of the foundations on native bearing soil or controlled compacted fill. If the areas outside the additions will be primarily landscaped and it is desired to minimize the excavations and replacement work, foundations could be locally lowered to be established directly on native bearing soils such that the removal and replacement work is limited to the addition footprints only. Suitable granular portions of the excavated fill should be stockpiled and covered if planned to be reused as controlled compacted fill.

Following the excavation of the existing fill and backfill materials, the exposed natural soil subgrades should be proofrolled, moisture conditioned, if necessary, and recompacted to a relatively firm and unyielding consistency under the observation of a representative from MTA and to at least 95 percent of their maximum dry density. Compaction should be performed using portable vibratory equipment such as a double drum trench roller to prevent damage to existing improvements. Following overexcavation and proofrolling, the excavation should then be backfilled with controlled compacted fill as discussed later in this report.

All fill necessary to reach the design subgrade levels following the excavation of existing fill below structural areas should consist of controlled compacted fill. The upper existing fill materials consisted primarily of clayey sandy silts and silty sands had moisture contents ranging from about 22 to 39 percent, which were at moisture contents typically in excess of their anticipated optimum moisture contents to permit compaction; therefore, drying and aeration would be expected to be necessary to permit reuse of these soils as controlled compacted fill or backfill. Due to the sensitivity to moisture related compaction and stability problems, we do not recommend the use of these materials as compacted fill below the addition slabs. These materials would be best used in landscape areas where lesser degrees of compaction are allowable. Natural silty sands were encountered in Borings 201, 203 and 205 and if available could be reused as structural fill if they are at or conditioned to moisture contents favorable for compaction but would also be sensitive to moisture related compaction concerns. As reuse of the clayey and silty sands as backfill within the building area could be difficult and may only be feasible by selective use of granular materials during the hot, dry portions of the year, and considering the relatively limited size of the addition areas, we recommend that the construction budget assume that imported fill would be required for use as structural fill or backfill to limit potential delays and claims for extras and to expedite the work.

Imported fill, where required to complete the building backfill should consist of uncontaminated, relatively well-graded sand and gravel soils containing less than 15 percent by weight of material passing a U.S. Standard No. 200 sieve and having a maximum particle size of 4 inches. Considering the limited size of the areas, the use of clean stone could be considered for use as structural fill within the addition footprints due to the stone's favorable drainage and compaction properties. Documentation of the environmental quality of the imported fill should include a written certification from the fill supplier stating that the fill is virgin material from a commercial or non-commercial source.

All mass fill within the building additions should consist of controlled compacted fill that is spread in layers on the order of 12 inches or less in loose thickness and uniformly compacted to at least 95 percent of maximum dry density as determined by the ASTM D-1557 test procedure. Due to the close proximity of the existing buildings, compaction should be performed using portable vibratory equipment such as a dual-drum trench roller, as necessary so as not to impact the building, occupants or any sensitive equipment. Backfill placed in confined areas such as foundation or utility trench excavations should be spread in layers of 6 to 8 inches or less in loose thickness and compacted to similar densities.

Construction excavations should be performed in accordance with applicable safety codes, including the latest OSHA Excavation Regulations. Excavation support should be provided, if needed, to prevent damage to existing improvements or to provide for safe excavations. Due to the variability and sandy nature of some of the soils encountered in the borings, it is our opinion that the encountered fill materials are typical of Type "C" soils as defined by the OSHA Excavation Regulations.

Groundwater was not encountered in any of the borings performed for the gymnasium and weight room additions and should not be a major construction concern for the anticipated shallow excavations. The presence of clayey fill and native soil layers and local mottling suggests water could occur at higher levels, and that perched and trapped groundwater seepage may be encountered in the fill, especially after wet weather periods. As such, some localized dewatering of excavations should be anticipated. If stone bedding is present below pipes or the footings of the existing building, the stone could be another source of local water seepage into excavations. It is anticipated that pumping from a series of sumps and trenches located in or adjacent to the excavations would be satisfactory for dewatering shallow excavations. The construction documents should require the contractor to provide all means necessary to maintain relatively dry excavations at all times during construction. The contractor should also be required to prevent surface water runoff and roof runoff from accumulating in the excavations.

Foundation Design Criteria: Following the site preparation procedures previously described, the proposed building additions may be supported by conventional shallow foundations deriving their support from the undisturbed natural stiff clayey and silty soils, medium dense silty sand soils or controlled compacted fill installed atop the natural, sandy and silty soils. Foundations established on the natural soils or properly placed controlled compacted fill installed atop suitable natural soils may be designed to impose maximum allowable net bearing pressures of up to 3,000 pounds per square foot to limit differential foundation movement between the addition and the existing building. Allowable bearing pressures up to 4,000 psf are acceptable if increased settlement can be tolerated.

Exterior foundations should be established at depths of at least 3 feet below the lowest adjacent exterior grades to provide protection from frost penetration or deeper if required by local code or ordinance. New foundations abutting the existing building should be established at the same elevation as the existing building foundations. The depth and location of existing foundations should be checked as excavations are performed during construction. Interior foundations in permanently heated portions of the additions may be established at convenient depths below the ground level floor slabs, provided they reach the intended bearing stratum. All foundation subgrades should be observed by a representative of MTA prior to the placement of concrete to confirm adequate bearing materials are present.

We estimate that post-construction settlements of foundations designed and constructed in accordance with our recommendations would be on the order of 1/2 of 1 inch, or less for a bearing pressure of 3,000 psf or less. Foundation settlements may increase to up to 3/4 of 1 inch, if design bearing pressures up to 4,000 psf are planned.

Seismic Design: For seismic design purposes, the explorations indicate the site subsoils would represent a Site Class "C" as referenced in the 2018 International Building Code, New Jersey Edition.

Floor Slab Design: The ground level floor slabs of the proposed additions may derive their support from controlled compacted fill installed atop the natural bearing soils. Assuming granular fill is installed to replace the existing fill, a subslab drainage layer consisting of a minimum of 4 inches of porous fill such as clean, 3/4-inch crushed stone or washed gravel should be provided below the ground level slabs to provide a capillary break between the slabs and the underlying subgrade soils. The need for a moisture barrier or additional porous fill should be reviewed by the architect if the gym space has special flooring requirements. Immediately prior to installation of the porous fill, the exposed subgrade soils should be recompacted under our observation to densify any soils disturbed by the construction operations. Any soils that cannot be compacted to a dense and stable condition should be removed and replaced or otherwise treated.

Estimated post-construction floor slab settlements if all existing fill is completely removed and replaced with controlled compacted fill are expected to be less than 1/4 of 1 inch or less for the anticipated light floor loads.

Please contact us if you have any questions regarding this report.

The following Plates and Appendix are attached and complete this report:

Plate 1 - Site Location Map
Plate 2 - Plot Plan
Plate 3A through 3E - Logs of Test Borings
Plate 4 - Unified Soil Classification System
Plates 5A and 5B - Gradation Curves
Appendix - Limitations

Very truly yours,

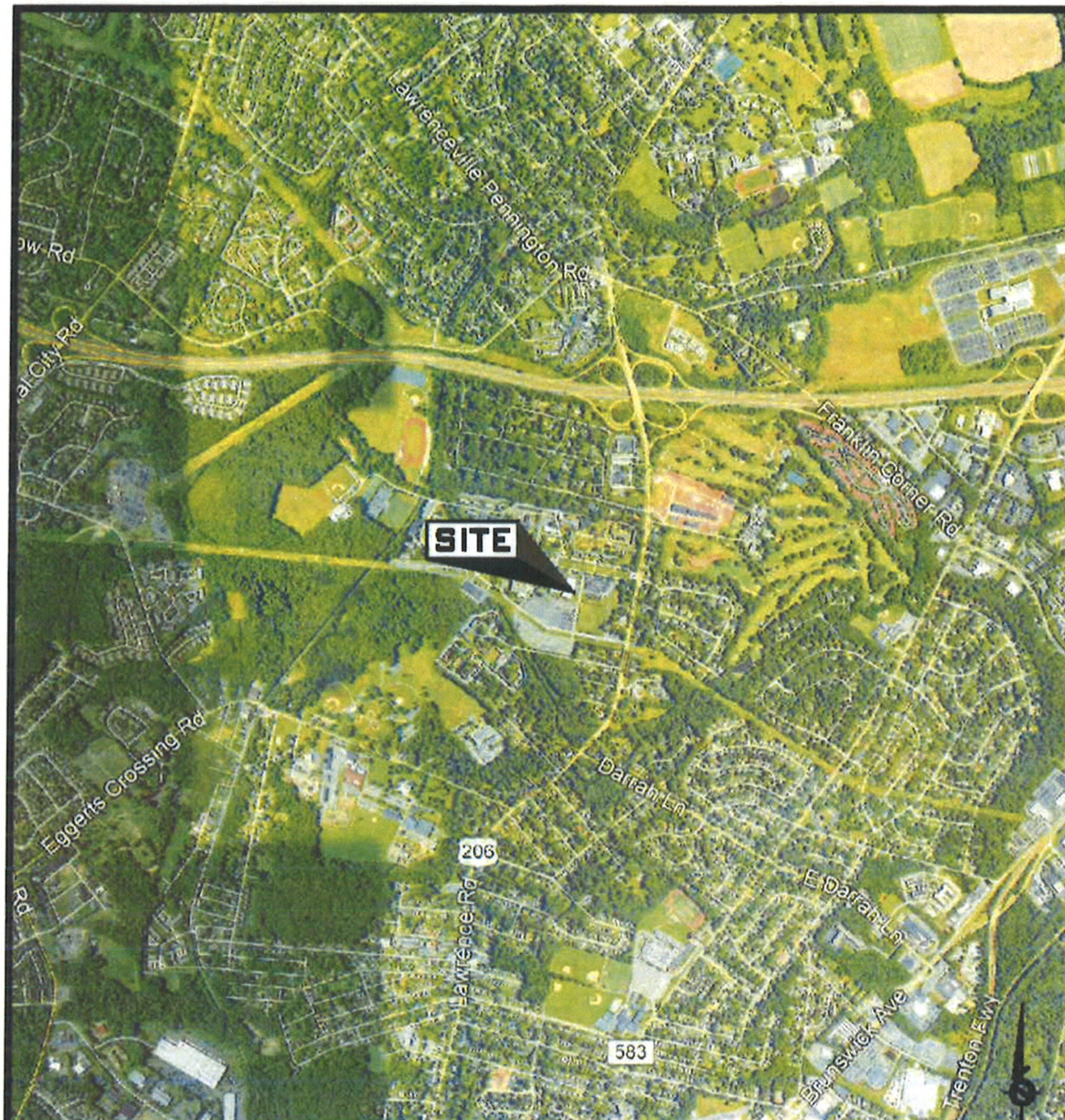
MELICK-TULLY and ASSOCIATES,
a Division of GZA GeoEnvironmental, Inc.

Christopher D. McLaughlin, P.E.
Project Manager

Robert E. Schwankert, P.E.
Principal

Mark R. Denno, P.E.
Consultant/Reviewer

CDM:RES/cdm



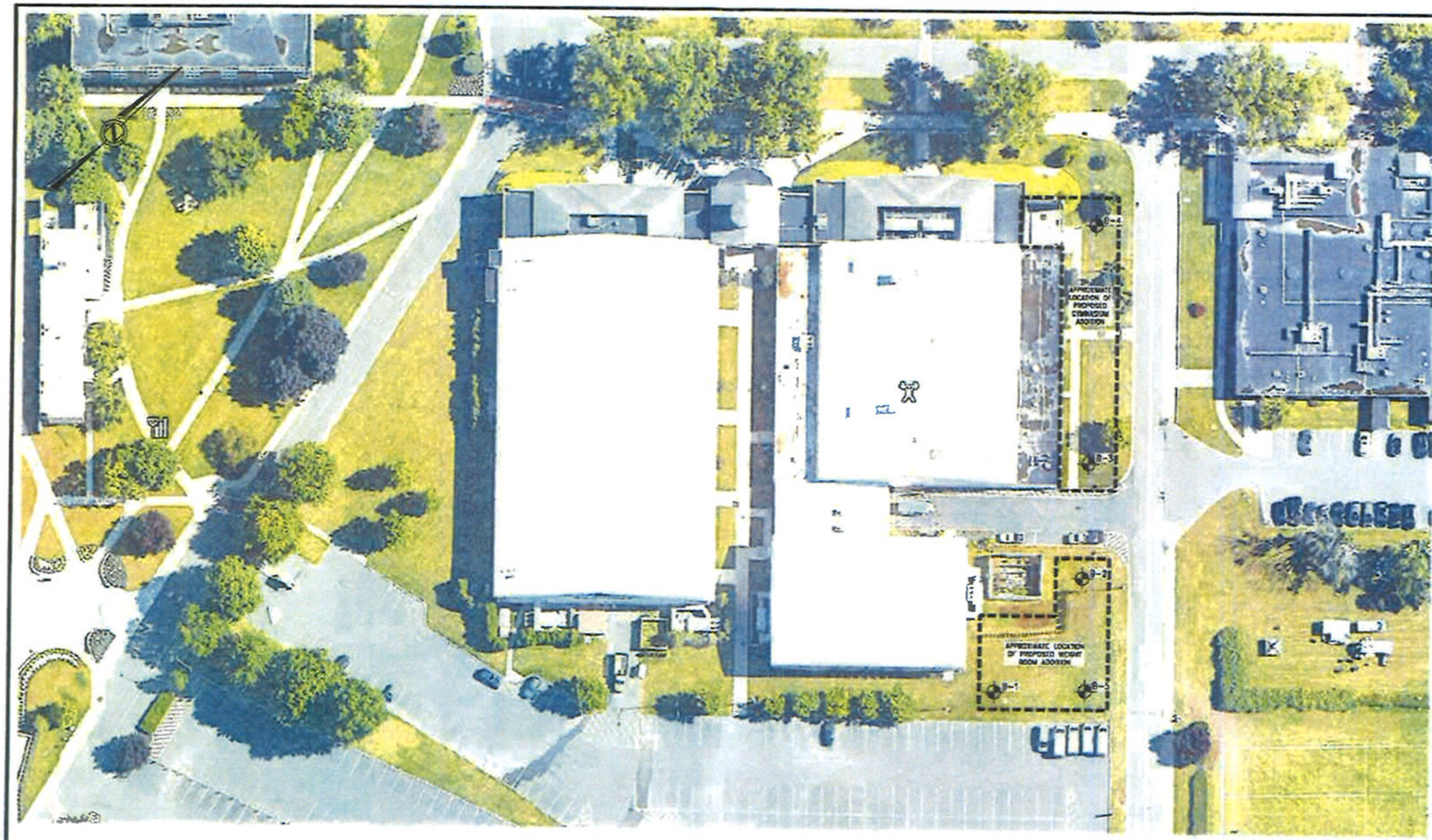
Aerial Photo courtesy of Google Earth Pro

MELICK-TULLY AND ASSOCIATES
A Division of GZA
Geotechnical Engineers & Environmental Consultants
117 Canal Road
South Bound Brook, New Jersey 08880
(732) 356-3400

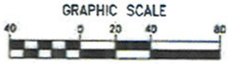
SITE LOCATION MAP

PROPOSED GYMNASIUM ADDITIONS
LAWRENCEVILLE, NEW JERSEY
RIDER UNIVERSITY

JOB NO.	FILE NO.	DR. BY	CHK. BY	DATE	SCALE	PLATE
26.0091992.00	-	VJD	CDM	1/17/20	1"=2,000'	1



GRAPHIC SCALE



1 inch = 40 ft.

KEY:

TP-1 NUMBER AND APPROXIMATE LOCATION OF TEST PITS PERFORMED FOR THIS STUDY

NOTES:

1. This drawing is part of Melick-Tully and Associates, a Division of GZA, Report No. 26.0091992.00 and should be read together with the report for complete evaluation.

2. General layout was obtained from an aerial photo downloaded from Google Earth Pro.

PLOT PLAN

PROPOSED GYMNASIUM ADDITIONS
LAWRENCEVILLE, NEW JERSEY
RIDER UNIVERSITY

MELICK-TULLY AND ASSOCIATES
A Division of GZA
Geotechnical Engineers & Environmental Consultants
117 Canal Road
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(732) 356-3400

JOB NO. 26.0091992.00		FILE NO. -		
DR. BY YJD	CHK. BY CDM	DATE 1/17/20	SCALE 1"= 40'	PLATE 2

TEST BORING LOG

MTA, a Division of GZA GeoEnvironmental, Inc
Engineers and Scientists

Rider University
Lawrence, NJ

EXPLORATION NO.: B-201
SHEET: 1 of 1
PROJECT NO: 26.0091992.00
REVIEWED BY: Chris McLaughlin

Logged By: Glenn Zmigrodski
Drilling Co.: GDI
Driller: George/Matt/Corey

Type of Rig: ATV Rig
Rig Model:
Drilling Method: H.S.A./SS

Boring Location: See Plan
Ground Surface Elev. (ft.): NA
Date Start - Finish: 1/4/2020 - 1/4/2020

Final Boring Depth (ft.): 12.2

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.25/4

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
1/4/20		NE	

Depth (ft)	Sample No.	Sample Depth (ft.)	Sample Blows (per 6 in.)	SPT Value	Symbol	Sample Description and Identification	Water Content (%)	Remark
						9" Topsoil		
	S1	1-3	5 5 8 7	13	ML	Brown clayey silt (wet)(stiff)	27.2	
					SM	Yellowish brown fine sand, and silt (very moist)(medium dense)		
	S2	3-5	4 4 9 9	13		- grading (wet)	25.9	
5	S3	5-7	14 23 23 28	46				
					SM	Yellowish brown fine sand, some silt (moist)(dense)		
10	S4	10-12	30 50/3	100+				
						Yellowish brown sandstone		
	S5	11.5-12	100/2"			- auger refusal @ 12'		
						End of exploration at 12.2 feet. Groundwater seepage not encountered		
15								
20								

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Plate No.: 3A

1- MTA BORING LOG WITH STRATUM LINES; 2/11/2020; 12:55:31 PM

TEST BORING LOG

MTA, a Division of GZA GeoEnvironmental, Inc
Engineers and Scientists

Rider University
Lawrence, NJ

EXPLORATION NO.: B-202
SHEET: 1 of 1
PROJECT NO: 26.0091992.00
REVIEWED BY: Chris McLaughlin

Logged By: Glenn Zmigrodski
Drilling Co.: GDI
Driller: George/Matt/Corey

Type of Rig: ATV Rig
Rig Model:
Drilling Method: H.S.A./SS

Boring Location: See Plan
Ground Surface Elev. (ft.): NA
Date Start - Finish: 1/2/2020 - 1/2/2020

Final Boring Depth (ft.): 17

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.):

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
1/2/20		NE	

Depth (ft)	Sample No.	Sample Depth (ft.)	Blows (per 6 in.)	SPT Value	Symbol	Sample Description and Identification	Water Content (%)	Remark
						12" Topsoil		
	S1	1-3	5 5 8 8	13		Fill - Reddish brown clayey silt, little fine sand, little fine to coarse gravel (moist)(stiff)	22.6	
	S2	3-5	3 8 8 8	16			32.3	
5	S3	5-7	5 7 9 12	16	ML	Reddish brown mottled clayey silt, some fine to medium sand (stiff)	39.4	
10	S4	10-12	16 18 27 45	45		Red-brown highly weathered/fractured shale (dense)		
15	S5	15-17	18 14 19 50	33		- grading sounder - auger refusal @ 17'		
	S6	17-19	100/0			End of exploration at 17 feet. Groundwater seepage not encountered		
20								

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Plate No.: 3B

TEST BORING LOG

MTA, a Division of GZA GeoEnvironmental, Inc *Engineers and Scientists*	Rider University Lawrence, NJ	EXPLORATION NO.: B-203 SHEET: 1 of 1 PROJECT NO: 26.0091992.00 REVIEWED BY: Chris McLaughlin

Logged By: Joe Malek **Drilling Co.:** GDI **Driller:** George/Alan/Dillon	**Type of Rig:** ATV Rig **Rig Model:** **Drilling Method:** H.S.A./SS	**Boring Location:** See Plan **Final Boring Depth (ft.):** 17.75 **Ground Surface Elev. (ft.):** NA **Date Start - Finish:** 1/6/2020 - 1/6/2020

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140 **Hammer Fall (in.):** 30
Auger or Casing O.D./I.D Dia (in.):

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
1/6/20		NE	

Depth (ft)	Sample No.	Sample Depth (ft.)	Sample Blows (per 6 in.)	Sample SPT Value	Symbol	Sample Description and Identification	Water Content (%)	Remark
						16" Topsoil		
	S1	1-3	3 4 4 6	8		Fill - Reddish yellow fine sand, and clayey silt (wet)(loose)	22.5	
	S2	3-5	7 7 8 11	15	SM	Light brown to reddish brown fine to medium sand, some silt (very moist)(medium dense) - mottled @ 4'	19.1	
5	S3	5-7	5 8 8 9	16	SM	Yellowish brown fine to coarse sand, little silt (moist)(medium dense)		
	S4	7-9	11 16 20 18	36		- grading (dense)		
10	S5	10-12	21 19 27 29	46				
						Light gray weathered/fractured sandstone (very dense)		
15	S6	15-17	34 57 91 50/3	100+				
						- auger refusal @ 17.75'		
20						End of exploration at 17.75 feet. Groundwater seepage not encountered		

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Plate No.: 3C

1- MTA BORING LOG WITH STRATUM LINES; 2/11/2020; 12:55:32 PM

TEST BORING LOG

MTA, a Division of GZA GeoEnvironmental, Inc
Engineers and Scientists

Rider University
Lawrence, NJ

EXPLORATION NO.: B-204
SHEET: 1 of 1
PROJECT NO: 26.0091992.00
REVIEWED BY: Chris McLaughlin

Logged By: Joe Malek	**Type of Rig:** ATV Rig	**Boring Location:** See Plan
Drilling Co.: GDI	**Rig Model:**	**Ground Surface Elev. (ft.):** NA
Driller: George/Alan/Dillon	**Drilling Method:** H.S.A./SS	**Date Start - Finish:** 1/6/2020 - 1/6/2020

Final Boring Depth (ft.): 19

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140 **Hammer Fall (in.):** 30
Auger or Casing O.D./I.D Dia (in.):

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/6/19		NE	

Depth (ft)	Sample No.	Sample Depth (ft.)	Blows (per 6 in.)	SPT Value	Symbol	Sample Description and Identification	Water Content (%)	Remark
						10" Topsoil		
	S1	1-3	2 3 4 4	7		Fill - Reddish brown clayey silt, some fine to medium sand (wet)(medium)	26.1	
	S2	3-5	4 8 10 10	18		- grading (very stiff)(possible natural)	24.4	
5	S3	5-7	14 19 18 21	37				
						Reddish brown mottled fine to coarse gravel, some clayey silt (moist)(dense)(decomposed/highly weathered shale)		
	S4	7-9	23 25 24 22	49				
10	S5	10-12	31 36 31 33	67		Reddish brown weathered shale (very dense)		
15	S6	15-17	25 38 74 100/4	100+		- grading less weathered		
	S7	18.5-19	100/1					
20						End of exploration at 19 feet. Groundwater seepage not encountered		

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Plate No.: 3D

1- MTA BORING LOG WITH STRATUM LINES; 2/11/2020; 12:55:32 PM

TEST BORING LOG

MTA, a Division of GZA GeoEnvironmental, Inc *Engineers and Scientists*	Rider University Lawrence, NJ	**EXPLORATION NO.:** B-205 **SHEET:** 1 of 1 **PROJECT NO:** 26.0091992.00 **REVIEWED BY:** Chris McLaughlin

Logged By: Glenn Zmigrodski **Drilling Co.:** GDI **Driller:** George	**Type of Rig:** ATV Rig **Rig Model:** **Drilling Method:** H.S.A./SS	**Boring Location:** See Plan **Ground Surface Elev. (ft.):** NA **Date Start - Finish:** 1/4/2020 - 1/4/2020	**Final Boring Depth (ft.):** 13.3

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140 **Hammer Fall (in.):** 30
Auger or Casing O.D./I.D Dia (in.):

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
1/4/20		NE	

Depth (ft)	Sample No.	Sample Depth (ft.)	Blows (per 6 in.)	SPT Value	Symbol	Sample Description and Identification	Water Content (%)	Remark
						12" Topsoil		
	S1	1-3	3 6 6 8	12	ML	Brown clayey silt (wet)(stiff)	24.7	
					SM	Yellowish brown fine sand, and silt (very moist)(medium dense)		
	S2	3-5	7 8 7 9	15		- grading (wet)	29.4	
5	S3	5-7	9 13 13 22	26				
10	S4	10-12	33 40 50/4"	100+				
						Yellowish brown fractured sandstone (very dense)		
	S5	12-13.3	100/4"					
						- auger refusal @ 13'		
						End of exploration at 13.3 feet. Groundwater seepage not encountered		
15								
20								

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Plate No.: 3E

1- MTA BORING LOG WITH STRATUM LINES; 2/11/2020; 12:55:33 PM

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL & GRAVELLY SOILS More than 50% of coarse fraction <u>RETAINED</u> on No. 4 Sieve	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.
		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 <u>LARGER</u> than No. 200 Sieve	SAND AND SANDY SOILS More than 50% of coarse fraction <u>PASSING</u> a No. 4 Sieve	CLEAN SAND (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.
			SP	Poorly-graded sands, gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
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 <u>SMALLER</u> than No. 200 Sieve	SILTS AND CLAYS	Liquid limit GREATER than 50	MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			PT	Peat, humus, swamp soils with high organic contents.

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

GRADATION*	COMPACTNESS* sand and/or gravel	CONSISTENCY* clay and/or silt
% Finer by Weight	Relative Density	Range of Shearing Strength in Pounds per Square Foot

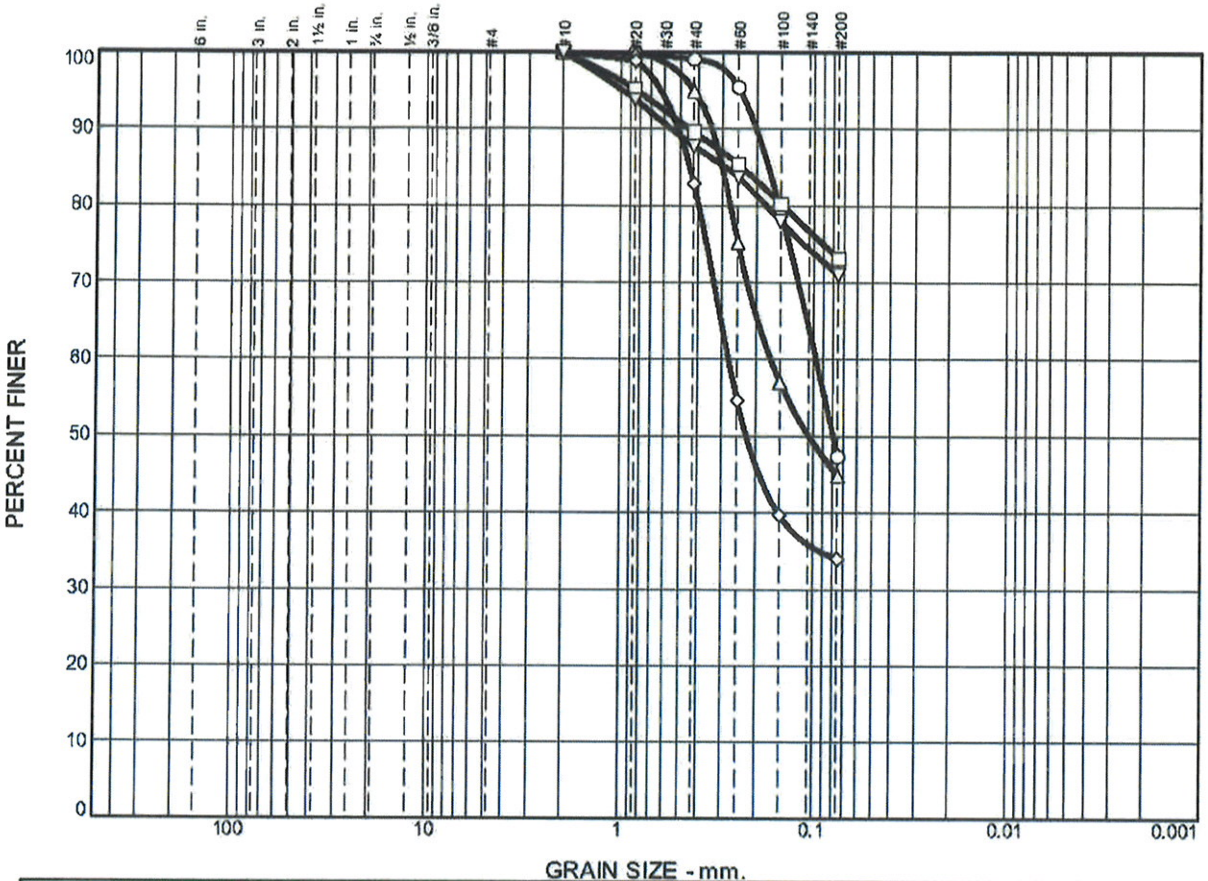
Trace	0% to 10%	Loose	0% to 40%	Very Soft	less than 250
Little	10% to 20%	Medium Dense	40% to 70%	Soft	250 to 500
Some	20% to 35%	Dense	70% to 90%	Medium	500 to 1000
And	35% to 50%	Very Dense	90% to 100%	Stiff	1000 to 2000
				Very Stiff	2000 to 4000
				Hard	Greater than 4000

**Values are from laboratory or field test data, where applicable. When no testing was performed, values are estimated.*

UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

Gradation Curve(s)



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.9	51.8	47.3	
□	0.0	0.0	0.0	0.0	10.4	16.5	73.1	
△	0.0	0.0	0.0	0.0	5.0	50.2	44.8	
◇	0.0	0.0	0.0	0.0	17.1	48.9	34.0	
▽	0.0	0.0	0.0	0.0	12.3	16.7	71.0	

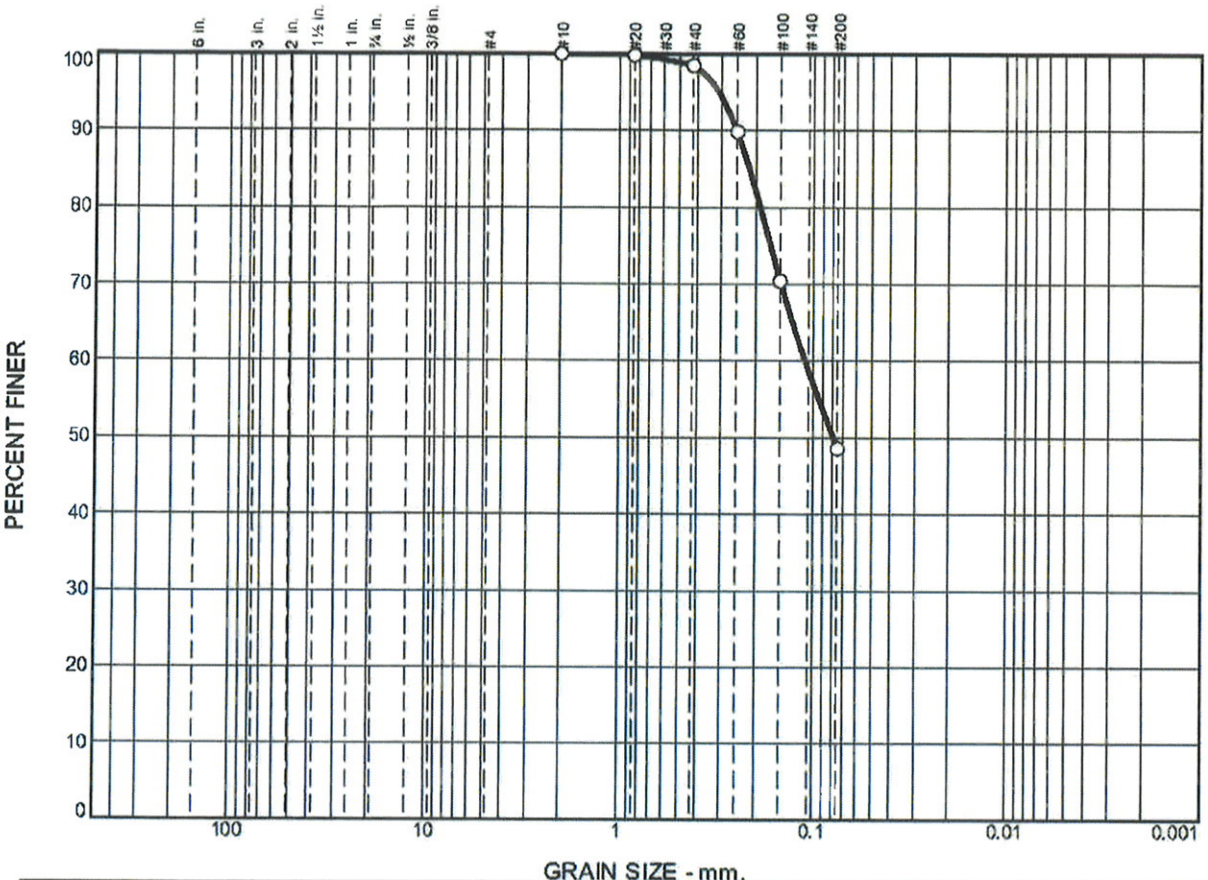
SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft)	Material Description	USCS
○	B-201	S-2	3-5	Fine Sand, and Silt. (MC=25.9%)	SM
□	B-202	S-1	5-7	Clayey Silt, some fine to medium Sand. (MC=39.4%)	ML
△	B-203	S-1	1-3	Fine Sand, and Silt. (MC=22.5%)	Fill
◇	B-203	S-2	3-5	Fine to medium Sand, some Silt. (MC=19.1%)	SM
▽	B-204	S-1	0-2	Clayey Silt, some fine to medium Sand. (MC=26.1%)	Fill

Melick-Tully & Associates
a Division of GZA GeoEnvironmental, Inc.
South Bound Brook, NJ

Client: Rider University
Project: Proposed Alumni Gymnasium Additions, Lawrenceville, NJ
Project No.: 26.0091992.00 **Plate** 5A

Gradation Curve(s)



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
O	0.0	0.0	0.0	0.0	1.5	50.0	48.5	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft)	Material Description	USCS
O	B-205	S-2	3-5	Fine Sand, and Silt (MC=29.4%)	SM

Melick-Tully & Associates
a Division of GZA GeoEnvironmental, Inc.
South Bound Brook, NJ

Client: Rider University
Project: Proposed Alumni Gymnasium Additions, Lawrenceville, NJ
Project No.: 26.0091992.00 **Plate** 5B

APPENDIX - Limitations

APPENDIX

Limitations

A. Subsurface Information

Locations: The locations of the explorations were approximately determined by tape measurement from existing site features. Elevations of the explorations were approximately determined by interpolation between contours shown on topographic plans provided to us by the site engineer. The locations and elevations of the explorations should be considered accurate only to the degree implied by the method used.

Interface of Strata: The stratification lines shown on the individual logs of the subsurface explorations represent the approximate boundaries between soil types, and the transitions may be gradual.

Field Logs/Final Logs: A field log was prepared for each exploration by a member of our staff. The field log contains factual information and interpretation of the soil conditions between samples. Our recommendations are based on the final logs as shown in this report and the information contained therein, and not on the field logs. The final logs represent our interpretation of the contents of the field logs, and the results of the laboratory observations and/or tests of the field samples.

Water Levels: Water level readings have been made in the explorations at times and under conditions stated on the individual logs. These data have been reviewed and interpretations made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater will occur due to variations in rainfall, temperature, and other factors.

Pollution/Contamination: Unless specifically indicated to the contrary in this report, the scope of our services was limited only to investigation and evaluation of the geotechnical engineering aspects of the site conditions, and did not include any consideration of potential site pollution or contamination resulting from the presence of chemicals, metals, radioactive elements, etc. This report offers no facts or opinions related to potential pollution/contamination of the site.

Environmental Considerations: Unless specifically indicated to the contrary in this report, this report does not address environmental considerations which may affect the site development, e.g., wetlands determinations, flora and fauna, wildlife, etc. The conclusions and recommendations of this report are not intended to supersede any environmental conditions which should be reflected in the site planning.

B. Applicability of Report

This report has been prepared in accordance with generally accepted soils and foundation engineering practices for the exclusive use of Rider University or specific application to the design of the proposed Alumni Gymnasium additions. No other warranty, expressed or implied, is made.

C. Reinterpretation of Recommendations

Change in Location or Nature of Facilities: In the event that any changes in the nature, design or location of the addition and stormwater facilities are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

Changed Conditions During Construction: The analyses and recommendations submitted in this report are based in part upon the data obtained from five widely-spaced test borings performed for this study. The nature and extent of variations between the explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

Changes in State-of-the-Art: The conclusions and recommendations contained in this report are based upon the applicable standards of our profession at the time this report was prepared.

D. Use of Report by Prospective Bidders

This soil and foundation engineering report was prepared for the project by Melick-Tully and Associates, a Division of GZA GeoEnvironmental, Inc. (MTA) for design purposes and may not be sufficient to prepare an accurate bid. Contractors utilizing the information in the report should do so with the express understanding that its scope was developed to address design considerations. Prospective bidders should obtain the owner's permission to perform whatever additional explorations or data gathering they deem necessary to prepare their bid accurately.

E. Construction Observation

We recommend that MTA be retained to provide on-site soils engineering services during the earthwork construction and foundation phases of the work. This is to observe compliance with the design concepts and to allow changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

APPENDIX B

USDA SOIL SURVEY REPORT (SSURGO)

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Mercer County, New Jersey

September 30, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map


74° 44' 16" W
74° 43' 59" W
522310
522370
522430
522490
522550
522610
522670
40° 16' 48" N
40° 16' 31" N
4458870
4458810
4458750
4458690
4458630
4458570
4458510
4458450
4458390
UdstB
OthA
REFA
BucB
Soil Map may not be valid at this scale.
Map Scale: 1:2,580 if printed on A portrait (8.5" x 11") sheet.
Meters
0 35 70 140 210
Feet
0 100 200 400 600
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mercer County, New Jersey
Survey Area Data: Version 16, Jun 1, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 6, 2020—Sep 21, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BucB	Bucks silt loam, 2 to 6 percent slopes	0.6	2.0%
OthA	Othello silt loams, 0 to 2 percent slopes, northern coastal plain	0.5	1.7%
REFA	Readington and Abbottstown silt loams, 0 to 2 percent slopes	1.1	3.5%
UdstB	Udorthents, stratified substratum, 0 to 8 percent slopes	28.3	92.8%
Totals for Area of Interest		**30.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Mercer County, New Jersey

BucB—Bucks silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1kj11
Elevation: 50 to 1,000 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Bucks and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bucks

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Silty noncalcareous loess over residuum weathered from sandstone and shale

Typical profile

Ap - 0 to 8 inches: silt loam
E - 8 to 13 inches: silt loam
BE - 13 to 18 inches: silt loam
Bt - 18 to 27 inches: silt loam
2C - 27 to 48 inches: very channery silt loam
2R - 48 to 80 inches: weathered bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 39 to 59 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Readington

Percent of map unit: 5 percent
Landform: Hillsides
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Abbottstown

Percent of map unit: 5 percent
Landform: Drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Penn

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

OthA—Othello silt loams, 0 to 2 percent slopes, northern coastal plain

Map Unit Setting

National map unit symbol: 2thwm
Elevation: 0 to 300 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 46 to 64 degrees F
Frost-free period: 190 to 250 days
Farmland classification: Farmland of statewide importance, if drained

Map Unit Composition

Othello, drained, and similar soils: 50 percent
Othello, undrained, and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Othello, Drained

Setting

Landform: Flats, depressions, swales
Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Talf, dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Silty eolian deposits over fluviomarine deposits

Typical profile

Ap - 0 to 9 inches: silt loam
Btg - 9 to 29 inches: silt loam
2BCg - 29 to 34 inches: sandy loam
2Cg - 34 to 80 inches: loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: About 10 to 20 inches
Frequency of flooding: None
Frequency of ponding: Rare
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Description of Othello, Undrained

Setting

Landform: Flats, depressions, swales, drainageways
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Talf, dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Silty eolian deposits over fluviomarine deposits

Typical profile

Oe - 0 to 2 inches: peat
A - 2 to 4 inches: silt loam
Eg - 4 to 10 inches: silt loam
Btg - 10 to 29 inches: silt loam
2BCg - 29 to 35 inches: sandy loam
2Cg - 35 to 80 inches: loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: About 0 to 10 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Fallsington, undrained

Percent of map unit: 8 percent
Landform: Swales, drainageways, flats, depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Dip, talf
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Kentuck, undrained

Percent of map unit: 7 percent
Landform: Swales, flats, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip, talf
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

Mattapex

Percent of map unit: 5 percent
Landform: Flats, depressions, swales, broad interstream divides
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Talf, dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

REFA—Readington and Abbottstown silt loams, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 4jpb
Elevation: 300 to 2,000 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Readington and similar soils: 45 percent
Abbottstown and similar soils: 35 percent

Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Readington

Setting

Landform: Hillsides
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-loamy residuum weathered from acid red shale, siltstone, and fine-grain sandstone

Typical profile

Ap - 0 to 7 inches: silt loam
BA - 7 to 15 inches: silt loam
Bt - 15 to 24 inches: silt loam
C - 24 to 28 inches: silt loam
2C - 28 to 40 inches: very channery silt loam
2R - 40 to 80 inches: weathered bedrock

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 39 to 60 inches to lithic bedrock
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Abbottstown

Setting

Landform: Flats, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Fine-loamy residuum weathered from acid red shale, siltstone, and fine-grain sandstone

Typical profile

Ap - 0 to 7 inches: silt loam
Bt - 7 to 25 inches: silt loam
Cg - 25 to 33 inches: silt loam
2Cg - 33 to 40 inches: very channery silt loam
2R - 40 to 80 inches: weathered bedrock

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 39 to 60 inches to lithic bedrock
Drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 7 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Doylestown

Percent of map unit: 10 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Watchung

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Lawrenceville

Percent of map unit: 5 percent
Landform: Flats
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

UdstB—Udorthents, stratified substratum, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 4jq2

Elevation: 30 to 1,500 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, stratified substratum, and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Stratified Substratum

Setting

Landform: Low hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy lateral spread deposits over gravelly lateral spread deposits

Typical profile

A - 0 to 10 inches: sand
C - 10 to 72 inches: gravelly coarse sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Urban land

Percent of map unit: 5 percent
Landform: Low hills
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear
Hydric soil rating: Unranked

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<u>APPENDIX C</u>

HYDROLOGIC ANALYSIS

APPENDIX C.1

HYDROGRAPH COMPARISON TABLE

Time (hr)	Ex. Outfall Flow- 2-yr (cfs)	Prop. Outfall Flow- 2-yr (cfs)	Ex. Outfall Flow- 10-yr (cfs)	Prop. Outfall Flow- 10-yr (cfs)	Ex. Outfall Flow- 100-yr (cfs)	Prop. Outfall Flow- 100-yr (cfs)
0.0	0.00	0.00	0.00	0.00	0.00	0.00
0.1	0.00	0.00	0.00	0.00	0.00	0.00
0.2	0.00	0.00	0.00	0.00	0.00	0.00
0.3	0.00	0.00	0.00	0.00	0.00	0.00
0.4	0.00	0.00	0.00	0.00	0.00	0.00
0.5	0.00	0.00	0.00	0.00	0.00	0.00
0.6	0.00	0.00	0.00	0.00	0.00	0.00
0.7	0.00	0.00	0.00	0.00	0.01	0.01
0.8	0.00	0.00	0.00	0.00	0.01	0.01
0.9	0.00	0.00	0.00	0.00	0.01	0.01
1.0	0.00	0.00	0.00	0.00	0.02	0.02
1.1	0.00	0.00	0.00	0.00	0.02	0.02
1.2	0.00	0.00	0.01	0.01	0.02	0.02
1.3	0.00	0.00	0.01	0.01	0.02	0.02
1.4	0.00	0.00	0.01	0.01	0.02	0.02
1.5	0.00	0.00	0.01	0.01	0.03	0.03
1.6	0.00	0.00	0.01	0.01	0.03	0.03
1.7	0.00	0.00	0.01	0.01	0.03	0.03
1.8	0.00	0.00	0.01	0.01	0.03	0.03
1.9	0.00	0.00	0.01	0.01	0.03	0.03
2.0	0.01	0.01	0.01	0.01	0.03	0.03
2.1	0.01	0.01	0.01	0.01	0.04	0.04
2.2	0.01	0.01	0.02	0.02	0.04	0.04
2.3	0.01	0.01	0.02	0.02	0.04	0.04
2.4	0.01	0.01	0.02	0.02	0.04	0.04
2.5	0.01	0.01	0.02	0.02	0.04	0.04
2.6	0.01	0.01	0.02	0.02	0.04	0.04
2.7	0.01	0.01	0.02	0.02	0.04	0.04
2.8	0.01	0.01	0.02	0.02	0.04	0.04
2.9	0.01	0.01	0.02	0.02	0.04	0.04
3.0	0.01	0.01	0.02	0.02	0.05	0.05
3.1	0.01	0.01	0.02	0.02	0.05	0.05
3.2	0.01	0.01	0.02	0.02	0.05	0.05
3.3	0.01	0.01	0.02	0.02	0.05	0.05
3.4	0.01	0.01	0.02	0.02	0.05	0.05
3.5	0.01	0.01	0.02	0.02	0.05	0.05
3.6	0.01	0.01	0.03	0.03	0.05	0.05
3.7	0.01	0.01	0.03	0.03	0.05	0.05
3.8	0.01	0.01	0.03	0.03	0.05	0.05
3.9	0.01	0.01	0.03	0.03	0.05	0.05
4.0	0.01	0.01	0.03	0.03	0.05	0.05
4.1	0.01	0.01	0.03	0.03	0.05	0.05
4.2	0.02	0.02	0.03	0.03	0.05	0.05
4.3	0.02	0.02	0.03	0.03	0.06	0.06
4.4	0.02	0.02	0.03	0.03	0.06	0.06
4.5	0.02	0.02	0.03	0.03	0.06	0.06
4.6	0.02	0.02	0.03	0.03	0.06	0.06
4.7	0.02	0.02	0.03	0.03	0.06	0.06
4.8	0.02	0.02	0.03	0.03	0.06	0.06
4.9	0.02	0.02	0.03	0.03	0.06	0.06
5.0	0.02	0.02	0.03	0.03	0.06	0.06
5.1	0.02	0.02	0.03	0.03	0.06	0.06
5.2	0.02	0.02	0.03	0.03	0.06	0.06
5.3	0.02	0.02	0.03	0.03	0.06	0.06
5.4	0.02	0.02	0.03	0.03	0.07	0.06
5.5	0.02	0.02	0.03	0.03	0.07	0.07
5.6	0.02	0.02	0.03	0.03	0.07	0.07
5.7	0.02	0.02	0.04	0.04	0.07	0.07
5.8	0.02	0.02	0.04	0.04	0.07	0.07

Time (hr)	Ex. Outfall Flow-2-yr (cfs)	Prop. Outfall Flow-2-yr (cfs)	Ex. Outfall Flow-10-yr (cfs)	Prop. Outfall Flow-10-yr (cfs)	Ex. Outfall Flow-100-yr (cfs)	Prop. Outfall Flow-100-yr (cfs)
5.9	0.02	0.02	0.04	0.04	0.07	0.07
6.0	0.02	0.02	0.04	0.04	0.07	0.07
6.1	0.02	0.02	0.04	0.04	0.08	0.07
6.2	0.02	0.02	0.04	0.04	0.08	0.08
6.3	0.02	0.02	0.04	0.04	0.08	0.08
6.4	0.02	0.02	0.04	0.04	0.08	0.08
6.5	0.02	0.02	0.04	0.04	0.09	0.08
6.6	0.03	0.03	0.04	0.04	0.09	0.09
6.7	0.03	0.03	0.04	0.04	0.09	0.09
6.8	0.03	0.03	0.04	0.04	0.09	0.09
6.9	0.03	0.03	0.05	0.05	0.10	0.09
7.0	0.03	0.03	0.05	0.05	0.10	0.10
7.1	0.03	0.03	0.05	0.05	0.10	0.10
7.2	0.03	0.03	0.05	0.05	0.11	0.10
7.3	0.03	0.03	0.05	0.05	0.11	0.11
7.4	0.03	0.03	0.05	0.05	0.11	0.11
7.5	0.03	0.03	0.05	0.05	0.12	0.11
7.6	0.03	0.03	0.06	0.05	0.12	0.12
7.7	0.03	0.03	0.06	0.06	0.12	0.12
7.8	0.03	0.03	0.06	0.06	0.12	0.12
7.9	0.04	0.04	0.06	0.06	0.13	0.12
8.0	0.04	0.04	0.06	0.06	0.13	0.13
8.1	0.04	0.04	0.06	0.06	0.13	0.13
8.2	0.04	0.04	0.07	0.06	0.14	0.13
8.3	0.04	0.04	0.07	0.07	0.14	0.14
8.4	0.04	0.04	0.07	0.07	0.14	0.14
8.5	0.04	0.04	0.07	0.07	0.15	0.14
8.6	0.04	0.04	0.07	0.07	0.15	0.15
8.7	0.04	0.04	0.07	0.07	0.15	0.15
8.8	0.04	0.04	0.08	0.07	0.16	0.15
8.9	0.04	0.04	0.08	0.08	0.16	0.16
9.0	0.04	0.04	0.08	0.08	0.17	0.16
9.1	0.05	0.05	0.08	0.08	0.17	0.17
9.2	0.05	0.05	0.09	0.09	0.18	0.18
9.3	0.05	0.05	0.09	0.09	0.19	0.19
9.4	0.05	0.05	0.10	0.10	0.20	0.20
9.5	0.06	0.06	0.11	0.10	0.21	0.21
9.6	0.06	0.06	0.11	0.11	0.22	0.22
9.7	0.06	0.06	0.12	0.11	0.24	0.23
9.8	0.07	0.06	0.12	0.12	0.25	0.24
9.9	0.07	0.07	0.13	0.13	0.26	0.25
10.0	0.07	0.07	0.13	0.13	0.27	0.26
10.1	0.08	0.07	0.14	0.14	0.28	0.28
10.2	0.08	0.08	0.15	0.14	0.29	0.29
10.3	0.08	0.08	0.15	0.15	0.30	0.30
10.4	0.09	0.09	0.16	0.16	0.32	0.31
10.5	0.09	0.09	0.17	0.16	0.33	0.32
10.6	0.10	0.10	0.18	0.18	0.36	0.35
10.7	0.11	0.11	0.20	0.20	0.40	0.39
10.8	0.13	0.12	0.23	0.22	0.44	0.43
10.9	0.14	0.13	0.25	0.24	0.48	0.47
11.0	0.15	0.15	0.27	0.27	0.53	0.52
11.1	0.17	0.17	0.31	0.30	0.59	0.58
11.2	0.20	0.19	0.35	0.34	0.67	0.66
11.3	0.22	0.22	0.39	0.38	0.75	0.74
11.4	0.25	0.24	0.44	0.43	0.83	0.82
11.5	0.27	0.27	0.48	0.47	0.91	0.90
11.6	0.39	0.38	0.67	0.66	1.25	1.24
11.7	0.46	0.45	0.80	0.78	1.50	1.48

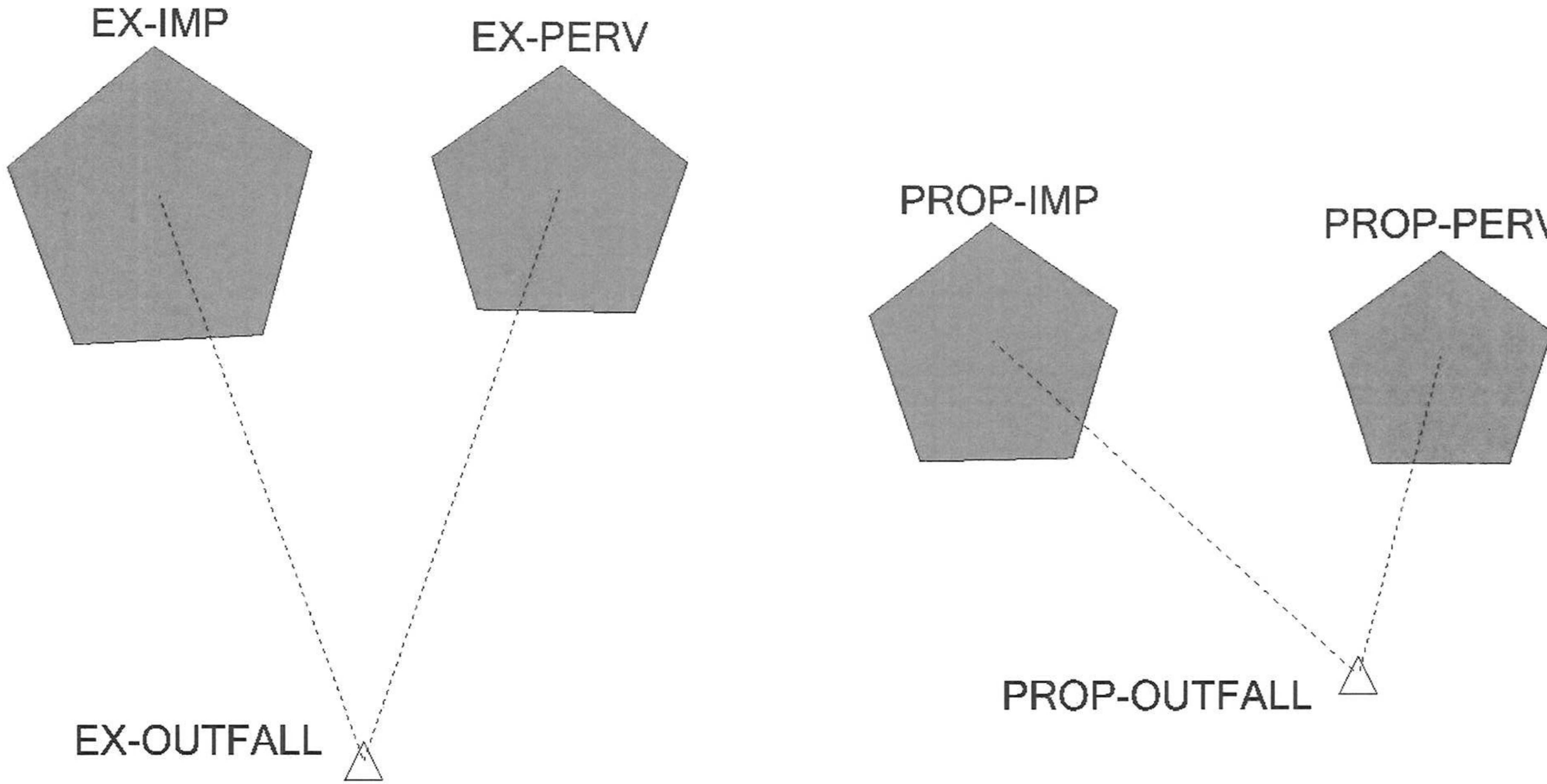
Time (hr)	Ex. Outfall Flow-2-yr (cfs)	Prop. Outfall Flow-2-yr (cfs)	Ex. Outfall Flow-10-yr (cfs)	Prop. Outfall Flow-10-yr (cfs)	Ex. Outfall Flow-100-yr (cfs)	Prop. Outfall Flow-100-yr (cfs)
11.8	0.60	0.59	1.03	1.02	1.92	1.90
11.9	0.85	0.84	1.45	1.43	2.67	2.65
12.0	1.43	1.41	2.41	2.38	4.38	4.34
12.1	2.50	2.46	4.14	4.10	7.43	7.38
12.12 (PEAK)	2.61	2.57	4.34	4.29	7.78	7.72
12.2	1.78	1.74	3.01	2.97	5.47	5.43
12.3	1.05	1.03	1.77	1.74	3.19	3.16
12.4	0.73	0.72	1.21	1.20	2.17	2.16
12.5	0.61	0.60	1.00	0.99	1.78	1.77
12.6	0.46	0.45	0.76	0.75	1.34	1.34
12.7	0.38	0.37	0.62	0.61	1.09	1.08
12.8	0.34	0.33	0.55	0.55	0.97	0.97
12.9	0.31	0.30	0.50	0.50	0.88	0.87
13.0	0.28	0.27	0.45	0.45	0.79	0.79
13.1	0.25	0.24	0.40	0.40	0.70	0.70
13.2	0.22	0.22	0.36	0.36	0.64	0.63
13.3	0.21	0.20	0.34	0.33	0.59	0.58
13.4	0.19	0.19	0.31	0.31	0.54	0.54
13.5	0.17	0.17	0.28	0.28	0.49	0.49
13.6	0.16	0.15	0.25	0.25	0.44	0.44
13.7	0.15	0.15	0.24	0.24	0.42	0.41
13.8	0.14	0.14	0.23	0.23	0.40	0.40
13.9	0.14	0.14	0.22	0.22	0.39	0.39
14.0	0.13	0.13	0.22	0.21	0.38	0.37
14.1	0.13	0.13	0.21	0.21	0.36	0.36
14.2	0.12	0.12	0.20	0.20	0.35	0.35
14.3	0.12	0.12	0.19	0.19	0.34	0.34
14.4	0.12	0.11	0.19	0.19	0.33	0.33
14.5	0.11	0.11	0.18	0.18	0.31	0.31
14.6	0.11	0.11	0.17	0.17	0.30	0.30
14.7	0.10	0.10	0.17	0.17	0.29	0.29
14.8	0.10	0.10	0.16	0.16	0.28	0.28
14.9	0.09	0.09	0.15	0.15	0.26	0.26
15.0	0.09	0.09	0.14	0.14	0.25	0.25
15.1	0.09	0.08	0.14	0.14	0.24	0.24
15.2	0.08	0.08	0.13	0.13	0.23	0.23
15.3	0.08	0.08	0.13	0.13	0.23	0.23
15.4	0.08	0.08	0.13	0.13	0.23	0.22
15.5	0.08	0.08	0.13	0.13	0.22	0.22
15.6	0.08	0.08	0.13	0.13	0.22	0.22
15.7	0.08	0.08	0.12	0.12	0.22	0.21
15.8	0.08	0.07	0.12	0.12	0.21	0.21
15.9	0.07	0.07	0.12	0.12	0.21	0.21
16.0	0.07	0.07	0.12	0.12	0.21	0.20
16.1	0.07	0.07	0.12	0.12	0.20	0.20
16.2	0.07	0.07	0.11	0.11	0.20	0.20
16.3	0.07	0.07	0.11	0.11	0.20	0.19
16.4	0.07	0.07	0.11	0.11	0.19	0.19
16.5	0.07	0.07	0.11	0.11	0.19	0.19
16.6	0.07	0.07	0.11	0.11	0.19	0.19
16.7	0.07	0.06	0.11	0.10	0.18	0.18
16.8	0.06	0.06	0.10	0.10	0.18	0.18
16.9	0.06	0.06	0.10	0.10	0.18	0.18
17.0	0.06	0.06	0.10	0.10	0.17	0.17
17.1	0.06	0.06	0.10	0.10	0.17	0.17
17.2	0.06	0.06	0.10	0.10	0.17	0.17
17.3	0.06	0.06	0.09	0.09	0.16	0.16
17.4	0.06	0.06	0.09	0.09	0.16	0.16
17.5	0.06	0.06	0.09	0.09	0.16	0.16

Time (hr)	Ex. Outfall Flow-2-yr (cfs)	Prop. Outfall Flow-2-yr (cfs)	Ex. Outfall Flow-10-yr (cfs)	Prop. Outfall Flow-10-yr (cfs)	Ex. Outfall Flow-100-yr (cfs)	Prop. Outfall Flow-100-yr (cfs)
17.6	0.06	0.05	0.09	0.09	0.15	0.15
17.7	0.05	0.05	0.09	0.09	0.15	0.15
17.8	0.05	0.05	0.08	0.08	0.15	0.15
17.9	0.05	0.05	0.08	0.08	0.14	0.14
18.0	0.05	0.05	0.08	0.08	0.14	0.14
18.1	0.05	0.05	0.08	0.08	0.14	0.14
18.2	0.05	0.05	0.08	0.08	0.13	0.13
18.3	0.05	0.05	0.08	0.08	0.13	0.13
18.4	0.05	0.05	0.08	0.08	0.13	0.13
18.5	0.05	0.05	0.08	0.08	0.13	0.13
18.6	0.05	0.05	0.08	0.08	0.13	0.13
18.7	0.05	0.05	0.08	0.07	0.13	0.13
18.8	0.05	0.05	0.07	0.07	0.13	0.13
18.9	0.05	0.05	0.07	0.07	0.13	0.13
19.0	0.05	0.05	0.07	0.07	0.13	0.13
19.1	0.05	0.05	0.07	0.07	0.13	0.13
19.2	0.05	0.05	0.07	0.07	0.13	0.13
19.3	0.05	0.04	0.07	0.07	0.13	0.12
19.4	0.04	0.04	0.07	0.07	0.12	0.12
19.5	0.04	0.04	0.07	0.07	0.12	0.12
19.6	0.04	0.04	0.07	0.07	0.12	0.12
19.7	0.04	0.04	0.07	0.07	0.12	0.12
19.8	0.04	0.04	0.07	0.07	0.12	0.12
19.9	0.04	0.04	0.07	0.07	0.12	0.12
20.0	0.04	0.04	0.07	0.07	0.12	0.12
20.1	0.04	0.04	0.07	0.07	0.12	0.12
20.2	0.04	0.04	0.07	0.07	0.12	0.12
20.3	0.04	0.04	0.07	0.07	0.12	0.12
20.4	0.04	0.04	0.07	0.07	0.12	0.12
20.5	0.04	0.04	0.07	0.07	0.12	0.11
20.6	0.04	0.04	0.07	0.07	0.11	0.11
20.7	0.04	0.04	0.07	0.07	0.11	0.11
20.8	0.04	0.04	0.07	0.06	0.11	0.11
20.9	0.04	0.04	0.06	0.06	0.11	0.11
21.0	0.04	0.04	0.06	0.06	0.11	0.11
21.1	0.04	0.04	0.06	0.06	0.11	0.11
21.2	0.04	0.04	0.06	0.06	0.11	0.11
21.3	0.04	0.04	0.06	0.06	0.11	0.11
21.4	0.04	0.04	0.06	0.06	0.11	0.11
21.5	0.04	0.04	0.06	0.06	0.11	0.11
21.6	0.04	0.04	0.06	0.06	0.11	0.11
21.7	0.04	0.04	0.06	0.06	0.11	0.10
21.8	0.04	0.04	0.06	0.06	0.10	0.10
21.9	0.04	0.04	0.06	0.06	0.10	0.10
22.0	0.04	0.04	0.06	0.06	0.10	0.10
22.1	0.04	0.04	0.06	0.06	0.10	0.10
22.2	0.04	0.04	0.06	0.06	0.10	0.10
22.3	0.04	0.04	0.06	0.06	0.10	0.10
22.4	0.04	0.04	0.06	0.06	0.10	0.10
22.5	0.04	0.04	0.06	0.06	0.10	0.10
22.6	0.04	0.04	0.06	0.06	0.10	0.10
22.7	0.04	0.03	0.06	0.06	0.10	0.10
22.8	0.03	0.03	0.06	0.06	0.10	0.10
22.9	0.03	0.03	0.06	0.05	0.10	0.09
23.0	0.03	0.03	0.06	0.05	0.09	0.09
23.1	0.03	0.03	0.05	0.05	0.09	0.09
23.2	0.03	0.03	0.05	0.05	0.09	0.09
23.3	0.03	0.03	0.05	0.05	0.09	0.09
23.4	0.03	0.03	0.05	0.05	0.09	0.09

Time (hr)	Ex. Outfall Flow-2-yr (cfs)	Prop. Outfall Flow-2-yr (cfs)	Ex. Outfall Flow-10-yr (cfs)	Prop. Outfall Flow-10-yr (cfs)	Ex. Outfall Flow-100-yr (cfs)	Prop. Outfall Flow-100-yr (cfs)
23.5	0.03	0.03	0.05	0.05	0.09	0.09
23.6	0.03	0.03	0.05	0.05	0.09	0.09
23.7	0.03	0.03	0.05	0.05	0.09	0.09
23.8	0.03	0.03	0.05	0.05	0.09	0.09
23.9	0.03	0.03	0.05	0.05	0.09	0.09
24.0	0.04	0.04	0.06	0.06	0.10	0.10
24.1	0.02	0.02	0.03	0.03	0.04	0.04
24.2	0.00	0.00	0.00	0.00	0.01	0.01
24.3	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX C.2

HYDROGRAPH ROUTINGS (2-, 10- 100-YEARS STORMS)


EX-IMP
EX-PERV
PROP-IMP
PROP-PERV
EX-OUTFALL
PROP-OUTFALL

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Rider Gym

Subsection: Time of Concentration Calculations
Label: EX-IMP
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.100 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.100 hours

Rider Gym

Subsection: Time of Concentration Calculations
Label: EX-IMP
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Rider Gym

Subsection: Time of Concentration Calculations
Label: EX-PERV
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.167 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.167 hours

Rider Gym

Subsection: Time of Concentration Calculations
Label: EX-PERV
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Rider Gym

Subsection: Time of Concentration Calculations
Label: PROP-IMP
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.100 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.100 hours

Rider Gym

Subsection: Time of Concentration Calculations
Label: PROP-IMP
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Rider Gym

Subsection: Time of Concentration Calculations
Label: PROP-PERV
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	0.167 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.167 hours

Rider Gym

Subsection: Time of Concentration Calculations
Label: PROP-PERV
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

==== User Defined

Tc =	Value entered by user
Where:	Tc= Time of concentration, hours

Rider Gym

Subsection: Unit Hydrograph Summary
Label: EX-IMP
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

Storm Event	Region C 24hr
Return Event	2 years
Duration	35.000 hours
Depth	3.3 in
Time of Concentration (Composite)	0.100 hours
Area (User Defined)	0.520 acres

Computational Time Increment	0.013 hours
Time to Peak (Computed)	12.120 hours
Flow (Peak, Computed)	1.82 ft³/s
Output Increment	0.010 hours
Time to Flow (Peak Interpolated Output)	12.120 hours
Flow (Peak Interpolated Output)	1.82 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.520 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.1 in
Runoff Volume (Pervious)	0.133 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.133 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.100 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Rider Gym

Subsection: Unit Hydrograph Summary
Label: EX-IMP
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

SCS Unit Hydrograph Parameters	
Unit peak, qp	5.89 ft^3/s
Unit peak time, Tp	0.067 hours
Unit receding limb, Tr	0.267 hours
Total unit time, Tb	0.333 hours

Rider Gym

Subsection: Unit Hydrograph Summary
Label: EX-IMP
Scenario: MERCER 10-yr

Return Event: 10 years
Storm Event: Region C 24hr

Storm Event	Region C 24hr
Return Event	10 years
Duration	35.000 hours
Depth	5.0 in
Time of Concentration (Composite)	0.100 hours
Area (User Defined)	0.520 acres

Computational Time Increment	0.013 hours
Time to Peak (Computed)	12.120 hours
Flow (Peak, Computed)	2.78 ft^3/s
Output Increment	0.010 hours
Time to Flow (Peak Interpolated Output)	12.120 hours
Flow (Peak Interpolated Output)	2.78 ft^3/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.520 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.8 in
Runoff Volume (Pervious)	0.207 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.207 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.100 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Rider Gym

Subsection: Unit Hydrograph Summary
Label: EX-IMP
Scenario: MERCER 10-yr

Return Event: 10 years
Storm Event: Region C 24hr

SCS Unit Hydrograph Parameters	
Unit peak, qp	5.89 ft^3/s
Unit peak time, Tp	0.067 hours
Unit receding limb, Tr	0.267 hours
Total unit time, Tb	0.333 hours

Rider Gym

Subsection: Unit Hydrograph Summary
Label: EX-IMP
Scenario: MERCER 100-yr

Return Event: 100 years
Storm Event: Region C 24hr

Storm Event	Region C 24hr
Return Event	100 years
Duration	35.000 hours
Depth	8.3 in
Time of Concentration (Composite)	0.100 hours
Area (User Defined)	0.520 acres

Computational Time Increment	0.013 hours
Time to Peak (Computed)	12.120 hours
Flow (Peak, Computed)	4.64 ft³/s
Output Increment	0.010 hours
Time to Flow (Peak Interpolated Output)	12.120 hours
Flow (Peak Interpolated Output)	4.64 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.520 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.1 in
Runoff Volume (Pervious)	0.351 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.351 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.100 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Rider Gym

Subsection: Unit Hydrograph Summary
Label: EX-IMP
Scenario: MERCER 100-yr

Return Event: 100 years
Storm Event: Region C 24hr

SCS Unit Hydrograph Parameters	
Unit peak, qp	5.89 ft^3/s
Unit peak time, Tp	0.067 hours
Unit receding limb, Tr	0.267 hours
Total unit time, Tb	0.333 hours

Rider Gym

Subsection: Unit Hydrograph Summary
Label: EX-PERV
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

Storm Event	Region C 24hr
Return Event	2 years
Duration	35.000 hours
Depth	3.3 in
Time of Concentration (Composite)	0.167 hours
Area (User Defined)	0.510 acres

Computational Time Increment	0.022 hours
Time to Peak (Computed)	12.158 hours
Flow (Peak, Computed)	0.86 ft^3/s
Output Increment	0.010 hours
Time to Flow (Peak Interpolated Output)	12.160 hours
Flow (Peak Interpolated Output)	0.85 ft^3/s

Drainage Area	
SCS CN (Composite)	80.000
Area (User Defined)	0.510 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.5 in
Runoff Volume (Pervious)	0.063 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.063 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.167 hours
Computational Time Increment	0.022 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Rider Gym

Subsection: Unit Hydrograph Summary
Label: EX-PERV
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

SCS Unit Hydrograph Parameters	
Unit peak, qp	3.46 ft^3/s
Unit peak time, Tp	0.111 hours
Unit receding limb, Tr	0.445 hours
Total unit time, Tb	0.557 hours

Rider Gym

Subsection: Unit Hydrograph Summary
Label: EX-PERV
Scenario: MERCER 10-yr

Return Event: 10 years
Storm Event: Region C 24hr

Storm Event	Region C 24hr
Return Event	10 years
Duration	35.000 hours
Depth	5.0 in
Time of Concentration (Composite)	0.167 hours
Area (User Defined)	0.510 acres

Computational Time Increment	0.022 hours
Time to Peak (Computed)	12.158 hours
Flow (Peak, Computed)	1.67 ft³/s
Output Increment	0.010 hours
Time to Flow (Peak Interpolated Output)	12.160 hours
Flow (Peak Interpolated Output)	1.66 ft³/s

Drainage Area	
SCS CN (Composite)	80.000
Area (User Defined)	0.510 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.9 in
Runoff Volume (Pervious)	0.123 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.123 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.167 hours
Computational Time Increment	0.022 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Rider Gym

Subsection: Unit Hydrograph Summary
Label: EX-PERV
Scenario: MERCER 10-yr

Return Event: 10 years
Storm Event: Region C 24hr

SCS Unit Hydrograph Parameters	
Unit peak, qp	3.46 ft^3/s
Unit peak time, Tp	0.111 hours
Unit receding limb, Tr	0.445 hours
Total unit time, Tb	0.557 hours

Rider Gym

Subsection: Unit Hydrograph Summary
Label: EX-PERV
Scenario: MERCER 100-yr

Return Event: 100 years
Storm Event: Region C 24hr

Storm Event	Region C 24hr
Return Event	100 years
Duration	35.000 hours
Depth	8.3 in
Time of Concentration (Composite)	0.167 hours
Area (User Defined)	0.510 acres

Computational Time Increment	0.022 hours
Time to Peak (Computed)	12.158 hours
Flow (Peak, Computed)	3.32 ft³/s
Output Increment	0.010 hours
Time to Flow (Peak Interpolated Output)	12.150 hours
Flow (Peak Interpolated Output)	3.31 ft³/s

Drainage Area	
SCS CN (Composite)	80.000
Area (User Defined)	0.510 acres
Maximum Retention (Pervious)	2.5 in
Maximum Retention (Pervious, 20 percent)	0.5 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	5.9 in
Runoff Volume (Pervious)	0.252 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.252 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.167 hours
Computational Time Increment	0.022 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Rider Gym

Subsection: Unit Hydrograph Summary
Label: EX-PERV
Scenario: MERCER 100-yr

Return Event: 100 years
Storm Event: Region C 24hr

SCS Unit Hydrograph Parameters	
Unit peak, qp	3.46 ft^3/s
Unit peak time, Tp	0.111 hours
Unit receding limb, Tr	0.445 hours
Total unit time, Tb	0.557 hours

Rider Gym

Subsection: Unit Hydrograph Summary
Label: PROP-IMP
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

Storm Event	Region C 24hr
Return Event	2 years
Duration	35.000 hours
Depth	3.3 in
Time of Concentration (Composite)	0.100 hours
Area (User Defined)	0.520 acres

Computational Time Increment	0.013 hours
Time to Peak (Computed)	12.120 hours
Flow (Peak, Computed)	1.82 ft^3/s
Output Increment	0.010 hours
Time to Flow (Peak Interpolated Output)	12.120 hours
Flow (Peak Interpolated Output)	1.82 ft^3/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.520 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.1 in
Runoff Volume (Pervious)	0.133 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.133 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.100 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Rider Gym

Subsection: Unit Hydrograph Summary
Label: PROP-IMP
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

SCS Unit Hydrograph Parameters	
Unit peak, qp	5.89 ft^3/s
Unit peak time, Tp	0.067 hours
Unit receding limb, Tr	0.267 hours
Total unit time, Tb	0.333 hours

Rider Gym

Subsection: Unit Hydrograph Summary
Label: PROP-IMP
Scenario: MERCER 10-yr

Return Event: 10 years
Storm Event: Region C 24hr

Storm Event	Region C 24hr
Return Event	10 years
Duration	35.000 hours
Depth	5.0 in
Time of Concentration (Composite)	0.100 hours
Area (User Defined)	0.520 acres

Computational Time Increment	0.013 hours
Time to Peak (Computed)	12.120 hours
Flow (Peak, Computed)	2.78 ft³/s
Output Increment	0.010 hours
Time to Flow (Peak Interpolated Output)	12.120 hours
Flow (Peak Interpolated Output)	2.78 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.520 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.8 in
Runoff Volume (Pervious)	0.207 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.207 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.100 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Rider Gym

Subsection: Unit Hydrograph Summary
Label: PROP-IMP
Scenario: MERCER 10-yr

Return Event: 10 years
Storm Event: Region C 24hr

SCS Unit Hydrograph Parameters	
Unit peak, qp	5.89 ft^3/s
Unit peak time, Tp	0.067 hours
Unit receding limb, Tr	0.267 hours
Total unit time, Tb	0.333 hours

Rider Gym

Subsection: Unit Hydrograph Summary
Label: PROP-IMP
Scenario: MERCER 100-yr

Return Event: 100 years
Storm Event: Region C 24hr

Storm Event	Region C 24hr
Return Event	100 years
Duration	35.000 hours
Depth	8.3 in
Time of Concentration (Composite)	0.100 hours
Area (User Defined)	0.520 acres

Computational Time Increment	0.013 hours
Time to Peak (Computed)	12.120 hours
Flow (Peak, Computed)	4.64 ft^3/s
Output Increment	0.010 hours
Time to Flow (Peak Interpolated Output)	12.120 hours
Flow (Peak Interpolated Output)	4.64 ft^3/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.520 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.1 in
Runoff Volume (Pervious)	0.351 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.351 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.100 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Rider Gym

Subsection: Unit Hydrograph Summary
Label: PROP-IMP
Scenario: MERCER 100-yr

Return Event: 100 years
Storm Event: Region C 24hr

SCS Unit Hydrograph Parameters	
Unit peak, qp	5.89 ft^3/s
Unit peak time, Tp	0.067 hours
Unit receding limb, Tr	0.267 hours
Total unit time, Tb	0.333 hours

Rider Gym

Subsection: Unit Hydrograph Summary
Label: PROP-PERV
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

Storm Event	Region C 24hr
Return Event	2 years
Duration	35.000 hours
Depth	3.3 in
Time of Concentration (Composite)	0.167 hours
Area (User Defined)	0.510 acres

Computational Time Increment	0.022 hours
Time to Peak (Computed)	12.158 hours
Flow (Peak, Computed)	0.82 ft³/s
Output Increment	0.010 hours
Time to Flow (Peak Interpolated Output)	12.160 hours
Flow (Peak Interpolated Output)	0.81 ft³/s

Drainage Area	
SCS CN (Composite)	79.000
Area (User Defined)	0.510 acres
Maximum Retention (Pervious)	2.7 in
Maximum Retention (Pervious, 20 percent)	0.5 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.4 in
Runoff Volume (Pervious)	0.060 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.060 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.167 hours
Computational Time Increment	0.022 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Rider Gym

Subsection: Unit Hydrograph Summary
Label: PROP-PERV
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

SCS Unit Hydrograph Parameters	
Unit peak, qp	3.46 ft^3/s
Unit peak time, Tp	0.111 hours
Unit receding limb, Tr	0.445 hours
Total unit time, Tb	0.557 hours

Rider Gym

Subsection: Unit Hydrograph Summary
Label: PROP-PERV
Scenario: MERCER 10-yr

Return Event: 10 years
Storm Event: Region C 24hr

Storm Event	Region C 24hr
Return Event	10 years
Duration	35.000 hours
Depth	5.0 in
Time of Concentration (Composite)	0.167 hours
Area (User Defined)	0.510 acres

Computational Time Increment	0.022 hours
Time to Peak (Computed)	12.158 hours
Flow (Peak, Computed)	1.62 ft³/s
Output Increment	0.010 hours
Time to Flow (Peak Interpolated Output)	12.160 hours
Flow (Peak Interpolated Output)	1.61 ft³/s

Drainage Area	
SCS CN (Composite)	79.000
Area (User Defined)	0.510 acres
Maximum Retention (Pervious)	2.7 in
Maximum Retention (Pervious, 20 percent)	0.5 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.8 in
Runoff Volume (Pervious)	0.119 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.119 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.167 hours
Computational Time Increment	0.022 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Rider Gym

Subsection: Unit Hydrograph Summary
Label: PROP-PERV
Scenario: MERCER 10-yr

Return Event: 10 years
Storm Event: Region C 24hr

SCS Unit Hydrograph Parameters	
Unit peak, qp	3.46 ft^3/s
Unit peak time, Tp	0.111 hours
Unit receding limb, Tr	0.445 hours
Total unit time, Tb	0.557 hours

Rider Gym

Subsection: Unit Hydrograph Summary
Label: PROP-PERV
Scenario: MERCER 100-yr

Return Event: 100 years
Storm Event: Region C 24hr

Storm Event	Region C 24hr
Return Event	100 years
Duration	35.000 hours
Depth	8.3 in
Time of Concentration (Composite)	0.167 hours
Area (User Defined)	0.510 acres

Computational Time Increment	0.022 hours
Time to Peak (Computed)	12.158 hours
Flow (Peak, Computed)	3.27 ft^3/s
Output Increment	0.010 hours
Time to Flow (Peak Interpolated Output)	12.150 hours
Flow (Peak Interpolated Output)	3.25 ft^3/s

Drainage Area

SCS CN (Composite)	79.000
Area (User Defined)	0.510 acres
Maximum Retention (Pervious)	2.7 in
Maximum Retention (Pervious, 20 percent)	0.5 in

Cumulative Runoff

Cumulative Runoff Depth (Pervious)	5.8 in
Runoff Volume (Pervious)	0.247 ac-ft

Hydrograph Volume (Area under Hydrograph curve)

Volume	0.247 ac-ft

SCS Unit Hydrograph Parameters

Time of Concentration (Composite)	0.167 hours
Computational Time Increment	0.022 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Rider Gym

Subsection: Unit Hydrograph Summary
Label: PROP-PERV
Scenario: MERCER 100-yr

Return Event: 100 years
Storm Event: Region C 24hr

SCS Unit Hydrograph Parameters	
Unit peak, qp	3.46 ft^3/s
Unit peak time, Tp	0.111 hours
Unit receding limb, Tr	0.445 hours
Total unit time, Tb	0.557 hours

Rider Gym

Subsection: Time-Depth Curve
Label: MERCER REGION C:NJWQ,2,10,100,500
Scenario: MERCER 10-yr

Return Event: 10 years
Storm Event: Region C 24hr

Time-Depth Curve: Region C 24hr	
Label	Region C 24hr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.2	0.2	0.2	0.2
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.3	0.3	0.3	0.3
4.500	0.3	0.3	0.3	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.4	0.4	0.4	0.4	0.4
6.000	0.4	0.4	0.4	0.4	0.4
6.500	0.4	0.4	0.5	0.5	0.5
7.000	0.5	0.5	0.5	0.5	0.5
7.500	0.5	0.6	0.6	0.6	0.6
8.000	0.6	0.6	0.6	0.6	0.7
8.500	0.7	0.7	0.7	0.7	0.7
9.000	0.7	0.7	0.8	0.8	0.8
9.500	0.8	0.8	0.9	0.9	0.9
10.000	0.9	0.9	1.0	1.0	1.0
10.500	1.0	1.1	1.1	1.1	1.2
11.000	1.2	1.2	1.3	1.4	1.4
11.500	1.5	1.6	1.7	1.8	2.0
12.000	2.4	3.0	3.2	3.3	3.4
12.500	3.5	3.6	3.7	3.7	3.8
13.000	3.8	3.8	3.9	3.9	3.9
13.500	4.0	4.0	4.0	4.1	4.1
14.000	4.1	4.1	4.1	4.2	4.2
14.500	4.2	4.2	4.2	4.2	4.3
15.000	4.3	4.3	4.3	4.3	4.3
15.500	4.3	4.4	4.4	4.4	4.4
16.000	4.4	4.4	4.4	4.4	4.5
16.500	4.5	4.5	4.5	4.5	4.5

Rider Gym

Subsection: Time-Depth Curve
Label: MERCER REGION C:NJWQ,2,10,100,500
Scenario: MERCER 10-yr

Return Event: 10 years
Storm Event: Region C 24hr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	4.5	4.5	4.5	4.6	4.6
17.500	4.6	4.6	4.6	4.6	4.6
18.000	4.6	4.6	4.6	4.6	4.6
18.500	4.7	4.7	4.7	4.7	4.7
19.000	4.7	4.7	4.7	4.7	4.7
19.500	4.7	4.7	4.7	4.8	4.8
20.000	4.8	4.8	4.8	4.8	4.8
20.500	4.8	4.8	4.8	4.8	4.8
21.000	4.8	4.8	4.8	4.9	4.9
21.500	4.9	4.9	4.9	4.9	4.9
22.000	4.9	4.9	4.9	4.9	4.9
22.500	4.9	4.9	4.9	4.9	4.9
23.000	5.0	5.0	5.0	5.0	5.0
23.500	5.0	5.0	5.0	5.0	5.0
24.000	5.0	(N/A)	(N/A)	(N/A)	(N/A)

Rider Gym

Subsection: Time-Depth Curve
Label: MERCER REGION C:NJWQ,2,10,100,500
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

Time-Depth Curve: Region C 24hr	
Label	Region C 24hr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	2 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.3	0.3
6.000	0.3	0.3	0.3	0.3	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.3	0.3	0.4
7.500	0.4	0.4	0.4	0.4	0.4
8.000	0.4	0.4	0.4	0.4	0.4
8.500	0.4	0.4	0.5	0.5	0.5
9.000	0.5	0.5	0.5	0.5	0.5
9.500	0.5	0.5	0.6	0.6	0.6
10.000	0.6	0.6	0.6	0.6	0.7
10.500	0.7	0.7	0.7	0.7	0.8
11.000	0.8	0.8	0.9	0.9	0.9
11.500	1.0	1.0	1.1	1.2	1.3
12.000	1.6	2.0	2.1	2.2	2.3
12.500	2.3	2.4	2.4	2.5	2.5
13.000	2.5	2.5	2.6	2.6	2.6
13.500	2.6	2.6	2.7	2.7	2.7
14.000	2.7	2.7	2.7	2.7	2.8
14.500	2.8	2.8	2.8	2.8	2.8
15.000	2.8	2.8	2.8	2.9	2.9
15.500	2.9	2.9	2.9	2.9	2.9
16.000	2.9	2.9	2.9	2.9	2.9
16.500	3.0	3.0	3.0	3.0	3.0

Rider Gym

Subsection: Time-Depth Curve
Label: MERCER REGION C:NJWQ,2,10,100,500
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	3.0	3.0	3.0	3.0	3.0
17.500	3.0	3.0	3.0	3.0	3.0
18.000	3.0	3.1	3.1	3.1	3.1
18.500	3.1	3.1	3.1	3.1	3.1
19.000	3.1	3.1	3.1	3.1	3.1
19.500	3.1	3.1	3.1	3.1	3.1
20.000	3.1	3.2	3.2	3.2	3.2
20.500	3.2	3.2	3.2	3.2	3.2
21.000	3.2	3.2	3.2	3.2	3.2
21.500	3.2	3.2	3.2	3.2	3.2
22.000	3.2	3.2	3.2	3.2	3.3
22.500	3.3	3.3	3.3	3.3	3.3
23.000	3.3	3.3	3.3	3.3	3.3
23.500	3.3	3.3	3.3	3.3	3.3
24.000	3.3	(N/A)	(N/A)	(N/A)	(N/A)

Rider Gym

Subsection: Time-Depth Curve
Label: MERCER REGION C:NJWQ,2,10,100,500
Scenario: MERCER 100-yr

Return Event: 100 years
Storm Event: Region C 24hr

Time-Depth Curve: Region C 24hr	
Label	Region C 24hr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.1	0.1	0.1	0.1
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.2	0.2	0.2
2.000	0.2	0.2	0.2	0.2	0.2
2.500	0.2	0.3	0.3	0.3	0.3
3.000	0.3	0.3	0.3	0.3	0.3
3.500	0.3	0.4	0.4	0.4	0.4
4.000	0.4	0.4	0.4	0.4	0.5
4.500	0.5	0.5	0.5	0.5	0.5
5.000	0.5	0.5	0.6	0.6	0.6
5.500	0.6	0.6	0.6	0.6	0.6
6.000	0.7	0.7	0.7	0.7	0.7
6.500	0.7	0.7	0.8	0.8	0.8
7.000	0.8	0.8	0.8	0.9	0.9
7.500	0.9	0.9	0.9	1.0	1.0
8.000	1.0	1.0	1.0	1.1	1.1
8.500	1.1	1.1	1.1	1.2	1.2
9.000	1.2	1.2	1.3	1.3	1.3
9.500	1.4	1.4	1.4	1.4	1.5
10.000	1.5	1.6	1.6	1.6	1.7
10.500	1.7	1.8	1.8	1.9	1.9
11.000	2.0	2.1	2.2	2.3	2.4
11.500	2.5	2.6	2.8	3.1	3.4
12.000	4.0	4.9	5.3	5.5	5.7
12.500	5.9	6.0	6.1	6.2	6.3
13.000	6.3	6.4	6.5	6.5	6.6
13.500	6.6	6.7	6.7	6.7	6.8
14.000	6.8	6.8	6.9	6.9	6.9
14.500	7.0	7.0	7.0	7.1	7.1
15.000	7.1	7.1	7.2	7.2	7.2
15.500	7.2	7.2	7.3	7.3	7.3
16.000	7.3	7.4	7.4	7.4	7.4
16.500	7.4	7.4	7.5	7.5	7.5

Rider Gym

Subsection: Time-Depth Curve
Label: MERCER REGION C:NJWQ,2,10,100,500
Scenario: MERCER 100-yr

Return Event: 100 years
Storm Event: Region C 24hr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	7.5	7.5	7.6	7.6	7.6
17.500	7.6	7.6	7.6	7.6	7.7
18.000	7.7	7.7	7.7	7.7	7.7
18.500	7.7	7.7	7.8	7.8	7.8
19.000	7.8	7.8	7.8	7.8	7.9
19.500	7.9	7.9	7.9	7.9	7.9
20.000	7.9	7.9	7.9	8.0	8.0
20.500	8.0	8.0	8.0	8.0	8.0
21.000	8.0	8.0	8.1	8.1	8.1
21.500	8.1	8.1	8.1	8.1	8.1
22.000	8.1	8.2	8.2	8.2	8.2
22.500	8.2	8.2	8.2	8.2	8.2
23.000	8.2	8.2	8.3	8.3	8.3
23.500	8.3	8.3	8.3	8.3	8.3
24.000	8.3	(N/A)	(N/A)	(N/A)	(N/A)

Rider Gym

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
EX-IMP	MERCER 2-yr	2	0.133	12.120	1.82
EX-IMP	MERCER 10-yr	10	0.207	12.120	2.78
EX-IMP	MERCER 100-yr	100	0.351	12.120	4.64
EX-PERV	MERCER 2-yr	2	0.063	12.160	0.85
EX-PERV	MERCER 10-yr	10	0.123	12.160	1.66
EX-PERV	MERCER 100-yr	100	0.252	12.150	3.31
PROP-IMP	MERCER 2-yr	2	0.133	12.120	1.82
PROP-IMP	MERCER 10-yr	10	0.207	12.120	2.78
PROP-IMP	MERCER 100-yr	100	0.351	12.120	4.64
PROP-PERV	MERCER 2-yr	2	0.060	12.160	0.81
PROP-PERV	MERCER 10-yr	10	0.119	12.160	1.61
PROP-PERV	MERCER 100-yr	100	0.247	12.150	3.25

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
EX-OUTFALL	MERCER 2-yr	2	0.197	12.120	2.61
EX-OUTFALL	MERCER 10-yr	10	0.330	12.120	4.34
EX-OUTFALL	MERCER 100-yr	100	0.603	12.120	7.78
PROP-OUTFALL	MERCER 2-yr	2	0.194	12.120	2.57
PROP-OUTFALL	MERCER 10-yr	10	0.326	12.120	4.29
PROP-OUTFALL	MERCER 100-yr	100	0.598	12.120	7.72

Rider Gym

Subsection: Addition Summary
Label: EX-OUTFALL
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

Summary for Hydrograph Addition at 'EX-OUTFALL'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-IMP
<Catchment to Outflow Node>	EX-PERV

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	EX-IMP	0.133	12.120	1.82
Flow (From)	EX-PERV	0.063	12.160	0.85
Flow (In)	EX-OUTFALL	0.197	12.120	2.61

Rider Gym

Subsection: Addition Summary
Label: EX-OUTFALL
Scenario: MERCER 10-yr

Return Event: 10 years
Storm Event: Region C 24hr

Summary for Hydrograph Addition at 'EX-OUTFALL'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-IMP
<Catchment to Outflow Node>	EX-PERV

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	EX-IMP	0.207	12.120	2.78
Flow (From)	EX-PERV	0.123	12.160	1.66
Flow (In)	EX-OUTFALL	0.330	12.120	4.34

Rider Gym

Subsection: Addition Summary
Label: EX-OUTFALL
Scenario: MERCER 100-yr

Return Event: 100 years
Storm Event: Region C 24hr

Summary for Hydrograph Addition at 'EX-OUTFALL'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-IMP
<Catchment to Outflow Node>	EX-PERV

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	EX-IMP	0.351	12.120	4.64
Flow (From)	EX-PERV	0.252	12.150	3.31
Flow (In)	EX-OUTFALL	0.603	12.120	7.78

Rider Gym

Subsection: Addition Summary
Label: PROP-OUTFALL
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

Summary for Hydrograph Addition at 'PROP-OUTFALL'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	PROP-IMP
<Catchment to Outflow Node>	PROP-PERV

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	PROP-IMP	0.133	12.120	1.82
Flow (From)	PROP-PERV	0.060	12.160	0.81
Flow (In)	PROP-OUTFALL	0.194	12.120	2.57

Rider Gym

Subsection: Addition Summary
Label: PROP-OUTFALL
Scenario: MERCER 10-yr

Return Event: 10 years
Storm Event: Region C 24hr

Summary for Hydrograph Addition at 'PROP-OUTFALL'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	PROP-IMP
<Catchment to Outflow Node>	PROP-PERV

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	PROP-IMP	0.207	12.120	2.78
Flow (From)	PROP-PERV	0.119	12.160	1.61
Flow (In)	PROP-OUTFALL	0.326	12.120	4.29

Rider Gym

Subsection: Addition Summary
Label: PROP-OUTFALL
Scenario: MERCER 100-yr

Return Event: 100 years
Storm Event: Region C 24hr

Summary for Hydrograph Addition at 'PROP-OUTFALL'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	PROP-IMP
<Catchment to Outflow Node>	PROP-PERV

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	PROP-IMP	0.351	12.120	4.64
Flow (From)	PROP-PERV	0.247	12.150	3.25
Flow (In)	PROP-OUTFALL	0.598	12.120	7.72

Rider Gym

Subsection: Runoff CN-Area
Label: EX-IMP
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
IMPERVIOUS	98.000	0.520	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.520	(N/A)	(N/A)	98.000

Rider Gym

Subsection: Runoff CN-Area
Label: EX-PERV
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
OPEN SPACE - HSG D - GOOD	80.000	0.510	0.0	0.0	80.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.510	(N/A)	(N/A)	80.000

Rider Gym

Subsection: Runoff CN-Area
Label: PROP-IMP
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
IMPERVIOUS	98.000	0.520	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.520	(N/A)	(N/A)	98.000

Rider Gym

Subsection: Runoff CN-Area
Label: PROP-PERV
Scenario: MERCER 2-yr

Return Event: 2 years
Storm Event: Region C 24hr

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
OPEN SPACE, HSG D, GOOD	80.000	0.230	0.0	0.0	80.000
MEADOW, HSG D	78.000	0.280	0.0	0.0	78.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.510	(N/A)	(N/A)	78.902

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Rider Gym

APPENDIX D

NEW JERSEY GROUNDWATER RECHARGE SPREADSHEET (NJ GSR-32)

New Jersey Groundwater Recharge Spreadsheet
Version 2.0
November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
MERCER CO., LAWRENCE TWP	44.9	1.43

Project Name:	Rider Alumni Gym
Description:	
Analysis Date:	09/17/21

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.52	Impervious areas	Udorthents	0.0	-
2	0.51	Open space	Udorthents	0.0	-
3					
4					
5					
6					
7					
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	1.0			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				0.0	-

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.52	Impervious areas	Udorthents	0.0	-
2	0.23	Open space	Udorthents	0.0	-
3	0.28	adow, Pasture, Grassland or ra	Udorthents	0.0	-
4					
5					
6					
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	1.0			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				0.0	-

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)	22,651
Post-Development Annual Recharge Deficit=	***0***	(cubic feet)	

Recharge Efficiency Parameters Calculations (area averages)

RWC=	#N/A	(in)	DRWC=	#N/A	(in)
ERWC =	#N/A	(in)	EDRWC=	#N/A	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

APPENDIX E

NONSTRUCTURAL STRATEGIES POINTS SYSTEM (NSPS) SPREADSHEET

NJDEP Nonstructural Strategies Points System (NSPS)

Version: January 31, 2006

Note: Input Values in Yellow Cells Only

Project:	Rider University Alumni Gym
Date:	September 17, 2021
User:	MNK
Notes:	Areas based on Impervious Maps

Step 1 - Provide Basic Major Development Site Information

A. Specify Total Area in Acres of Development Site Described in Steps 2 and 3 = 1.0 **Acres**

B. Specify by Percent the Various Planning Areas Located within the Development Site:

State Plan Planning Area:	PA-1	PA-2	PA-3	PA-4	PA-4B	PA-5	Total % Area
Percent of Each Planning Area within Site:		100.0%					100.0%

Note: See User's Guide for Equivalent Zones within Designated Centers and the NJ Meadowlands, Pinelands, and Highlands Districts

Step 2 - Describe Existing or Pre-Developed Site Conditions

A. Specify Existing Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG: HSG A	HSG B	HSG C	HSG D	Use/Cover Subtotals	Points
1	Wetlands and Undisturbed Stream Buffers					0.0	0
2	Lawn and Open Space				0.5	0.5	89
3	Brush and Shrub					0.0	0
4	Meadow, Pasture, Grassland, or Range					0.0	0
5	Row Crop					0.0	0
6	Small Grain and Legumes					0.0	0
7	Woods - Indigenous					0.0	0
8	Woods - Planted					0.0	0
9	Woods and Grass Combination					0.0	0
10	Ponds, Lakes, and Other Open Water					0.0	0
11	Gravel and Dirt					0.0	0
12	Porous and Permeable Paving					0.0	0
13	Directly Connected Impervious				0.5	0.5	0
14	Unconnected Impervious with Small D/S Pervious					0.0	0
15	Unconnected Impervious with Large D/S Pervious					0.0	0
	HSG Subtotals (Acres):	0.0	0.0	0.0	1.0	**Total Area:**	1.0
	HSG Subtotals (%):	0.0%	0.0%	0.0%	100.0%	**Total % Area:**	100.0%

Points Subtotal: 89

Total Existing Site Points: 89

Step 3 - Describe Proposed or Post-Developed Site Conditions

A. Specify Proposed Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG: HSG A	HSG B	HSG C	HSG D	Use/Cover Subtotals	Points
1	Wetlands and Undisturbed Stream Buffers					0.0	0
2	Lawn and Open Space				0.2	0.2	40
3	Brush and Shrub					0.0	0
4	Meadow, Pasture, Grassland, or Range				0.3	0.3	64
5	Row Crop					0.0	0
6	Small Grain and Legumes					0.0	0
7	Woods - Indigenous					0.0	0
8	Woods - Planted					0.0	0
9	Woods and Grass Combination					0.0	0
10	Ponds, Lakes, and Other Open Water					0.0	0
11	Gravel and Dirt					0.0	0
12	Porous and Permeable Paving					0.0	0
13	Directly Connected Impervious				0.5	0.5	0
14	Unconnected Impervious with Small D/S Pervious					0.0	0
15	Unconnected Impervious with Large D/S Pervious					0.0	0
	HSG Subtotals (Acres):	0.0	0.0	0.0	1.0	**Total Area:**	1.0
	HSG Subtotals (%):	0.0%	0.0%	0.0%	100.0%	**Total % Area:**	100.0%
						Points Subtotal:	**104**

B. Compare Proposed Impervious Coverage with Maximum Allowable Impervious Coverage:

Total Directly Connected Impervious Coverage =	50%	% of Site
Total Unconnected Impervious Coverage with Small D/S Pervious =	0%	% of Site
Total Unconnected Impervious Coverage with Large D/S Pervious =	0%	% of Site
Total Site Impervious Coverage =	50%	% of Site
Effective Site Impervious Coverage =	50%	% of Site
Specify Source of Maximum Allowable Impervious Coverage:	None	(None or Table)

Points Subtotal: 0

C. Compare Proposed Site Disturbance with Maximum Allowable Site Disturbance:

Total Proposed Site Disturbance =		% of Site
Maximum Allowable Site Disturbance by Municipal Ordinance =		% of Site

Points Subtotal: 0

D. Describe Proposed Runoff Conveyance System:

Total Length of Runoff Conveyance System =	0	Feet
Length of Vegetated Runoff Conveyance System =	0	Feet
% of Total Runoff Conveyance System That is Vegetated =	0%	

Points Subtotal: 0

E. Residential Lot Clustering:

Percent of Total Site Area that will be Clustered =		% of Site
Minimum Standard Lot Size as Per Zoning (Note: 1/2 Acre or Greater) =		Acres
Maximum Proposed Cluster Lot Size (Note:1/4 Acre or Less) =		Acres
Percent of Clustered Portion of Site to be Preserved as Vegetated Open Space =		% of Clustered Site Portion

Points Subtotal: 0

F. Will the Following be Utilized to Minimize Soil Compaction?

Proposed Lawn Areas will be Graded with Lightweight Construction Equipment:	No	(Yes or No)
Percent of Proposed Lawn Areas to be Graded with Such Equipment:	0%	% of Lawn Areas

Points Subtotal: **0**

G. Are Any of the Following Stormwater Management Standards Met Using Only Nonstructural Strategies and Measures?

Groundwater Recharge Standards (NJAC 7:8-5.4-a-2):	No	(Yes or No)
Stormwater Runoff Quality Standards (NJAC 7:8-5.5):	No	(Yes or No)
Stormwater Runoff Quantity Standards (NJAC 7:8-5.4-a-3):	No	(Yes or No)

Points Subtotal: **0**

Note: If the Answers to All Three Questions at G Above are "Yes", Adequate Nonstructural Measures have been Utilized.

Total Proposed Site Points: **104**

Ratio of Proposed to Existing Site Points: **116%**

Required Site Points Ratio: **80%**

Nonstructural Point System Results: **Proposed Nonstructural Measures are Adequate**

APPENDIX F

STORM SEWER CALCULATIONS

van note-harvey associates

- Since 1894 -

Storm Sewer Computations

Project: Rider Alumni Gym
Location: Lawrence Township, Mercer County, NJ

Design Storm: 100 Years

Notes: C = 0.99 (Impervious) C = 0.25 (Woods) C = 0.35 (Lawn)
*STORM PIPE INFORMATION SHOWN ON PLANS (LENGTH/SLOPE/INVERT) MAY VARY SLIGHTLY, DUE TO ROUNDING, FROM THE INFORMATION PROVIDED ON THESE SHEETS. CALCULATIONS SHOWN HEREON HAVE ACCOUNTED FOR THESE VARIATIONS.

Job No. 44760-400-21
Date: 9/17/2021
By: MNK
Chkd: BRP
Sheet 1 of 1

LOCATION		Imp. Area	Runoff Coef.	Grass Area	Runoff Coef.	ACRES		RUNOFF			TIME CONC. (min)			Intensity	Flow, Q (cfs)		PIPE SUPPLIED									
FROM	TO	(Acre)	C	(Acre)	C	"A"	Total	"C"	CxA	ΣCxA	INLET	PIPE	TOTAL	I (in/hr)	Des	Cap	Top Up	Inv. Up	Inv. Dn	Fall (ft)	L (ft)	Dia (in)	Type	"N"	S (%)	V (fps)
Begin Run																										
EX. B-INL	MH-7	0.01	0.99	0	0.35	0.01	0.01	0.99	0.01	0.01	6	0.0	6	9.00	0.09	8.17	103.62	98.94	98.41	0.53	12	12	HDPE	0.012	4.50	0.11
MH-7	MH-5	0.07	0.99	0	0.35	0.07	0.08	0.99	0.07	0.08	6.0	1.7	7.72	8.57	0.68	8.56	101.50	94.39	93.29	1.10	74	15	HDPE	0.012	1.50	0.55
MH-5	A INL-4	0.00	0.99	0.04	0.35	0.04	0.12	0.35	0.01	0.09	7.7	2.2	9.93	8.02	0.75	8.55	100.25	93.29	92.89	0.40	26	15	HDPE	0.012	1.50	0.61
A INL-4	A INL-3	0.01	0.99	0.01	0.35	0.02	0.14	0.67	0.01	0.11	9.9	0.7	10.65	7.86	0.84	8.55	99.95	92.89	92.43	0.46	30	15	HDPE	0.012	1.50	0.68
A INL-3	A INL-2	0.06	0.99	0.01	0.35	0.07	0.21	0.90	0.06	0.17	10.7	0.7	11.40	7.69	1.30	8.56	99.95	92.43	91.57	0.86	57	15	HDPE	0.012	1.50	1.06
A INL-2	EX. A-INL	0.00	0.99	0	0.35	0.00	0.21	0.99	0.00	0.17	11.4	0.9	12.30	7.49	1.27	8.55	101.00	91.57	91.21	0.36	24	15	HDPE	0.012	1.50	1.04
EX. A-INL	DGHS-MH-11	0.02	0.99	0	0.35	0.02	0.23	0.99	0.02	0.19	12.3	0.4	12.68	7.41	1.40	4.25	99.25	91.21	91.11	0.10	23	15	RCP	0.013	0.43	1.14
Begin Run																										
A INL-13	A INL-12	0.01	0.99	0.03	0.35	0.04	0.04	0.51	0.02	0.02	6	0.0	6	9.00	0.18	8.56	98.50	94.20	93.66	0.54	36	15	HDPE	0.012	1.50	0.15
Begin Run																										
DB-14	A INL-12	0	0.99	0.01	0.35	0.01	0.01	0.35	0.00	0.00	6	0.0	6	9.00	0.03	1.84	99.10	94.76	94.24	0.52	26	8	HDPE	0.012	2.00	0.09
Sum Runs																										
A INL-12	DGHS-MH-11	0.01	0.99	0	0.35	0.01	0.06	0.99	0.01	0.03	6.0	4.8	10.80	7.82	0.26	8.54	99.30	93.66	93.14	0.52	35	15	HDPE	0.012	1.50	0.22
Sum Runs																										
DGHS-MH-11	EX STM MH	0.00	0.99	0	0.35	0.00	0.07	0.99	0.00	0.04	10.8	2.7	13.49	7.23	0.27	4.23	99.80	91.11	90.77	0.34	79	15	HDPE	0.013	0.43	0.22