FRENCH & PARRELLO ASSOCIATES

ENGINEERING AND CONSULTING **SINCE 1974**

Environmental Impact Assessment prepared for **Penn Medicine Princeton Health Cancer Center Garage**

Township of Plainsboro
Middlesex County, New Jersey
Block 1701, Lots 3.01 & 4.04





Prepared For:

Princeton HealthCare System
A New Jersey Nonprofit Corporation
d/b/a Penn Medicine Princeton Health
1 Plainsboro Road
Plainsboro, NJ 08536

_____
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July 25, 2023| FPA No. 06C028T.003
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TABLE OF CONTENTS

SECTION A - PROJECT DESCRIPTION 1
SECTION B - SITE DESCRIPTION AND INVENTORY 2
1) Environmentally Sensitive Areas 2
2) Soil Classifications 3
3) Topography 4
4) Geology 4
5) Vegetation 4
6) Existing Development Features 4
7) Ground, Surface, Potable Water 4
8) Sewerage Facilities 5
9) Drainage 5
10) Depth to Seasonally High Groundwater 5
11) Erosion Hazards 5
12) Traffic 5
SECTION C - ANTICIPATED ENVIRONMENTAL IMPACT 5
1) Land Use 5
2) Ground, Surface, Potable Water 6
3) Air Quality 6
4) Wildlife Habitat 6
5) Social and Economic Aspects of the Community 7
6) Noise 7
7) Solid and Other Waste 8
8) Cultural Activities 8
9) Aesthetics of the Project Area 8
10) Archaeological and Historic Sites 8
11) Traffic 8
12) Drainage 9
13) Erosion Hazard 9

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TABLE OF CONTENTS

14) Other Environmental Impacts 9
SECTION D - CUMULATIVE AND/OR LONG TERM ENVIRONMENTAL EFFECTS 9
1) Surface Water Runoff 9
2) Displacement of People and Businesses 9
SECTION E - EVALUATION OF UNAVOIDABLE IMPACTS 10
SECTION F - METHODS OF MITIGATING ADVERSE ENVIRONMENTAL IMPACTS 10
1) Noise 10
2) Surface Water Runoff 10
3) Air Quality 10
SECTION G - ALTERNATIVES TO THE PROPOSED PROJECT 11
1) No-Build/Postponement 11
2) Alternative Location 11
3) Alternative Design 11
SECTION H - CONCLUSION 11

Appendix A

NRCS Web Soil Map and Descriptions

Appendix B

Air Quality Readings

TABLE OF CONTENTS

Appendix C

List of Figures

Figure 1. Overall Site Map
Figure 2. NJDEP Wetlands Map
Figure 3. FEMA FIRM
Figure 4. Groundwater Recharge Map
Figure 5. Aquifer Recharge Map
Figure 6. NJDEP Landscape Project Map
Figure 7. NJDEP Historic Preservation Map
Figure 8. NJDEP Streams Map
Figure 9. NJDEP Geology Map

SECTION A - PROJECT DESCRIPTION

The Penn Medicine Princeton HealthCare System Campus has been designated as an area for redevelopment in Plainsboro Township and the township has adopted the Amended Redevelopment for the Princeton HealthCare System at Plainsboro Site, dated March 13, 2013 which establishes the zoning requirements for the project. Penn Medicine Princeton Health ("PMPH" "Applicant") has identified a need for a Cancer Center facility and associated parking garage. The project site for the Cancer Center and Parking Garage is in the Hospital Medical Office Complex (HMOC) district within the Redevelopment Plan. A temporary surface parking lot is proposed on vacant Lot 4.04 located in the Office and Residential Complex (ORC) Zone to account for the on-site parking displaced during construction.

Penn Medicine Princeton HealthCare System is developing a plan for a new cancer center as part of the second phase of development of the HMOC site. It has been decided to separate the second phase into two site plan applications, one to address the new parking structure and one to address the new cancer center. The purpose of separating the overall project into two site plan applications is to allow the construction sequencing of the parking garage first and then the Cancer Center to minimize the impact on the existing operation of the HMOC. This application is for site plan approval for the parking structure on Lot 3.01 and the temporary parking area on Lot 4.04.

The Parking Garage is a permitted accessory use within the HMOC Zone District. A deviation is necessary for the "minimum building setback from perimeter lot lines" for the proposed parking garage setback of proposed 69 feet where 75 feet is required. The temporary parking lot is also a permitted accessory use and it conforms to the Amended Redevelopment Plan requirements. A deviation from the landscape requirements is needed for the temporary parking lot. The intent is to maximize the temporary parking and minimize the overall disturbance. The temporary lot will be removed upon the completion of construction, therefore, the landscaping would also be removed. Other than the deviations noted, the proposed project conforms to the land use plan and bulk design standards set forth in the Plan. The building orientation, massing, materials and landscape design will be consistent with the Plan requirements and will maintain the same high quality standards within the healthcare campus. See Figure 1 for an overall site plan depicting the location of each project.

Parking Garage

The proposed parking garage consists of a six-level parking facility which will provide 1,161 spaces including 117 ADA spaces.

Temporary Parking Lot

349 parking spaces, including 19 handicap spaces, will be displaced as a result of the Cancer Center and Parking Garage construction. The applicant is proposing to construct replacement temporary spaces on the vacant lot adjacent to the campus. The temporary parking lot will also provide parking spaces for construction workers during construction. The ADA spaces will be temporarily relocated near the main hospital entrance and near the Education Building. The surface of the parking lot will be constructed

with a combination of traditional bituminous concrete and pervious type pavement. Even though the temporary lot will be removed after construction is completed, the stormwater management system was designed in accordance with the Stormwater Management Rules at NJAC 7:8.

The following Environmental Impact Assessment ("EIA") has been prepared on behalf of the applicant in accordance with Plainsboro Township Land Use ordinance, Chapter 20, Section 10. This EIA provides a description of the proposed project and site, an inventory of existing environmental conditions and assessment of probable impacts, a list and evaluation of adverse environmental impacts which cannot be avoided and a discussion of alternatives to the proposed project.

SECTION B - SITE DESCRIPTION AND INVENTORY

1) Environmentally Sensitive Areas

Wetlands

Based on recent site visits and a review of the NJDEP Geoweb Wetlands Mapping (see Figure 2), there are no freshwater wetlands located within the area of the proposed site improvements for the Parking Garage and Temporary Parking Area.

Floodplains

According to the FEMA Flood Insurance Rate Maps, the project site is not located within a flood hazard area (see Figure 3).

Aquifer Recharge

Aquifer recharge is the process of increasing water to an aquifer through ground water recharge that can provide water to natural springs and wells. According to the NJDEP Geoweb, the area of the proposed Cancer Center and Parking Garage has a ground water recharge potential of 1 to 7 in/yr and 11 to 15 in/yr. The area designated for the Temporary Parking Lot has a ground water recharge potential of 11 to 15 in/yr (see figure 4). The amount of water from ground water recharge that reaches the aquifer depends on many factors such as land use, soil type and extent of water features. The New Jersey Geological Survey (NJGS) has developed aquifer recharge mapping for Middlesex County (see Figure 5). The mapping suggests that the potential for aquifer recharge within the project area is similar to the potential for ground water recharge.

However, over the past 15 years, the soil conditions of the property have been heavily disturbed and compacted where the soil is not providing infiltration of the groundwater. FPA has performed several soil logs to an approximate depth of 10 feet below the surface throughout the property to assess the subsurface soil conditions, estimate the seasonal high water table and perform soil percolation testing of the surface soils. Based on the soil logs, seasonal high water table was not encountered in any of the soil excavations, which is consistent with the findings of the subsurface soil conditions performed for the Regional Detention Basin located at the rear of the property. Also, on-site percolation testing was performed at each soil log excavation at depths from 7" to 14" below the surface and all percolation

testing failed during the pre-soak where the water elevation either did not drop at all or insignificantly after 1 hour. The on-site percolation testing results indicated that the existing surface soil conditions do not provide any infiltration of stormwater runoff into the groundwater. Therefore, the annual pre-construction groundwater recharge is zero and the requirement for post-construction recharge would be the same. Since there is no groundwater recharge under the existing conditions, the project meets the recharge requirements of N.J.A.C. 7:8 New Jersey Stormwater Management Rules or a waiver is hereby requested. See the Stormwater Management Report prepared by FPA for Soil Logs and on-site percolation testing results.

Woodland and Wildlife Habitat

The project area consists of only urban land. According to the NJDEP GeoWeb, the site does not contain any wildlife habitats of specific priority (see Figure 6).

Agricultural Land

The project site of the Parking Garage does not contain area that is currently being farmed. A small portion of Lot 4.04 is currently being farmed for small grains but since the parking area is only temporary, once the temporary is no longer needed the area can be farmed again.

Archaeological and Historic Sites

According to the NJDEP GeoWeb, the project site does not contain any historical and/or archeological significant areas within the area of the proposed site improvements (see Figure 7).

Intermittent Streams

There are no existing streams located on the subject property. A Tributary to Millstone River is located approximately 580 feet southeast of the proposed Temporary Parking, Lot 4.01, Block 1701 (see Figure 8).

2) Soil Classifications

Three soil types are found on the project site which can be found in Appendix A. Below are the soil types found within the proposed portion of the site.

a. NknB: Nixon loam, 2 to 5 percent slopes
   This soil type is most likely to be found on flat land. It has a moderate available water capacity of about 6.4 inches. This soil does not experience frequent flooding or ponding and is well drained.

b. SacC: Sassafras sandy loam, 5 to 10 percent slopes
   This soil type is most likely to be found on slightly sloped land. It has a moderate available water capacity of about 6.4 inches. This soil does not experience frequent flooding or ponding and is somewhat excessively drained.

c. NkrA: Nixon moderately well drained variant loam, 0 to 2 percent slopes

This soil type is most likely to be found on flat land. It has a moderate available water capacity of about 5.3 inches. This soil does not experience frequent flooding or ponding and is well drained.

3) Topography

The topography of the overall project generally slopes in a southeasterly direction from elevation 93 feet at the north side of the proposed parking garage to elevation 74 at the existing stormwater basin just east of the proposed temporary parking lot. No major elevation changes or drainage pattern alterations will occur as a result of this project.

4) Geology

The existing project area is underlain by the Stockton Formation (see Figure 9). According to the NJDEP GeoWeb, the Stockton Formation is composed of Triassic siltstone, shale, sandstone, conglomerates, and mudstone.

5) Vegetation

The area proposed for the new Parking Garage is currently developed with parking, drive aisles, sidewalks and maintained landscaped areas. The area of the proposed Temporary Parking Lot was previously covered in stone for utilization as a parking lot. The stone was removed approximately 10 years ago. This area was recently utilized as a staging area for the construction of the adjacent assisted living facility providing additional disturbance. After construction was completed in 2019, the westerly portion of Lot 4.04 was farmed with small grains. The easterly portion was restored and is currently vegetated with low lying grasses and shrubs.

6) Existing Development Features

The project area is part of the Penn Medicine Health Care Campus and currently contains an existing parking lot, access driveway, storage shed, site lighting, a manmade retention pond, stormwater structures and other associated improvements.

7) Ground, Surface, Potable Water

The project site of the Parking Garage currently has an existing man-made retention pond that is used to detain and treat stormwater runoff. Much of the stormwater runoff is directed to the man-made retention pond through overland flow and a storm sewer system. The project site for the temporary parking area currently has an existing Regional Detention Basin to manage and control the stormwater runoff from Lot 4.04. Potable water is currently provided to the site through an existing New Jersey American Water Company water main.

8) Sewerage Facilities

The site is currently serviced with a 12" sanitary sewer pipe that runs on the north and south sides of the existing buildings.

9) Drainage

The site currently has an existing man-made retention pond that is used to detain and treat stormwater runoff. The majority of the stormwater runoff is directed to the man-made retention pond through overland flow and a storm sewer system. Lot 4.04 has a regional detention basin which serves Lot 4.04, the assisted living facility and the daycare center.

10) Depth to Seasonally High Groundwater

The entire project site has been previously developed and seasonal high groundwater was not encountered. We don't anticipate encountering the seasonally high groundwater during the construction of the proposed site improvements.

11) Erosion Hazards

Currently the site is a stable, developed facility with pervious and impervious areas mixed throughout the property. There are minimal amounts of steep slopes on the project site.

12) Traffic

The project site is located at the intersection of Route 1 and Plainsboro Road with two main access locations to the health care campus. Punia Boulevard is the main "spine" entry roadway into the Health Care Campus. Punia Boulevard starts at Plainsboro Road and proceeds northward to connect to Hospital Drive. Hospital Drive is the secondary entry roadway that links Punia Boulevard to Campus Road to the east.

SECTION C - ANTICIPATED ENVIRONMENTAL IMPACT

1) Land Use

The Penn Medicine Princeton HealthCare System Campus has been designated as an area for redevelopment in Plainsboro Township and the township has adopted the Amended Redevelopment for the Princeton HealthCare System at Plainsboro Site, dated March 13, 2013 which establishes the zoning requirements for the project. The project site for the Cancer Center and Parking Garage is located in the Hospital Medical Office Complex (HMOC) district within the Redevelopment Plan. The temporary parking lot is located in the Office and Residential Complex (ORC) Zone.

The Parking Garage is a permitted accessory use within the HMOC Zone District. A deviation is necessary for the "minimum building setback from perimeter lot lines" for the proposed parking garage

setback of proposed 69 feet where 75 feet is required. The temporary parking lot is also a permitted accessory use and it conforms to the Amended Redevelopment Plan requirements. The temporary parking lot is being proposed to manage the displaced parking during construction and to maintain adequate parking for the current operation on the project site. A deviation from the landscape requirements is needed for the temporary parking lot. The intent is to maximize the temporary parking and minimize the overall disturbance. The temporary lot will be removed upon the completion of construction, therefore, the landscaping would also be removed. Other than the deviations noted, the proposed project conforms to the land use plan and bulk design standards set forth in the Plan. The building orientation, massing, materials and landscape design will be consistent with the Plan requirements and will maintain the same high quality standards within the healthcare campus.

2) Ground, Surface, Potable Water

Ground water is not anticipated to be encountered during the construction of the proposed site improvements. The proposed parking garage will be designed to comply with the Township Stormwater Management requirements, which include stormwater quantity reductions and water quality treatment using Green Infrastructure (GI) elements. Please refer to the Stormwater Management Report for specific details. Potable water will be supplied to the parking Garage facility by service connections to the existing 8" NJAW main.

3) Air Quality

The level of air quality in the State of New Jersey is monitored on a regular basis by the NJDEP at a number of stations located throughout the State. The closest station to the site is located at Rider University, which is in close proximity to the site. Since this monitoring station is located in an area that is similar to the project site, it is reasonable to assume that the ambient air quality at the site is similar to the monitoring station. Monitor readings taken at various days between November 17, 2022 and December 7, 2022, were recorded for the site to have "GOOD" air quality,[5] see Appendix B. The project site will not impact the air quality of the Township of Plainsboro in terms of traffic congestion and auto emissions build-up sufficient to exceed NJDEP Air Quality Standards. A minor temporary increase in air pollution can be expected from dust during installation operations but will quickly dissipate upon construction completion.

4) Wildlife Habitat

As stated earlier, the site is currently developed and does not contain any wildlife habitats of specific priority according to the NJDEP Geoweb.

[5] Obtained from the NJDEP Bureau of Air Quality Monitoring website (https://www.njaqinow.net/). See Appendix A.

5) Social and Economic Aspects of the Community

The construction of this facility will benefit the Community, surrounding areas and Township by providing support for the future Cancer Center and medical services on the HMOC site.

6) Noise

Table 1 displays common noise levels associated with a range of indoor and outdoor activities. Levels of 70 decibels (dBA) or above have been generally accepted as interfering with normal conversation. Noise levels in the range of 45 to 55 dBA can be disruptive to normal sleep patterns. Actual on-site measurements of noise levels were not conducted for this EIA. Temporary increased noise levels will be generated at the site due to the short term activity involving the construction of the proposed site improvements.

TABLE 1[1]

COMMON NOISE LEVELS

COMMON OUTDOOR NOISE LEVELS	NOISE LEVEL (DbA)	COMMON INDOOR NOISE LEVELS
Jet Flyover at 1,000 feet	110	Rock Band
Gas Lawn Mower at 3 feet	100	Inside Subway Train
Diesel Truck at 50 feet	90	Flood Blender at 3 feet
Noisy Urban Daytime	80	Garbage Disposal at 3 feet Shouting at 3 feet
Gas Lawn Mower at 100 feet	70	Vacuum Cleaner at 10 feet
Heavy Traffic at 300 feet	60	Large Business Office
Quiet Urban Daytime	50	Dishwasher Next Room
Quiet Urban Nighttime	40	Small Theater
Quiet Rural Nighttime	30	Bedroom at Night Concert Hall (background)

[1] Source: Bolt, Beranek & Newman, Inc. Fundamentals and Abatement of Highway Traffic Noise, Office of Environmental Policy, Federal Highway Administration, U.S. Department of Transportation, Washington D.C., 1973.

7) Solid and Other Waste

The proposed improvements are expected to increase the amount of solid and other waste associated with the Princeton Healthcare Campus. Currently a private waste management service handles and removes the solid waste in accordance with local and state regulations for the existing medical center use. The existing facilities will be utilized for waste management. No change to the existing facility is proposed.

8) Cultural Activities

The proposed site improvements will not impact the cultural activities of the community.

9) Aesthetics of the Project Area

The proposed project conforms to the Hospital Medical Office Complex (HMOC) use standards under the amended Redevelopment Plan. The location of the proposed facilities will be landscaped with the high quality of plantings consistent with the Health Care Campus landscaping.

The proposed development complies with the Open Space requirements of the Amended Redevelopment Plan and does not impact the existing open space areas on the hospital site. The open space areas located on the project site will remain, which includes the healing gardens, educational gardens and landscape areas on the hospital site. The existing Public Park on the south side of Plainsboro Road will not be impacted by the proposed development and pedestrian access to the passive park will be maintained. The area surrounding the parking garage will be landscaped with pedestrian paths.

10) Archaeological and Historic Sites

According to the NJDEP GeoWeb, the project site does not contain any historical and/or archeological significant areas within the area of the proposed facility and site improvements. Therefore, there shall be no adverse impact to archaeological or historic sites as a result of the proposed project.

11) Traffic

The proposed parking garage is situated within the existing P6 parking area which will maintain the existing site circulation on the north side of the hospital site. Vehicular access to the parking garage will be on the southwestern portion of the structure, which will keep queuing of vehicles off of Hospital

Drive. There will be another vehicular entrance to the parking garage directly aligned with the exit of the expanded patient drop-off area. Also, there will be an exit only access from the parking garage directly onto Hospital Drive which will be aligned with the P10 access driveway and with consideration of the pedestrian crossing of Hospital Drive. The temporary parking area located on Lot 4.04 will use the existing access driveway on Punia Boulevard for both ingress and egress to the temporary parking area. Please refer to the traffic impact analysis prepared by others for a detailed analysis.

12) Drainage

The proposed parking garage has been designed to comply with the Township Stormwater Management requirements, which include stormwater quantity reductions and water quality treatment using Green Infrastructure (GI) elements. The temporary parking lot has also been designed to comply with the Township Stormwater Management requirements, even though it is temporary and will be removed. Please refer to the Stormwater Management for a detailed description.

13) Erosion Hazard

The project proposes soil erosion and sediment control measures in accordance with the current standards for soil erosion and sediment control in New Jersey. The applicant will apply to the Freehold Soil Conservation District for soil erosion and sediment control for certification of our plan.

14) Other Environmental Impacts

We do not anticipate any other environmental impacts associated with the proposed site improvements that have not already been discussed herein.

SECTION D - CUMULATIVE AND/OR LONG TERM ENVIRONMENTAL EFFECTS

1) Surface Water Runoff

The proposed stormwater management plan is consistent with the NJDEP Stormwater Management rules and Township requirements. The project is in compliance with the N.J.A.C. 7:8, New Jersey Stormwater Management Rules.

2) Displacement of People and Businesses

The proposed Cancer Center and Parking Garage will result in approximately 110 new permanent jobs (over a period of time) for the operation of the facility. The construction estimate for the project is an investment of approximately $200 million which is anticipated to create approximately 200 jobs throughout the construction period of this project.

SECTION E - EVALUATION OF UNAVOIDABLE IMPACTS

It is our opinion, that any impacts that are unavoidable as a result of this project, will not compromise the integrity of the project and the betterment of the uses on the HMOC site which will provide a benefit to the community.

SECTION F - METHODS OF MITIGATING ADVERSE ENVIRONMENTAL IMPACTS

Various mitigating measures will be implemented to reduce the minor environmental impacts that will occur from the development of the site. Certain steps will be taken to ensure the impacts that do occur are minimal and that the proposed project is compatible with the surrounding environment.

1) Noise

Construction noise, which is a temporary impact, can be mitigated by the proper selection of construction equipment. The ambient noise level may slightly increase during construction; however, it should not generally be uncomfortable or objectionable. Some of the methods of reducing noise impact during this phase may include the following:

a. Installation of noise suppressors on all construction equipment, where applicable.
b. Limitation of construction operations to normal working hours during weekdays and whenever possible, elimination of work on weekends.
c. Retention of as much existing vegetation as possible which will dissipate noise.
d. Expeditious scheduling of those activities that generate noise to minimize their duration.

2) Surface Water Runoff

Mitigation through stormwater management measures have been incorporated into the design of the site. Please see the Stormwater Management Report submitted separately with this application. A Soil Erosion and Sediment Control Plan will be required since the disturbance area is greater than 5,000 square feet. Some of the erosion control procedures may include:

a. Installation of hay bale filters or silt fence to trap sediment before leaving the site.
b. Installation of a gravel-tracking pad at the construction entrance of the site to prevent off-site tracking of mud.

3) Air Quality

Construction work will also have a minimal, temporary impact on air quality. This impact will occur mainly from truck and construction equipment exhaust emissions and dust associated with the construction of the proposed improvements. Impacts, besides being temporary, can be mitigated by reducing vehicular idling time, and using accepted construction techniques.

SECTION G - ALTERNATIVES TO THE PROPOSED PROJECT

In considering alternatives to the project, three scenarios were considered:

1) No-Build/Postponement

No-Build/Postponement - The no-build/postponement alternative is not considered a viable option since the proposed project will benefit the community by providing State of the Art Diagnostic and Treatment Services.

2) Alternative Location

The property and location is best suited for the project because it is an approved use within the Amended Redevelopment Plan and provides compatibility and synergy with the other medical uses on the project site.

3) Alternative Design

Various designs were considered for the proposed site. The current design was determined to best suit the property constraints and meet environmental objectives while still satisfying the overall goals of the project.

SECTION H - CONCLUSION

As demonstrated in this report, the project site for the Cancer Center Parking Garage does not have any environmental constraints (wetlands, streams, riparian zones, flood plains, etc.), the site is currently developed with an existing parking lot, the parking garage location is consistent with the Redevelopment Plan, the location of the parking garage is situated on the Hospital Site where there is the highest demand for parking and the parking garage is required to support the development of the Cancer Center on the Hospital Site. Based on review and consideration of the site constraints and requirements of the Redevelopment Plan, it was determined that the proposed Parking Garage is required and situated at the best location to support the Hospital Site.

Appendix A
NRCS Web Soil Map and Descriptions



Map Scale: 1:3,450 if printed on A landscape (11" x 8.5") sheet.

N

0 50 100 200 300 Meters

0 150 300 600 900 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

P23-03 Penn Med PB Submission Reports 08/09/23

Component Text Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the selected area. The component descriptions in this report, 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 associated 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 (components) for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

The "Map Unit Component Nontechnical Descriptions" report gives a brief, general description of the soil components that occur in a map unit. Descriptions of nonsoil (miscellaneous areas) and minor map unit components may or may not be included. This description is written by the local soil scientists responsible for the respective soil survey area data. A more detailed description can be generated by the "Map Unit Description" report.

Additional information about the map units described in this report is available in other Soil Data Mart reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the Soil Data Mart reports define some of the properties included in the map unit descriptions.

Report—Component Text Descriptions

Middlesex County, New Jersey

Map Unit: NknB—Nixon loam, 2 to 5 percent slopes

Description Category: GENSOIL

Nixon: 85 percent

The Nixon component makes up 85 percent of the map unit. Slopes are 2 to 5 percent. This component is on flats on North atlantic coastal plains. The parent material consists of old fine-loamy alluvium derived from arkose and/or shale. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 2e. This soil does not meet hydric criteria.

Description Category: GENSOIL

Lansdowne: 5 percent

Generated brief soil descriptions are created for major soil components. The Lansdowne soil is a minor component.

Description Category: GENSOIL

Woodstown: 5 percent

Generated brief soil descriptions are created for major soil components. The Woodstown soil is a minor component.

Description Category: GENSOIL

Sassafras: 5 percent

Generated brief soil descriptions are created for major soil components. The Sassafras soil is a minor component.

Map Unit: NkrA—Nixon moderately well drained variant loam, 0 to 2 percent slopes

Description Category: GENSOIL

Nixon, moderately well drained: 85 percent

The Nixon, moderately well drained component makes up 85 percent of the map unit. Slopes are 0 to 2 percent. This component is on flats on piedmonts. The parent material consists of old fine-loamy alluvium derived from arkose and/or shale. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches during January, February, March, April, May, December. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 2w. This soil does not meet hydric criteria.

Description Category: GENSOIL

Fallsington, bedrock substratum, rarely flooded: 5 percent

Generated brief soil descriptions are created for major soil components. The Fallsington, bedrock substratum, rarely flooded soil is a minor component.

Description Category: GENSOIL

Woodstown: 5 percent

Generated brief soil descriptions are created for major soil components. The Woodstown soil is a minor component.

Description Category: GENSOIL

Sassafras: 5 percent

Generated brief soil descriptions are created for major soil components. The Sassafras soil is a minor component.

Map Unit: SacC—Sassafras sandy loam, 5 to 10 percent slopes, Northern Coastal Plain

Description Category: GENSOIL

Sassafras: 80 percent

The Sassafras component makes up 80 percent of the map unit. Slopes are 5 to 10 percent. This component is on fluviomarine terraces on uplands coastal plains. The parent material consists of loamy fluviomarine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria.

Description Category: GENSOIL

Downer: 4 percent

Generated brief soil descriptions are created for major soil components. The Downer soil is a minor component.

Description Category: GENSOIL

Woodstown: 4 percent

Generated brief soil descriptions are created for major soil components. The Woodstown soil is a minor component.

Description Category: GENSOIL

Fallsington, drained: 4 percent

Generated brief soil descriptions are created for major soil components. The Fallsington, drained soil is a minor component.

Description Category: GENSOIL

Ingleside: 4 percent

Generated brief soil descriptions are created for major soil components. The Ingleside soil is a minor component.

Description Category: GENSOIL

Aura: 4 percent

Generated brief soil descriptions are created for major soil components. The Aura soil is a minor component.

Data Source Information

Soil Survey Area: Middlesex County, New Jersey
Survey Area Data: Version 18, Aug 30, 2022

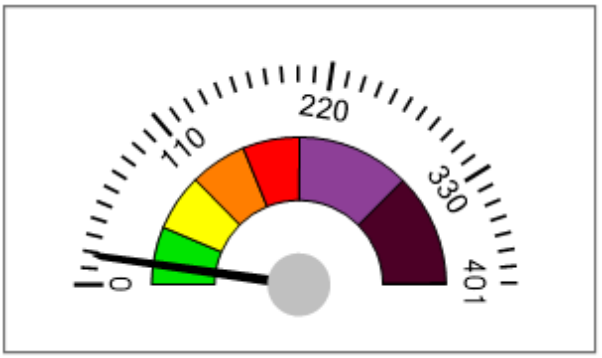
Appendix B
Air Quality Readings

P23-03 Penn Med PB Submission Reports 08/09/23

Station Information

Rider University





Download API

Index Value : 18
Pollutants : O3,PM 2.5
Dominant Pollution : O3

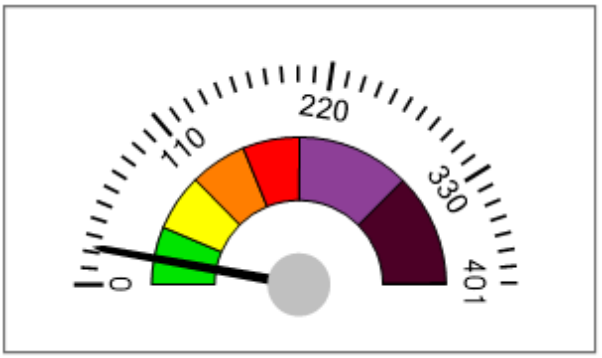
Last Received	RH	TEMP	O3	WSPD	WDIR	SOLAR	BP	PM2.5
	%	DegF	ppm	mph	Deg	Langleys	in Hg	ppb
11/17/2022 4:00 PM	44.6	40	0.025	8.0	313		29.89	

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Station Information

Rider University





Download API

Index Value : 23
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Dominant Pollution : O3

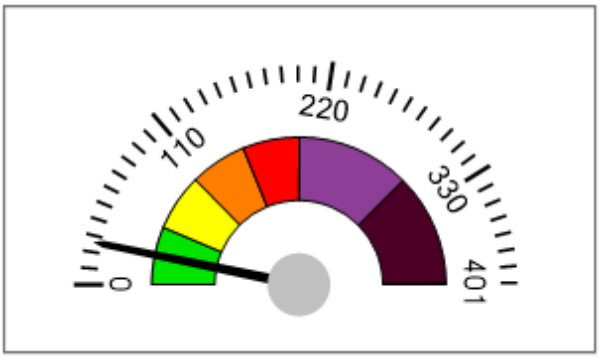
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11/21/2022 4:00 PM	25.4	41	0.031	4.9	195		30.19	1.6

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Station Information

Rider University





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Index Value : 26
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Dominant Pollution : O3

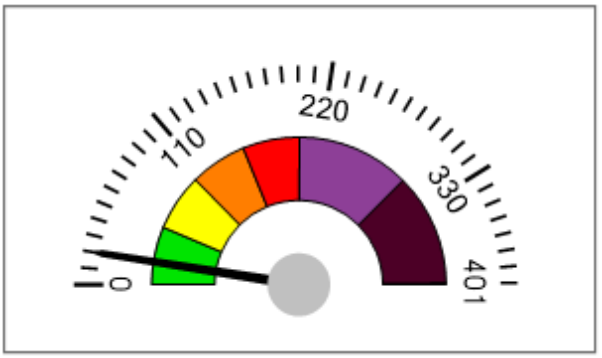
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	%	DegF	ppm	mph	Deg	Langleys	in Hg	ppb
11/22/2022 2:00 PM	31.6	51	0.033	4.0	232		30.16	-1.1

P23-03 Penn Med PB Submission Reports 08/09/23

Station Information

Rider University





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Index Value : 20
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Dominant Pollution : O3

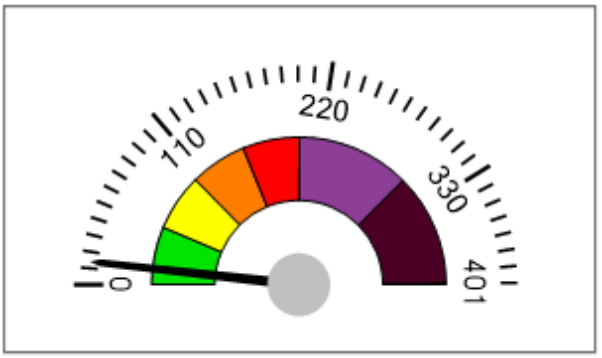
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	%	DegF	ppm	mph	Deg	Langleys	in Hg	ppb
11/29/2022 1:00 PM	51.7	42	0.026	4.3	251		30.16	-4.1

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Station Information

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Index Value : 14
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Dominant Pollution : O3

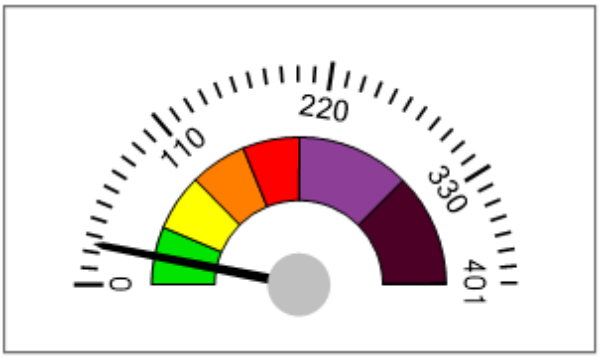
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11/30/2022 2:00 PM	90.6	54	0.018	2.4	244		29.61	-11.6

P23-03 Penn Med PB Submission Reports 08/09/23

Station Information

Rider University



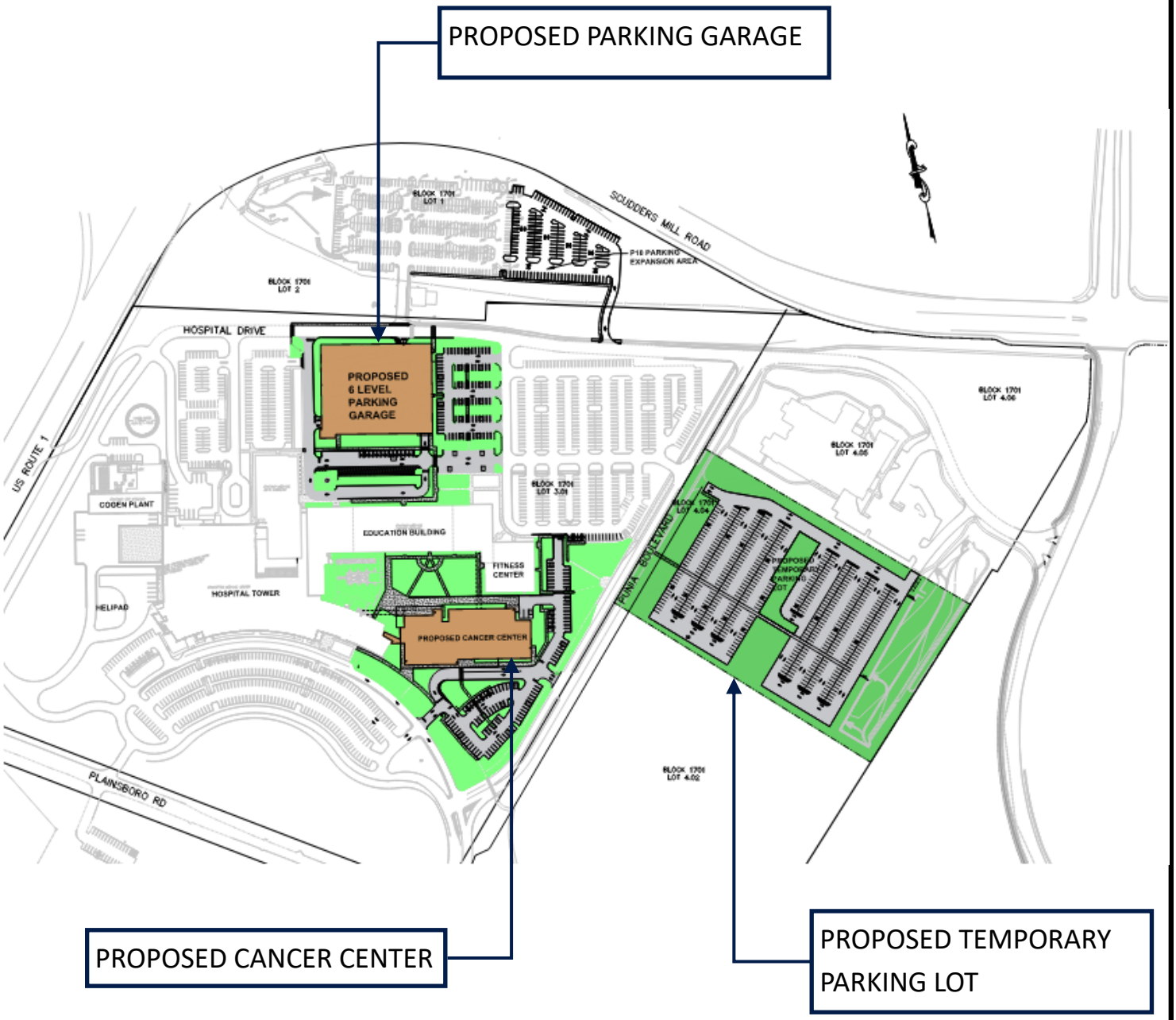


Download API

Index Value : 25
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Dominant Pollution : PM 2.5

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	%	DegF	ppm	mph	Deg	Langleys	in Hg	ppb
12/7/2022 10:00 AM	92.4	54	0.005	1.8	193		30.06	6.6

Appendix C
Figures



FRENCH & PARRELLO ASSOCIATES

OVERALL SITE MAP
PENN MEDICINE PRINCETON HEALTH

Township of Plainsboro
Middlesex County, New Jersey

SCALE:	DATE:	JOB No.:	DRAWING
AS SHOWN	DECEMBER 2022	06C028T.003	FIGURE 1

PROPOSED PARKING GARAGE

NJ-GeoWeb Wetlands



PROPOSED CANCER CENTER

PROPOSED TEMPORARY PARKING LOT

FRENCH & PARRELLO ASSOCIATES

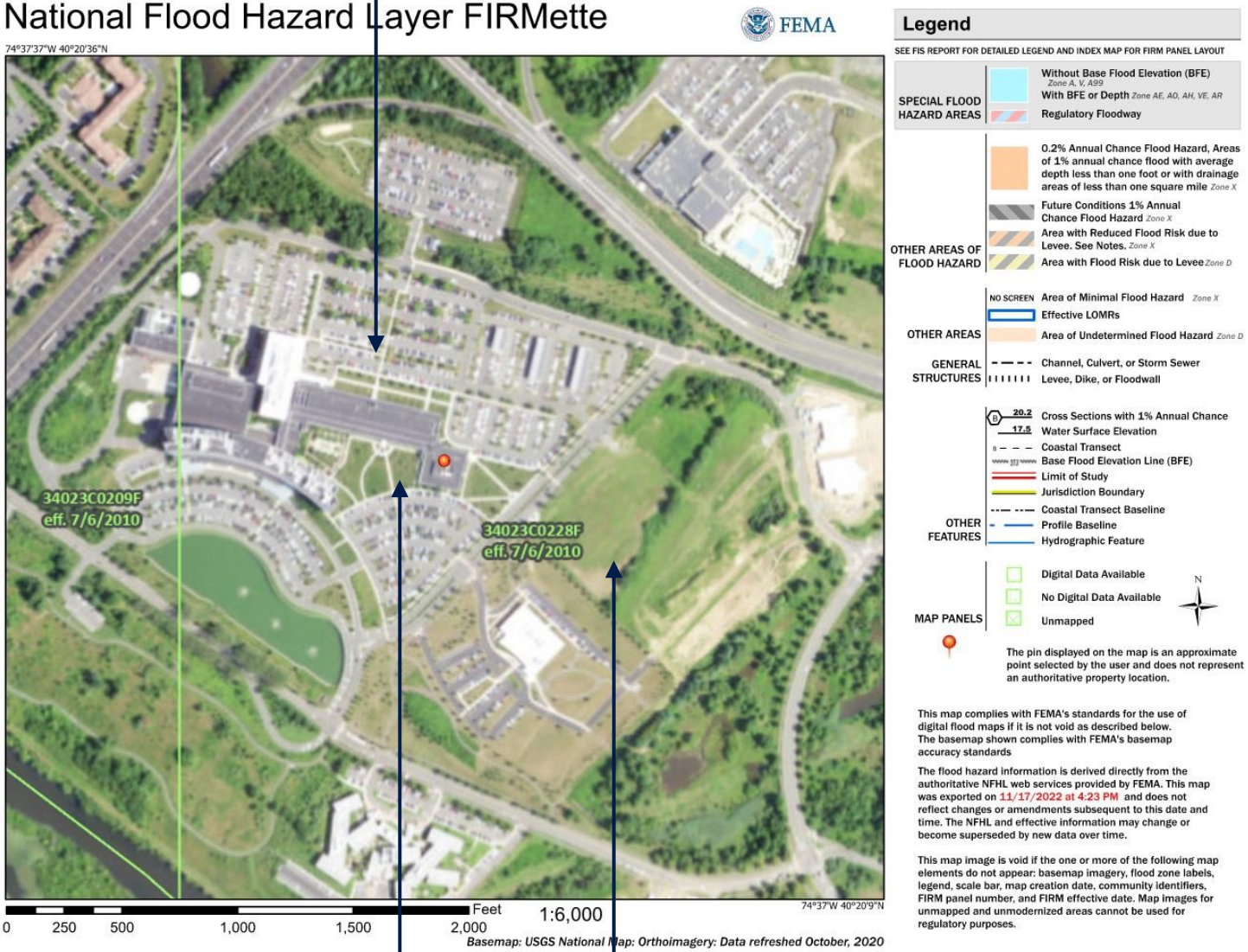
NJDEP WETLANDS MAP

PENN MEDICINE PRINCETON HEALTH

Township of Plainsboro
Middlesex County, New Jersey

SCALE:	DATE:	JOB No.:	DRAWING
AS SHOWN	DECEMBER 2022	06C028T.003	FIGURE 2

PROPOSED PARKING GARAGE



PROPOSED CANCER CENTER

PROPOSED TEMPORARY PARKING LOT

FRENCH & PARRELLO ASSOCIATES

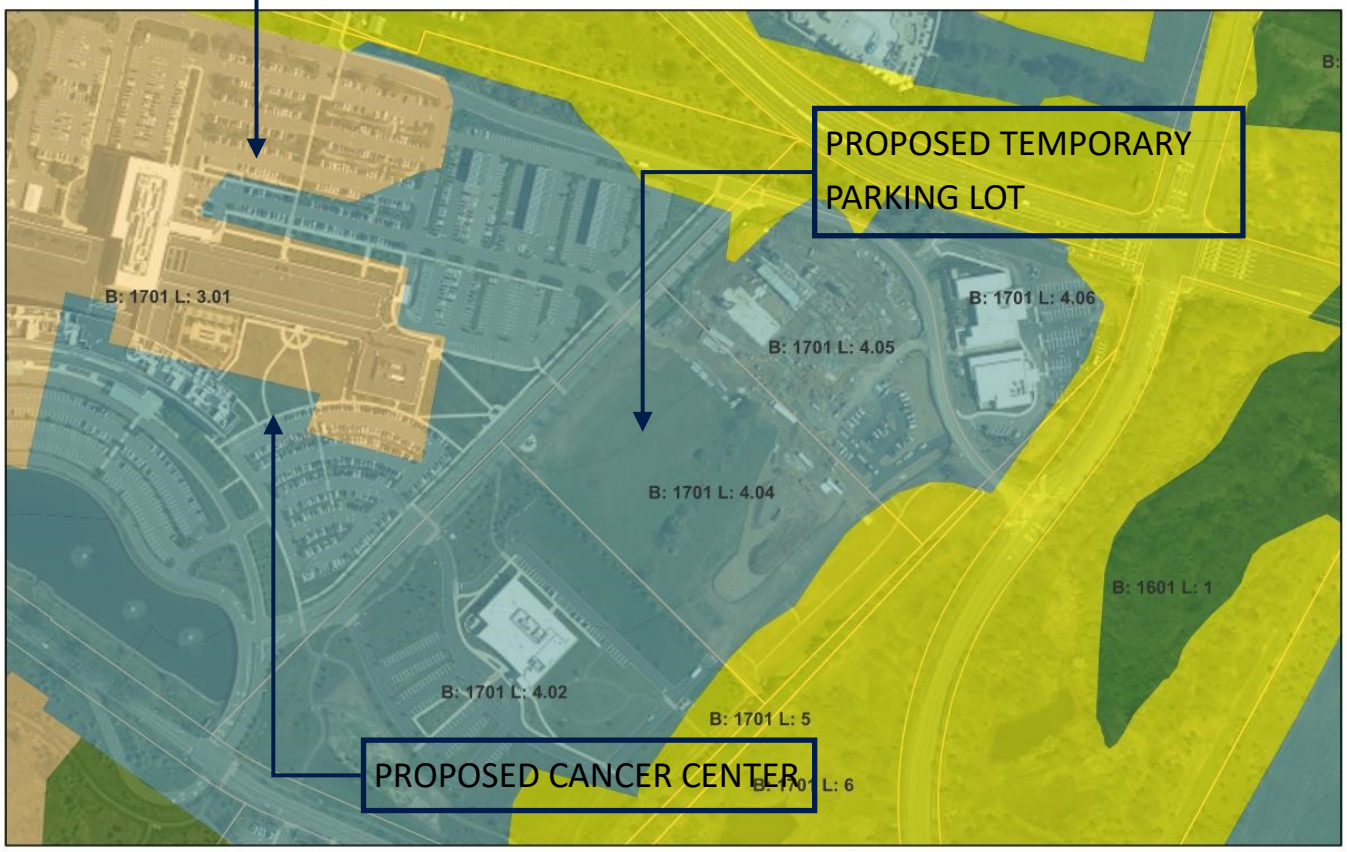
FEMA FIRM
PENN MEDICINE PRINCETON HEALTH

Township of Plainsboro
Middlesex County, New Jersey

SCALE:	DATE:	JOB No.:	DRAWING
AS SHOWN	**DECEMBER 2022**	**06C028T.003**	**FIGURE 3**

PROPOSED PARKING GARAGE

NJ-GeoWeb Ground Water Recharge

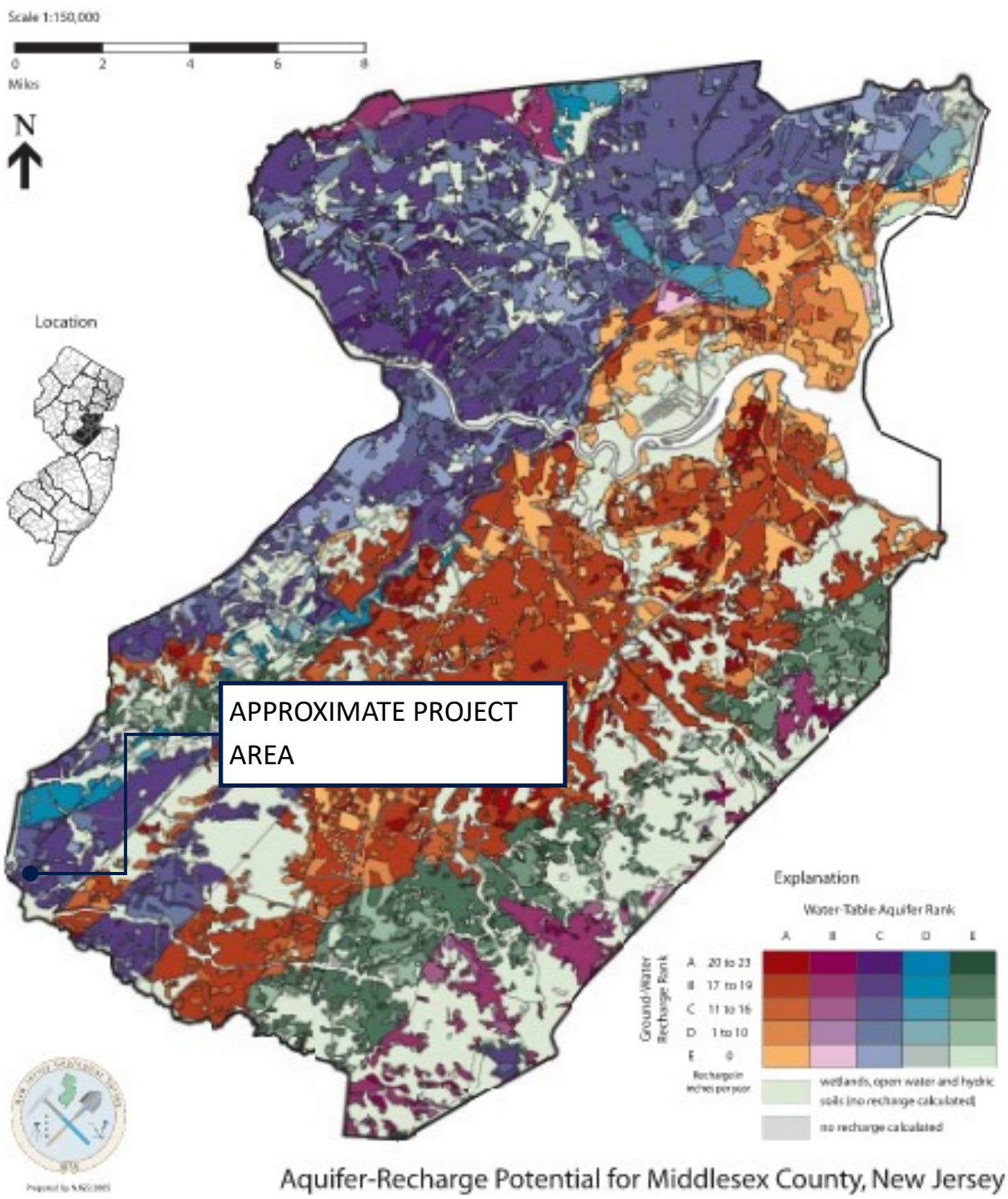


FRENCH & PARRELLO ASSOCIATES

GROUND WATER RECHARGE MAP
PENN MEDICINE PRINCETON HEALTH

Township of Plainsboro
Middlesex County, New Jersey

SCALE:	DATE:	JOB No.:	DRAWING
AS SHOWN	DECEMBER 2022	06C028T.003	FIGURE 4



Aquifer-Recharge Potential for Middlesex County, New Jersey

FRENCH & PARRELLO ASSOCIATES

AQUIFER RECHARGE MAP
PENN MEDICINE PRINCETON HEALTH

Township of Plainsboro
Middlesex County, New Jersey

SCALE:	DATE:	JOB No.:	DRAWING
AS SHOWN	DECEMBER 2022	06C028T.003	FIGURE 5

PROPOSED PARKING GARAGE

NJ-GeoWeb Landscape Project



PROPOSED CANCER CENTER

PROPOSED TEMPORARY PARKING LOT

FRENCH & PARRELLO ASSOCIATES

NJDEP LANDSCAPE PROJECT MAP

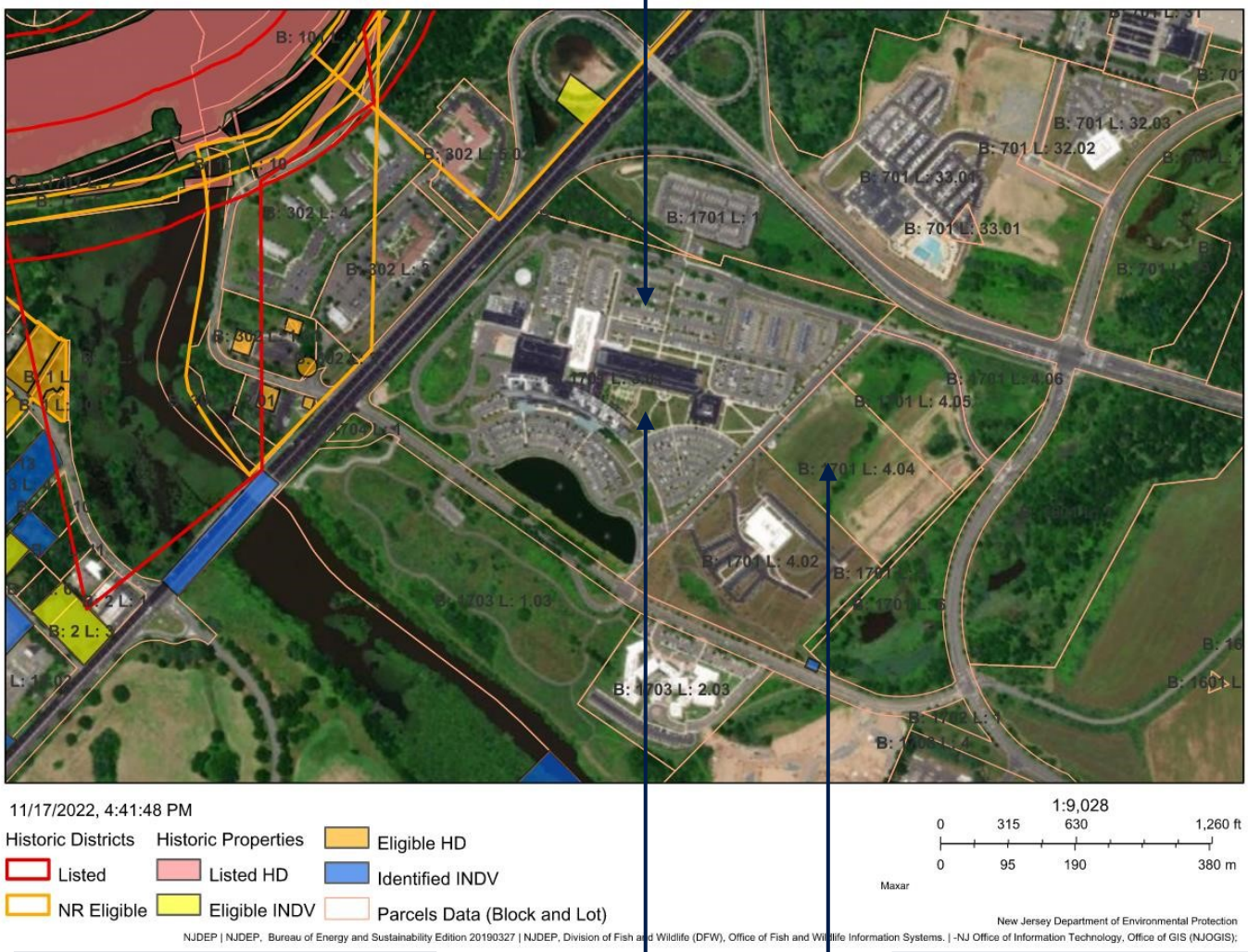
PENN MEDICINE PRINCETON HEALTH

Township of Plainsboro
Middlesex County, New Jersey

SCALE:	DATE:	JOB No.:	DRAWING
AS SHOWN	DECEMBER 2022	06C028T.003	FIGURE 6

PROPOSED PARKING GARAGE

NJ-GeoWeb Historic Preservation



PROPOSED CANCER CENTER

PROPOSED TEMPORARY PARKING LOT

FRENCH & PARRELLO ASSOCIATES

NJDEP HISTORIC PRESERVATION MAP

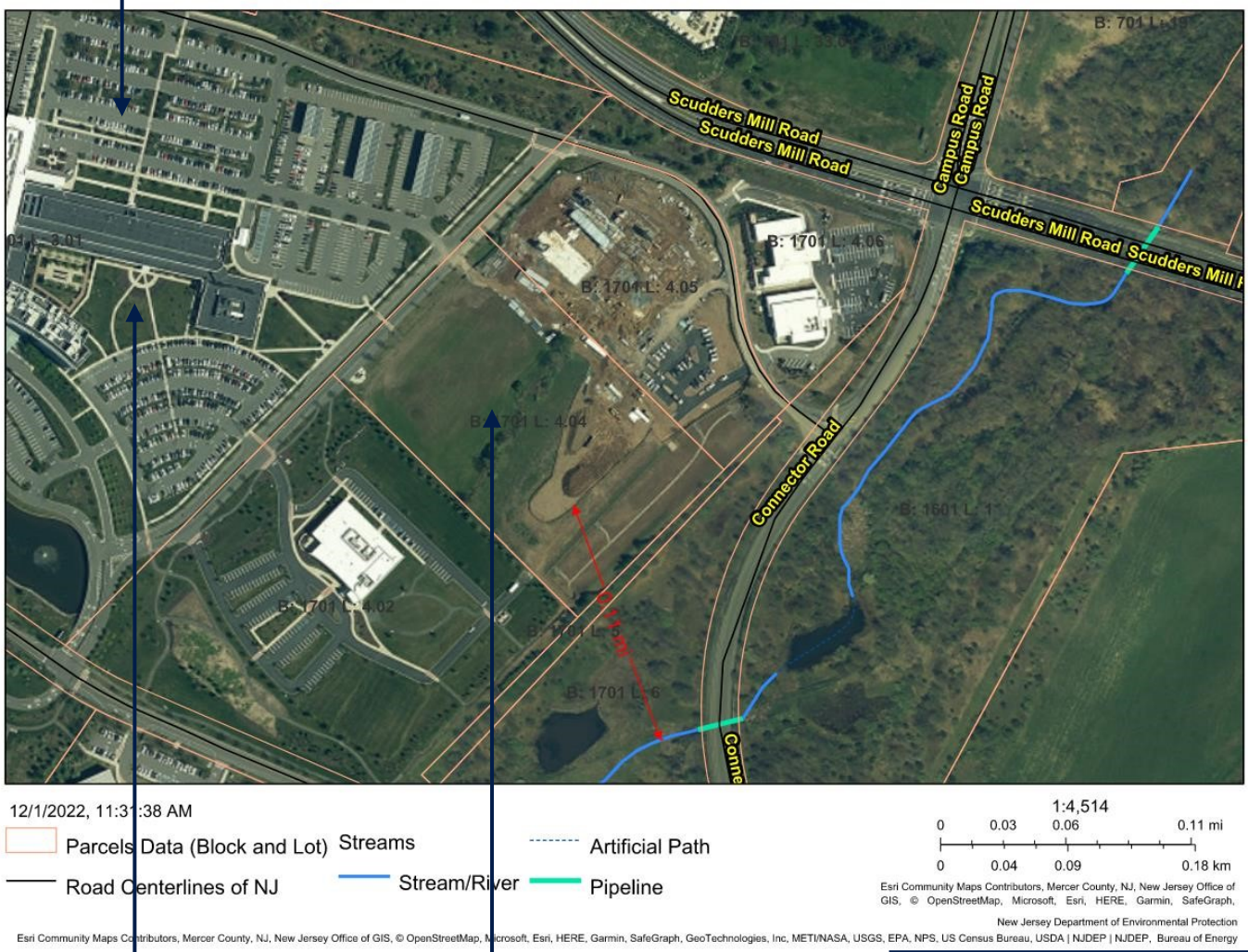
PENN MEDICINE PRINCETON HEALTH

Township of Plainsboro
Middlesex County, New Jersey

SCALE:	DATE:	JOB No.:	DRAWING
AS SHOWN	DECEMBER 2022	06C028T.003	FIGURE 7

PROPOSED PARKING GARAGE

NJ-GeoWeb Streams



PROPOSED TEMPORARY PARKING LOT

PROPOSED CANCER CENTER

FRENCH & PARRELLO ASSOCIATES

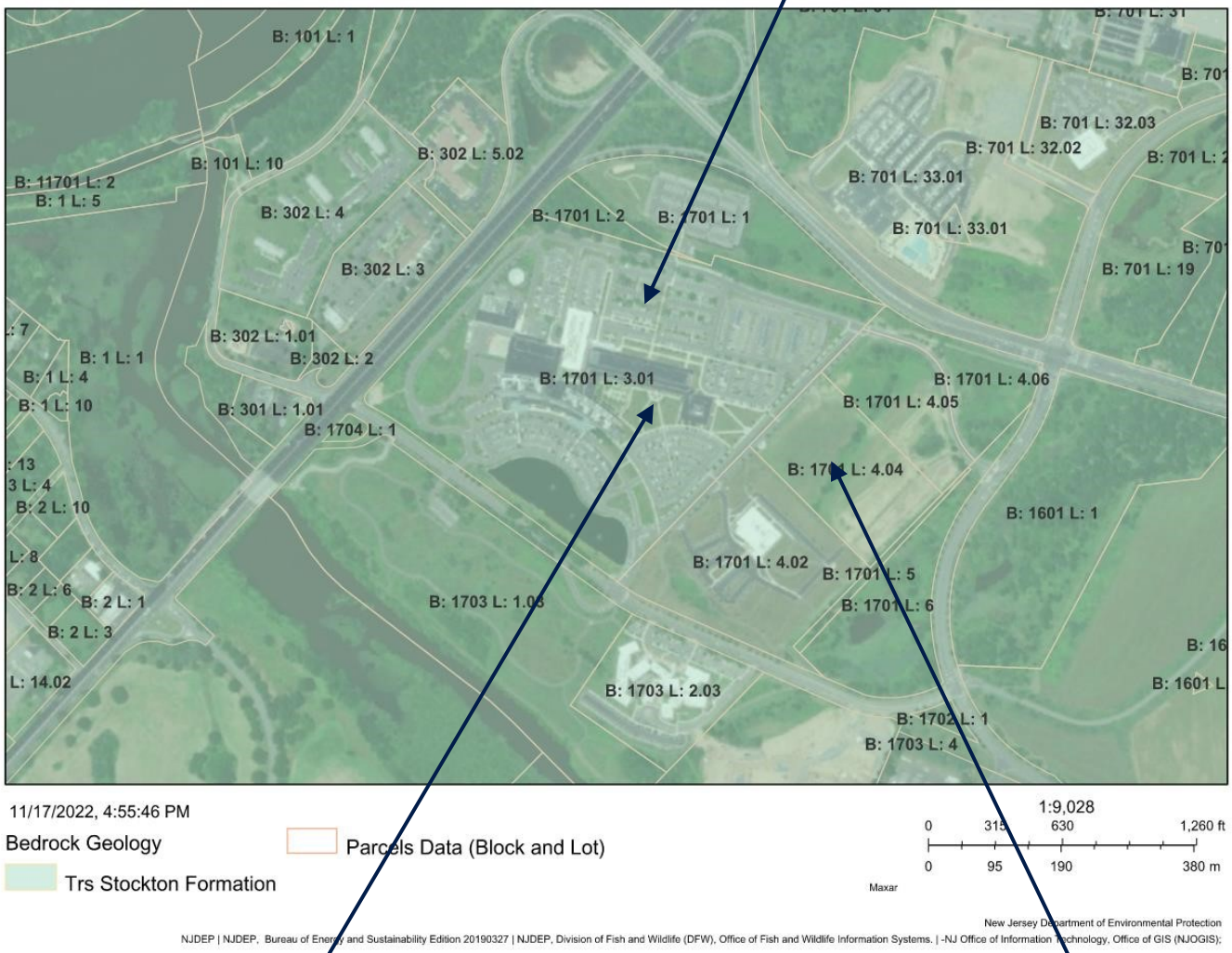
NJDEP STREAMS MAP
PENN MEDICINE PRINCETON HEALTH

Township of Plainsboro
Middlesex County, New Jersey

SCALE:	DATE:	JOB No.:	DRAWING
AS SHOWN	DECEMBER 2022	06C028T.003	FIGURE 8

PROPOSED PARKING GARAGE

NJ-GeoWeb Geology



PROPOSED CANCER CENTER

PROPOSED TEMPORARY PARKING LOT

FRENCH & PARRELLO ASSOCIATES

NJDEP GEOLOGY MAP

PENN MEDICINE PRINCETON HEALTH

Township of Plainsboro
Middlesex County, New Jersey

SCALE:	DATE:	JOB No.:	DRAWING
AS SHOWN	DECEMBER 2022	06C028T.003	FIGURE 9

FRENCH & PARRELLO ASSOCIATES

ENGINEERING AND CONSULTING **SINCE 1974**

STORMWATER MANAGEMENT REPORT

For

Penn Medicine Princeton Health

Cancer Center Parking Garage

Block 1701, Lot 3.01
Township of Plainsboro
Middlesex County, New Jersey





Prepared For:

Princeton HealthCare System
A New Jersey Nonprofit Corporation
d/b/a Penn Medicine Princeton Health
1 Plainsboro Road
Plainsboro, NJ 08536

_____

Andrew L. French
Professional Engineer, NJ License No # 42894

April 14, 2023| FPA No. 06C028T.003
Last Revised, July 25, 2023
1800 Route 34, Suite 101, Wall Township, NJ 07719

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 BASIS OF ENGINEERING ANALYSIS 1

3.0 EXISTING CONDITIONS 2

4.0 PROPOSED CONDITIONS 3

5.0 COMPLIANCE 4

- 5.1 Groundwater Recharge 4
- 5.2 Water Quality 5
- 5.3 Water Quantity 5
- 5.4 Delaware and Raritan Canal Commission 7
- 5.5 Soil Erosion and Sediment Control 8

6.0 CONCLUSION 8

Appendix A

Supporting Documents

- NRCS Soils Map
- NJ 24 Hour Rainfall Frequency Data
- Soils Testing Data

Appendix B

Present Conditions Runoff Calculations

- Time of Concentration Calculations
- Existing Conditions Runoff Calculations – Total
- Existing Conditions Runoff Calculations – Reduction Areas

Appendix C

Water Quality Calculations

Appendix D

Proposed Conditions Calculations

FPA

TABLE OF CONTENTS

- Basin Volume Calculations
- Proposed Conditions Runoff Calculations
- Storm Sewer Calculations (25 Year Storm)
- Storm Sewer Calculations (100 Year Storm)

Appendix E

Delaware and Raritan Canal Commission

- Nonstructural Stormwater Strategies Point System (NSPS) worksheet

Appendix F

Drainage Area Maps

1.0 INTRODUCTION

Penn Medicine Princeton HealthCare System is developing a plan for a new cancer center as part of the second phase of development of the HMOC site. It has been decided to separate the second phase into two site plan applications, one to address the new parking structure and one to address the new cancer center. The purpose of separating the overall project into two site plan applications is to allow the construction sequencing of the parking garage first and then the Cancer Center to minimize the impact on the existing operation of the HMOC.

As part of this site plan application, the applicant/owner Princeton Healthcare System, a New Jersey nonprofit corporation, d/b/a Penn Medicine Princeton Health, is proposing to construct a new Parking Garage on the hospital site known as Block 1701, Lot 3.01 in Plainsboro, New Jersey. The project proposes the construction of a new six (6) level Parking Garage with approximately 1,161 parking stalls and other site improvements, such as sidewalks, landscaping, lighting, and stormwater management facilities.

This report contains the stormwater management calculations demonstrating compliance with the requirements of the Stormwater Management Rules at N.J.A.C. 7:8 for the proposed Parking Garage Lot 3.01 in the Township of Plainsboro, Middlesex County, New Jersey.

2.0 BASIS OF ENGINEERING ANALYSIS

The stormwater management systems, including collection and conveyance structures, groundwater recharge, water quality, and detention measures (BMP'S) have been designed in accordance with the provisions outlined in N.J.A.C. 7:8 New Jersey Stormwater Management Rules and the Plainsboro Township Stormwater Management Ordinance. The New Jersey Best Management Practices Manual dated April 2004 and last updated March 2021 was used for technical guidance to comply with the above regulations.

The soils map located in Appendix A, published by Natural Resources Conservation Service Web Soil Survey, National Cooperative Soil Survey, was used to obtain the required soil information for the project, including soil types and hydrologic soil groups. A subsurface soil assessment was performed to obtain site specific information to determine the seasonal high water table and on-site soil permeability conditions; see Appendix A for supporting documentation.

The calculation of the stormwater runoff rates and volumes were performed utilizing the procedures outlined in the New Jersey Best Management Practices Manual. The PondPack Connect Edition Update 2 Computer Program developed by the Haested Methods was used to generate the runoff hydrographs and hydrologic model for project site. Peak discharges, run-off volumes, and hydrographs were computed for the 2, 10, 25, and 100-year storm events utilizing the USDA Natural Resources Conservation Service (NRCS) methodology, as found in the NRCS National Engineering Handbook, Part 630-Hydrology. The NOAA Type D, 24-hour rainfall distribution, and 24-hour rainfall frequency data for

Middlesex County, New Jersey published in August 2012 by NRCS were used in the computations. Runoff calculations and precipitation losses were calculated using the NRCS Curve Numbers (CNs), based upon the present and proposed watershed conditions. Times of Concentration (TC) were based upon estimates of overland, shallow concentrated, and open channel flow utilizing methods presented in Chapter 15 of the NEH, Part 630-Hydrology.

The rainfall distribution for the NJDEP Water Quality Design Storm (1.25 inches of rain falling nonuniformly in a 2-hour storm event), as shown on Table 5-2 of the New Jersey Stormwater Best Management Practices Manual was used to compute the peak runoff rate and runoff volume for this storm.

3.0 EXISTING CONDITIONS

The subject property consists of 49.4 acres and is located in the Township of Plainsboro, Middlesex County, New Jersey. The property is known as Block 1701, Lot 3.01. The site currently contains a hospital and parking lots. The property fronts on Plainsboro Rd to the south. Existing parking lots are adjacent to the property across Hospital Drive to the north. Stormwater currently drains to an existing wet pond to the south of the site. The wet pond was designed under the previous stormwater rules to manage the stormwater runoff quantity reductions for the maximum development of the hospital property. Stormwater drains from the proposed garage area to two locations, POA-A and POA-B before draining through a pipe network to the wet pond.

The existing conditions were previously approved for reductions in peak runoff rates in accordance with N.J.A.C. 7:8 New Jersey Stormwater Management Rules. The proposed development increases the impervious area in POA-A and decreases the area for POA-B. The required peak runoff reductions were applied to POA-A for the increase in impervious area. This method of applying reductions to the increase in impervious area was verified to meet the requirements of N.J.A.C. 7:8 by the NJDEP on July 20, 2023. The total existing peak runoff is presented in Table 3.1 Column B. The portion of peak runoff to be reduced is the existing peak runoff from the proposed building footprint and presented in Table 3.1 Column C. The Reduction required (Column D) is only applied to the portion of peak runoff from the area of the proposed building (Column C) which is equivalent to the increase in impervious. There is no increase in impervious in POA-B, therefore, the reductions were not applied.

The following table summarizes the existing conditions, peak runoff rates and establishes the allowable proposed conditions peak runoff rates in accordance with N.J.A.C. 7:8 New Jersey Stormwater Management Rules. The formula describes how the allowable peak runoff rates were calculated to incorporate areas with and without required reductions. Detailed calculations are presented in Appendix B of this report.

Allowable Proposed Conditions Runoff	=	Portion of Existing Peak Runoff with no Required Reduction	+	Portion of Existing Peak Runoff with Required Reduction	*	Required Reduction per Storm event
F	=	E	+	C	*	D

Table 3.1

Summary of Present Conditions Peak Runoff Rates POA-A					
A	**B**	**C**	**D**	**E**	**F**
Storm Frequency	**Total Existing Peak Runoff (cfs)**	**Portion of Peak Runoff to be Reduced**	**Required Reduction**	**Portion of Peak runoff with no required reduction**	**Allowable Proposed Conditions Runoff (cfs)**
2-Year	9.07	0.24	50%	9.07-0.24=8.83	8.83+(0.50*0.24) = **8.95**
10-Year	14.59	0.62	75%	14.59-0.62=13.97	13.97+(0.75*0.62) = **14.44**
25-Year	18.55	---	---	**---**	**18.55**
100-Year	25.94	1.54	80%	25.94-1.54=24.40	24.40+ (0.80*1.54) = **25.63**

Table 3.2

Summary of Present Conditions Peak Runoff Rates POA-B			
Storm Frequency	**Peak Runoff (cfs)**	**Existing Volume of Runoff (ft^3)**	**Allowable Proposed Conditions Runoff (cfs)**
2-Year	2.92	13.331	2.92
10-Year	4.93	22,586	4.93
25-Year	6.40	29,406	6.40
100-Year	9.17	42,306	9.17

4.0 PROPOSED CONDITIONS

The applicant is proposing to construct a new Cancer Center and Parking Garage. Both the new Cancer Center and Parking Garage are located on Block 1701, Lot 3.01 in Plainsboro, New Jersey. The garage project proposes the construction of a new six (6) level Parking Garage with approximately 1,161

parking stalls and other site improvements, such as sidewalks, landscaping, lighting, and stormwater management facilities. The garage is not needed without the Cancer Center; therefore, both the Cancer Center and Parking Garage are considered as one project. Two reports have been provided as two site plan applications will be filed to allow for phasing of the project to commence the parking garage construction first.

The existing impervious cover on the Hospital (HMOC) site is 56.21% or 27.78 acres. The proposed Cancer Center and parking garage project will result in a total impervious cover of 57.90% or 28.612 acres (1,246,339 sf). There is an increase of 0.842 acres (36,678 sf) in impervious cover. This increase consists of 0.468 acres (20,386 sf) impervious for the garage and 0.365 acres (15,899 sf) of impervious for the cancer center.

However, there is a decrease in motor vehicle surfaces for the overall project of the Cancer Center and Parking Garage, which are generating total suspended solids, because much of the existing parking lot will be converted to the Cancer Center building. The decrease in motor vehicle surface is 0.473 ac (20,604 sf). The parking garage project results in an increase of impervious surface of 20,386 sf. The parking garage top deck will be open and therefore, there will be an increase of 19,820 sf of motor vehicle surfaces. The proposed Cancer Center and Parking Garage shall result in an increase of total impervious of 36,242 sf. However, there will be a decrease in motor vehicle surface of 20,604 sf for the overall project.

If for some unforeseen reason, the parking garage should be constructed and the Cancer Center project does not proceed, then then Hospital will remove 19,820 sf of existing parking area on Lot P4 so that there will not be any increase in motor vehicle surfaces. Therefore, water quality treatment will not be required, even if the Cancer Center project does not proceed.

The proposed stormwater management facilities for the Parking Garage consist of a pervious pavement system with underground storage areas to address the water quantity aspect of the rules. The pervious pavement system includes an underground storage area with 18-inch ADS perforated piping (and associated underdrains) to handle the control and reductions of the 2, 10, and 100-year storm events.

5.0 COMPLIANCE

5.1 Groundwater Recharge

N.J.A.C. 7:8 New Jersey Stormwater Management Rules requires that the proposed project maintain the present conditions average annual groundwater recharge volume for the project site. The project site for the parking garage is currently used as a parking lot.

Throughout the property we performed seventeen (17) soil logs to at least 15 feet below the surface to assess the subsurface soil conditions, estimate the seasonal high water table and perform soil percolation testing of the surface soils. The results of the soil logs were consistent with the subsurface

soil conditions on the surrounding properties, which included mostly silty clay loam. Based on the soil logs, seasonal high-water table was not encountered in any of the soil excavations.

5.2 Water Quality

Since there is a decrease in motor vehicle surface area, water quality treatment is not required as per NJAC 7:8-5.5(a):

This section contains the minimum design and performance standards to control stormwater runoff quality impacts of major development. Stormwater runoff quality standards are applicable when the major development results in an increase of one quarter acre or more of regulated motor vehicle surface.

5.3 Water Quantity

The governing regulations require that the proposed peak runoff rates for the 2-year, 10-year, and 100-year storm events from the proposed development be reduced to 50, 75, and 80 percent, respectively, of the projects present conditions peak runoff rates for the same storms. This applies to the increased impervious cover for this portion of the parking garage project which is 0.52 acres. The proposed stormwater management facilities consist of pervious pavement system with underground storage areas for the parking areas. The pervious pavement system includes an underground storage area with 18-inch ADS perforated piping (and associated underdrains) to manage the control and reductions of the 2, 10, and 100-year storm events.

The proposed pervious pavement systems are approved Green Infrastructure BMPs that have been designed to meet the peak runoff reductions of N.J.A.C. 7:8 New Jersey Stormwater Management Rules. The basin routing summary and the overall peak runoff rate reductions for the site are shown in the following tables:

Table 5.1

Pervious Pavement Routing Summary			
Storm Frequency	**Peak Inflow (cfs)**	**Peak Outflow (cfs)**	**Maximum Water Surface Elevation (ft)**
2-Year Storm	4.09	2.63	83.12
10-Year Storm	7.19	4.47	83.71
25-Year Storm	9.32	5.61	84.19
100-Year Storm	13.13	9.99	85.29

Table 5.2

Comparison of Present Conditions vs. Proposed Conditions Peak Runoff Rates POA-A			
Storm Frequency	**Maximum Allowable Proposed Conditions Peak Runoff Rate (From Table 3.1) (cfs)**	**Estimated Proposed Conditions Peak Runoff Rate* (cfs)**	
2-Year Storm	8.95	8.08	OK
10-Year Storm	14.44	12.84	OK
25-Year Storm	18.55	16.02	OK
100-Year Storm	25.63	25.06	OK

Table 5.3

Comparison of Present Conditions vs. Proposed Conditions Peak Runoff Rates POA-B					
Storm Frequency	**Maximum Allowable Proposed Conditions Peak Runoff Rate (From Table 3.1) (cfs)**	**Estimated Proposed Conditions Peak Runoff Rate* (cfs)**	**Existing Volume of Runoff (From Table 3.1) (ft^3)**	**Estimated Proposed Volume of Runoff (ft^3)**	
2-Year Storm	2.92	2.85	13.331	12,747	OK
10-Year Storm	4.93	4.83	22,586	21,513	OK
25-Year Storm	6.40	6.27	29,406	27,948	OK
100-Year Storm	9.17	8.98	42,306	40,088	OK

Detailed computations are presented in Appendix C of this report.

*Addition is with respect to time.

Because N.J.A.C. 7:8 New Jersey Stormwater Management Rules require that runoff from TSS generating surfaces be pretreated to 80% prior to discharging into an underground basin, a manufactured treatment device will be provided. An Up-Flo filter will treat the runoff from approximately half of the garage prior to being discharged to the underground pipes. Furthermore, a First Defense Optimum filter (a 50% treatment device) will be provided for the other half of the garage, prior to discharging to an existing drainage system.

Since pervious pavement with underground pipes is being utilized for water quantity compliance, it was designed in accordance with the BMP requirements to qualify as green infrastructure. Therefore, the pervious pavement systems are being provided to include 3-inch-thick stone below the pavement with underdrains to handle and treat the entire water quality storm. Therefore, this BMP complies with the Green Infrastructure (GI) requirements of N.J.A.C. 7:8 New Jersey Stormwater Management Rules. The following provides a summary of the stone thickness required to contain the water quality storm volume below the pervious pavement:

Table 5.4

Water Quality Calculations Summary					
Pervious Pavement Area (SF)	**Stone Void Space**	**Void Area (SF)**	**Thickness Required***		**Thickness Provided (in)**
			ft	**in**	
28,763 *(0.66 ac.)*	40%	11,505 *(0.264 ac.)*	0.22	2.6	3

*Detailed computations are presented in Appendix C of this report.

For POA-B, the overall drainage area and peak flows were reduced. The post-development hydrographs do not exceed the pre-development hydrographs and therefore this meets the State rules as per NJAC 7:8-5.6(B)1.

5.4 Delaware and Raritan Canal Commission

This project is located within the Delaware and Raritan Canal Commission (DRCC) jurisdiction area. It is located in Review Zone B. The DRCC regulations, NJAC 7:45-8.5, have the same requirements as N.J.A.C. 7:8 for water quantity and recharge. For water quality, N.J.A.C. 7:45-8.5 requires that the post-construction load of total suspended solids (TSS) in stormwater runoff generated from the water quality design storm be reduced by 80% of the anticipated load from the developed site, expressed as an annual average. This requirement differs from N.J.A.C. 7:8 in that the 80% TSS reduction is applicable to the impervious for the development, not just the increase in motor vehicle surfaces. The increase in total impervious area for the Parking Garage is 0.469 ac. However, the DRCC regulations allow the use of the wet pond for stormwater management for both the volume and water quality. The wet pond was designed to treat and reduce the runoff from the maximum site development of 60%. The proposed impervious with both the Cancer Center and Parking Garage is 57.927%. Therefore, water quantity reductions and water quality treatment requirements are met by the existing wet pond.

The DRCC requires that the nonstructural stormwater management strategies be incorporated into the site design. A Nonstructural Stormwater Strategies Point System (NSPS) worksheet can be provided to demonstrate compliance. The NSPS worksheet can be found in Appendix E.

5.5 Soil Erosion and Sediment Control

The project proposes to discharge into the existing wet pond to the south. The existing system discharges to the wet pond via two pipes that each outfall into separate riprap aprons. Therefore, per The Standards for Soil Erosion and Sediment Control in New Jersey, 7th Edition, January 2014, Revised July 2017; Chapter 21: Standard for Off-Site Stability, off-site stability conditions are stable due to the stormwater discharging into a stable conveyance pipe.

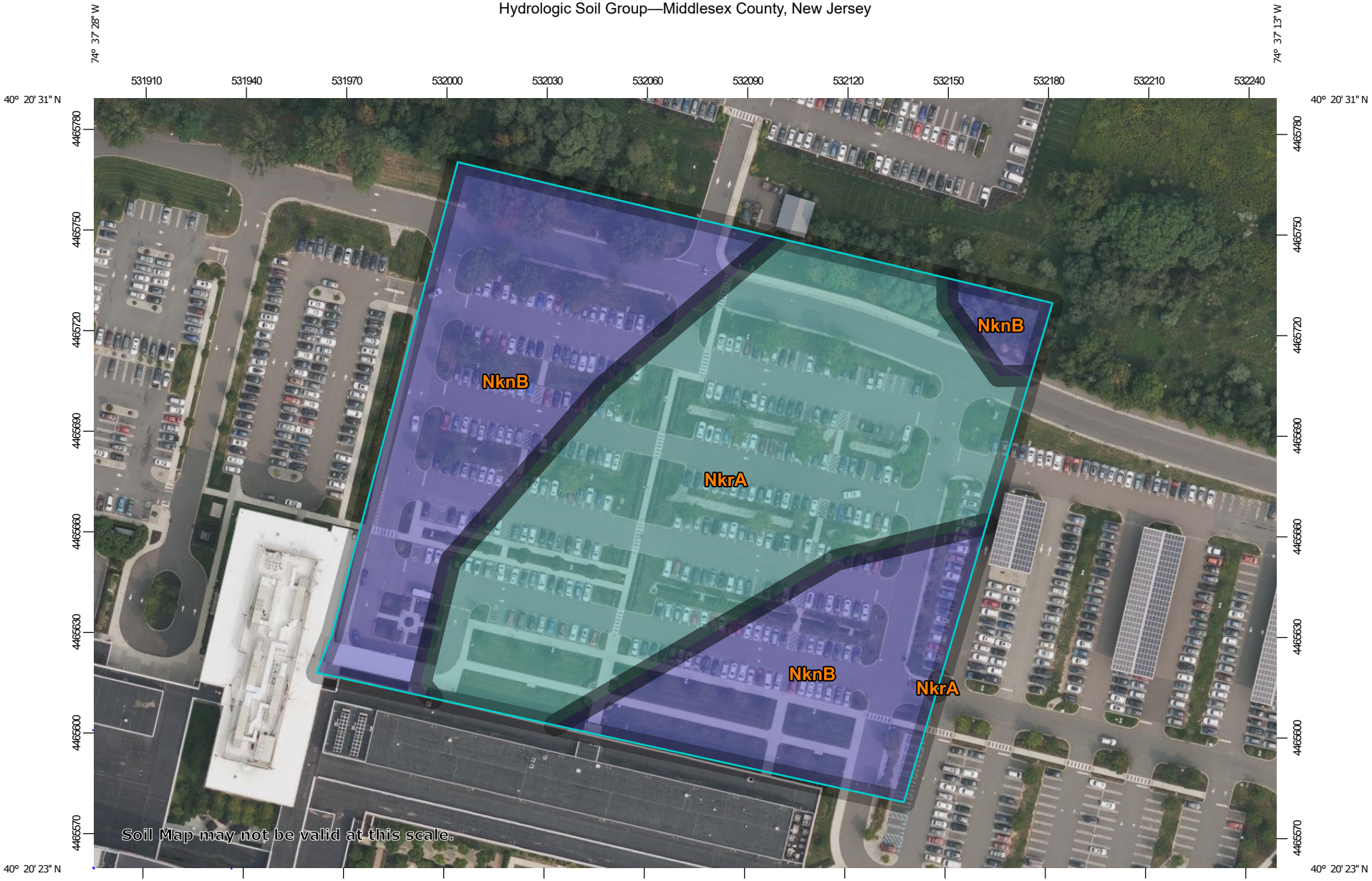
6.0 CONCLUSION

The proposed Parking Garage on Lot 3.01 has been designed with pervious pavement system include underground storage area to comply with the Township Stormwater Management requirements, which for this project include stormwater quantity reductions only using Green Infrastructure (GI) elements.

Based upon the calculations present in this report, the proposed stormwater management system meets the requirements of the N.J.A.C. 7:8 - New Jersey Stormwater Management Rules, the Plainsboro Township Stormwater Management Ordinance and the DRCC.

Appendix A
Supporting Documents

Hydrologic Soil Group—Middlesex County, New Jersey



Map Scale: 1:1,620 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

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 Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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: Middlesex County, New Jersey
Survey Area Data: Version 18, Aug 30, 2022

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
NknB	Nixon loam, 2 to 5 percent slopes	B	3.5	49.8%
NkrA	Nixon moderately well drained variant loam, 0 to 2 percent slopes	C	3.5	50.2%
Totals for Area of Interest			**7.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NEW JERSEY 24 HOUR RAINFALL FREQUENCY DATA

Rainfall amounts in Inches

County	1 year	2 year	5 year	10 year	25 year	50 year	100 year
Atlantic	2.72	3.31	4.30	5.16	6.46	7.61	8.90
Bergen	2.75	3.34	4.27	5.07	6.28	7.32	8.47
Burlington	2.77	3.36	4.34	5.18	6.45	7.56	8.81
Camden	2.73	3.31	4.25	5.06	6.28	7.34	8.52
Cape May	2.67	3.25	4.22	5.07	6.34	7.47	8.73
Cumberland	2.69	3.27	4.25	5.09	6.37	7.49	8.76
Essex	2.85	3.44	4.40	5.22	6.44	7.49	8.66
Gloucester	2.71	3.29	4.24	5.05	6.29	7.36	8.55
Hudson	2.73	3.31	4.23	5.02	6.19	7.20	8.31
Hunterdon	2.80	3.38	4.26	5.00	6.09	7.02	8.03
Mercer	2.74	3.31	4.23	5.01	6.19	7.20	8.33
Middlesex	2.76	3.35	4.30	5.12	6.36	7.43	8.63
Monmouth	2.79	3.38	4.38	5.23	6.53	7.66	8.94
Morris	2.94	3.54	4.47	5.24	6.37	7.32	8.35
Ocean	2.81	3.42	4.45	5.33	6.68	7.87	9.20
Passaic	2.87	3.47	4.42	5.23	6.43	7.47	8.62
Salem	2.69	3.26	4.20	5.00	6.22	7.28	8.45
Somerset	2.76	3.34	4.25	5.01	6.15	7.13	8.21
Sussex	2.68	3.22	4.02	4.70	5.72	6.60	7.58
Union	2.80	3.39	4.35	5.17	6.42	7.49	8.69
Warren	2.78	3.34	4.18	4.89	5.93	6.83	7.82

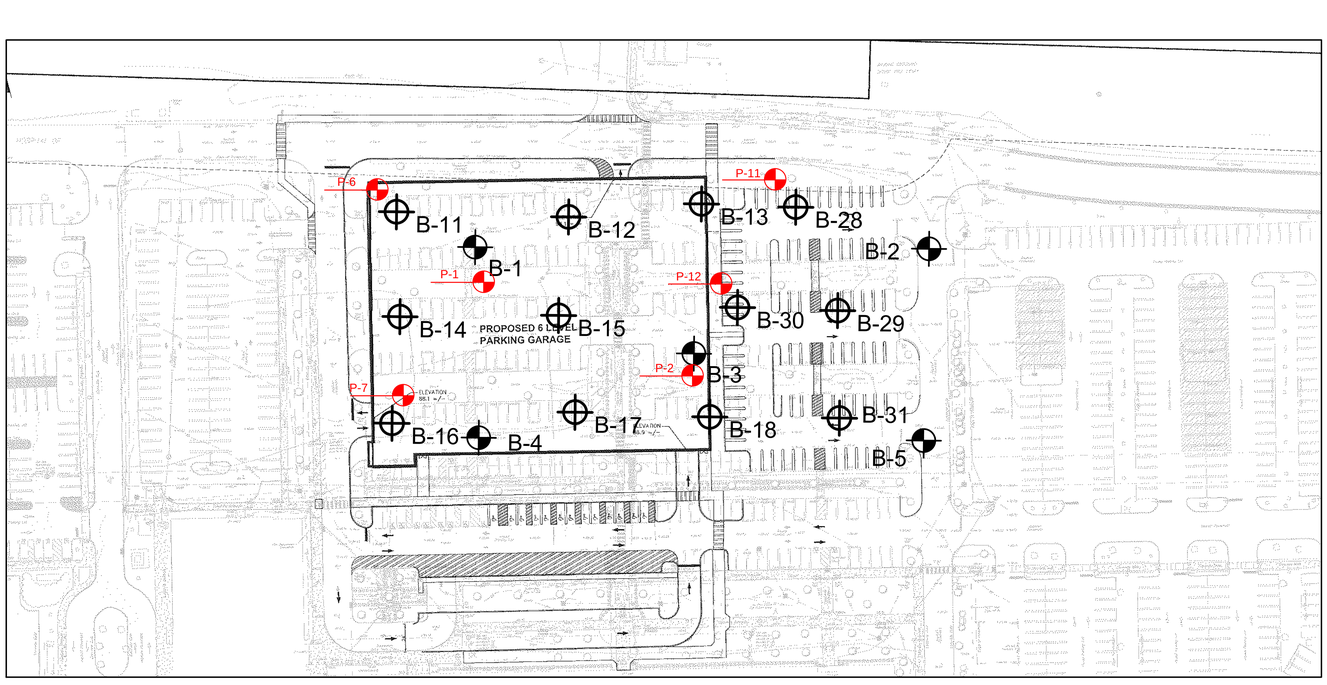
Notes: The average point rainfall amounts listed above were developed from data contained in NOAA Atlas 14 Volume 2.

Point rainfall estimates for specific locations may be obtained from the Precipitation Frequency Data Server located at http://www.nws.noaa.gov/ohd/hdsc/

For most hydrologic design procedures, the rainfall amounts listed above may be rounded to the nearest tenth of an inch.

Appendix A
Soils Testing Data

PARKING GARAGE AREA



LEGEND:

- 2021 TEST BORING LOCATION
- 2022 TEST BORING LOCATION

No.	Date	Revision	Revised By	Checked By

60 0 60 120
SCALE IN FEET

FRENCH & PARRELLO ASSOCIATES
Corporate Office:
1800 Route 34, Suite 101
Wall, New Jersey 07719
732.312.9800
FPAengineers.com
New Jersey ▲ New York ▲ Pennsylvania ▲ Georgia

TEST BORING LOCATION PLAN

FOR

PENN MEDICINE

CANCER CENTER

BLOCK 1701, LOTS 1, 2 & 3

TAX MAP SHEET NO. 17

TOWNSHIP OF PLAINSBORO
MIDDLESEX COUNTY, NEW JERSEY

DATE:	DESIGNED BY:	SCALE:	PROJECT NUMBER:
8/19/22	MC	1" = 60'	06C028T.003
DRAWN BY:	CHECKED BY:	FIELD BOOK	DRAWING NO.
RDK	ALF		2

O:\CE\2006\06C028T - CANCER CENTER\06C028T.002 - PENN MED. CANCER - CONSULTANT\CADD\DWG\GEOTECHNICAL\06C028T.002 - TEST BORING LOCATION PLAN 2022.DWG (OVERALL)

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DUE TO INHERENT ERRORS IN REPRODUCTION METHODS, ERRORS MAY OCCUR WHEN SCALING THIS DRAWING

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-1 (B-1)** Date Tested **7/20/2023**

2. Depth **8" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation dropped 1/8" after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

7. I hereby certify that the information furnished on Form 3d of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____
Mark Kalusz, PE

Date _____

Signature of Professional Engineer _____
Mark Kalusz, PE

License No. 24GE05937000

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-2 (B-3)** Date Tested **7/20/2023**

2. Depth **6" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____Four Hour Pre-soak completed - Indicate result:
   _____Test Hole Drained within 15 to 24 hours after Pre-soak
   __X__Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation dropped 1/16" after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____
Mark Kalusz, PE

Date _____

Signature of Professional Engineer _____
Mark Kalusz, PE

License No. 24GE05937000

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-6 (B-11)** Date Tested **7/20/2023**

2. Depth **6" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____Four Hour Pre-soak completed - Indicate result:
   _____Test Hole Drained within 15 to 24 hours after Pre-soak
   __X__Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation dropped 1/8" after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

7. I hereby certify that the information furnished on Form 3d of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____
Mark Kalusz, PE

Date _____

Signature of Professional Engineer _____
Mark Kalusz, PE

License No. 24GE05937000

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-7 (B-16)** Date Tested **7/20/2023**

2. Depth **6" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____Four Hour Pre-soak completed - Indicate result:
   _____Test Hole Drained within 15 to 24 hours after Pre-soak
   __X__Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation did not drop after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____
Mark Kalusz, PE

Date _____

Signature of Professional Engineer _____
Mark Kalusz, PE

License No. 24GE05937000

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-11 (B-28)** Date Tested **7/20/2023**

2. Depth **6" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____Four Hour Pre-soak completed - Indicate result:
   _____Test Hole Drained within 15 to 24 hours after Pre-soak
   __X__Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation dropped 1/8" after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

7. I hereby certify that the information furnished on Form 3d of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____
Mark Kalusz, PE

Date _____

Signature of Professional Engineer _____
Mark Kalusz, PE

License No. 24GE05937000

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-12 (B-30)** Date Tested **7/20/2023**

2. Depth **6" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____Four Hour Pre-soak completed - Indicate result:
   _____Test Hole Drained within 15 to 24 hours after Pre-soak
   __X__Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation dropped 1/8" after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

7. I hereby certify that the information furnished on Form 3d of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____
Mark Kalusz, PE

Date _____

Signature of Professional Engineer _____
Mark Kalusz, PE

License No. 24GE05937000

Appendix B

Present Conditions and Runoff Calculations

FRENCH & PARRELLO ASSOCIATES

TELEPHONE : (732) 312-9800
FAX : (732) 312-9801

1800 ROUTE 34, SUITE 101
WALL, NEW JERSEY 07719

PROJECT NUMBER:	06C028T.003		
PROJECT NAME:	Penn Med Parking Garage		
CALCULATED BY:	SP	DATE:	11/18/2022
CHECKED BY:		DATE:	
REVISED BY:		DATE:	

TIME OF CONCENTRATION CALCULATOR

DRAINAGE AREA NAME:	Existing Drainage Area A PER	DRAINAGE AREA NOTATION:	DA-A-PERV-EX

Sheet Flow: Segment 1

Surface Type:	Grass: Short-grass prairie	
Slope of land surface, S:	0.021	ft/ft
n-value (from Table 15-1):	0.15	---
Limiting Length of flow, *l*:	96.6	ft
2-year, 24 hours rainfall, P_2:	3.300	in
Travel time, T_t:	9.2	minutes

calculations for sheet flow based upon Equation 15-8 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{0.007(n l)^{0.8}}{(P_2)^{0.5} S^{0.4}} \quad \text{(Eq 15-8)}$$

Shallow Concentrated Flow: Segment 2

Surface Type:	Short-grass pasture	
Flow length, l:	97.9	ft
Slope of land surface, S:	0.008	ft/ft
n-value (from Table 15-3):	0.073	---
Average velocity, V:	0.629	ft/s
Travel time, T_t:	2.6	minutes

calculations for shallow concentrated flow based upon Equation 15-1 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{l}{3{,}600V} \quad \text{(Eq 15-1)}$$

Shallow Concentrated Flow: Segment 3

Surface Type:	Short-grass pasture	
Flow length, l:	12.5	ft
Slope of land surface, S:	0.027	ft/ft
n-value (from Table 15-3):	0.073	---
Average velocity, V:	1.148	ft/s
Travel time, T_t:	0.2	minutes

Open Channel Flow:

	Segment 4		Segment 5	
Hydraulic Length:	21	ft	45	ft
Slope:	0.007	ft/ft	0.016	ft/ft
Manning's n:	0.012	---	0.013	---
Flow Area:	0.674	ft^2	1.053	ft^2
Wetted Perimeter:	2.22	ft	2.77	ft
Velocity:	4.74	fps	7.61	fps
Travel time, T_t:	0.1	minutes	0.1	minutes

Continued on next sheet

FRENCH & PARRELLO ASSOCIATES
TELEPHONE : (732) 312-9800
FAX : (732) 312-9801
1800 ROUTE 34, SUITE 101
WALL, NEW JERSEY 07719

PROJECT NUMBER:	06C028T.003		
PROJECT NAME:	Penn Med Parking Garage		
CALCULATED BY:	SP	DATE:	11/18/2022
CHECKED BY:		DATE:	
REVISED BY:		DATE:	

TIME OF CONCENTRATION CALCULATOR

DRAINAGE AREA NAME:	Existing Drainage Area A PER	DRAINAGE AREA NOTATION:	DA-A-PERV-EX

Open Channel Flow:	Segment 6		Segment 7	
Hydraulic Length:	90	ft	89	ft
Slope:	0.015	ft/ft	0.005	ft/ft
Manning's n:	0.013	---	0.013	---
Flow Area:	1.053	ft^2	2.064	ft^2
Wetted Perimeter:	2.77	ft	3.88	ft
Velocity:	7.25	fps	5.37	fps
Travel time, T_t:	0.2	minutes	0.3	minutes

Open Channel Flow:	Segment 8		Segment 9	
Hydraulic Length:	43	ft	17	ft
Slope:	0.006	ft/ft	0.005	ft/ft
Manning's n:	0.013	---	0.013	---
Flow Area:	2.695	ft^2	2.695	ft^2
Wetted Perimeter:	4.43	ft	4.43	ft
Velocity:	6.44	fps	5.99	fps
Travel time, T_t:	0.1	minutes	0.0	minutes

Open Channel Flow:	Segment 10		Segment 11	
Hydraulic Length:	31	ft	253	ft
Slope:	0.009	ft/ft	0.003	ft/ft
Manning's n:	0.013	---	0.013	---
Flow Area:	2.695	ft^2	2.695	ft^2
Wetted Perimeter:	4.43	ft	4.43	ft
Velocity:	7.68	fps	4.51	fps
Travel time, T_t:	0.1	minutes	0.9	minutes

Total Time of Concentration:	13.8	minutes	user input

FRENCH & PARRELLO ASSOCIATES

TELEPHONE : (732) 312-9800
FAX : (732) 312-9801

1800 ROUTE 34, SUITE 101
WALL, NEW JERSEY 07719

PROJECT NUMBER:	06C028T.003		
PROJECT NAME:	Penn Med Parking Garage		
CALCULATED BY:	SP	DATE:	11/18/2022
CHECKED BY:		DATE:	
REVISED BY:	KN	DATE:	7/20/2023

TIME OF CONCENTRATION CALCULATOR

DRAINAGE AREA NAME:	Existing Drainage Area A IMP	DRAINAGE AREA NOTATION:	DA-A-IMP-EX

Sheet Flow: Segment 1

Surface Type:	Smooth surface (concrete, asphalt, gravel, or bare soil)	
Slope of land surface, S:	0.013	ft/ft
n-value (from Table 15-1):	0.011	---
Limiting Length of flow, *l*:	100.0	ft
2-year, 24 hours rainfall, P_2:	3.300	in
Travel time, T_t:	1.4	minutes

calculations for sheet flow based upon Equation 15-8 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{0.007(n l)^{0.8}}{(P_2)^{0.5} S^{0.4}} \quad \text{(Eq 15-8)}$$

Shallow Concentrated Flow: Segment 2

Surface Type:	Pavement and small upland gullies	
Flow length, l:	90	ft
Slope of land surface, S:	0.055	ft/ft
n-value (from Table 15-3):	0.025	---
Average velocity, V:	4.767	ft/s
Travel time, T_t:	0.3	minutes

calculations for shallow concentrated flow based upon Equation 15-1 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{l}{3{,}600V} \quad \text{(Eq 15-1)}$$

Shallow Concentrated Flow: Segment 3

Surface Type:	Short-grass pasture	
Flow length, l:	43	ft
Slope of land surface, S:	0.055	ft/ft
n-value (from Table 15-3):	0.073	---
Average velocity, V:	1.633	ft/s
Travel time, T_t:	0.4	minutes

Open Channel Flow:

	Segment 4		Segment 5	
Hydraulic Length:	45	ft	89	ft
Slope:	0.034	ft/ft	0.005	ft/ft
Manning's n:	0.013	---	0.013	---
Flow Area:	2.064	ft^2	2.064	ft^2
Wetted Perimeter:	3.88	ft	3.88	ft
Velocity:	13.83	fps	5.37	fps
Travel time, T_t:	0.1	minutes	0.3	minutes

Continued on next sheet

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PROJECT NUMBER:	06C028T.003		
PROJECT NAME:	Penn Med Parking Garage		
CALCULATED BY:	SP	DATE:	11/18/2022
CHECKED BY:		DATE:	
REVISED BY:		DATE:	

TIME OF CONCENTRATION CALCULATOR

DRAINAGE AREA NAME:	Existing Drainage Area A IMP	DRAINAGE AREA NOTATION:	DA-A-IMP-EX

Open Channel Flow:	Segment 6		Segment 7	
Hydraulic Length:	43	ft	17	ft
Slope:	0.006	ft/ft	0.005	ft/ft
Manning's n:	0.013	---	0.013	---
Flow Area:	2.695	ft^2	2.695	ft^2
Wetted Perimeter:	4.43	ft	4.43	ft
Velocity:	6.44	fps	5.99	fps
Travel time, T_t:	0.1	minutes	0.0	minutes

Open Channel Flow:	Segment 8		Segment 9	
Hydraulic Length:	31	ft	253	ft
Slope:	0.009	ft/ft	0.003	ft/ft
Manning's n:	0.013	---	0.013	---
Flow Area:	2.695	ft^2	2.695	ft^2
Wetted Perimeter:	4.43	ft	4.43	ft
Velocity:	7.68	fps	4.51	fps
Travel time, T_t:	0.1	minutes	0.9	minutes

Open Channel Flow:	Segment 10		Segment 11	
Hydraulic Length:		ft		ft
Slope:		ft/ft		ft/ft
Manning's n:		---		---
Flow Area:		ft^2		ft^2
Wetted Perimeter:		ft		ft
Velocity:	#DIV/0!	fps	#DIV/0!	fps
Travel time, T_t:	0.0	minutes	0.0	minutes

Total Time of Concentration:	3.7	minutes	user input

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PROJECT NUMBER:	06C028T.003		
PROJECT NAME:	Penn Med Parking Garage		
CALCULATED BY:	SP	DATE:	11/18/2022
CHECKED BY:		DATE:	
REVISED BY:	KN	DATE:	7/20/2023

TIME OF CONCENTRATION CALCULATOR

DRAINAGE AREA NAME:	EXISTING DRAINAGE AREA B IMP	DRAINAGE AREA NOTATION:	DA-B-IMP-EX

Sheet Flow: Segment 1

Surface Type:	Smooth surface (concrete, asphalt, gravel, or bare soil)	
Slope of land surface, S:	0.021	ft/ft
n-value (from Table 15-1):	0.011	---
Limiting Length of flow, *l*:	100.0	ft
2-year, 24 hours rainfall, P_2:	3.300	in
Travel time, T_t:	1.2	minutes

calculations for sheet flow based upon Equation 15-8 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{0.007(n l)^{0.8}}{(P_2)^{0.5} S^{0.4}} \quad \text{(Eq 15-8)}$$

Shallow Concentrated Flow: Segment 2

Surface Type:	Short-grass pasture	
Flow length, l:	289	ft
Slope of land surface, S:	0.021	ft/ft
n-value (from Table 15-3):	0.073	---
Average velocity, V:	1.009	ft/s
Travel time, T_t:	4.8	minutes

calculations for shallow concentrated flow based upon Equation 15-1 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{l}{3{,}600V} \quad \text{(Eq 15-1)}$$

Open Channel Flow:

	Segment 3		Segment 5	
Hydraulic Length:	46	ft		ft
Slope:	0.005	ft/ft		ft/ft
Manning's n:	0.012	---		---
Flow Area:	1.227	ft^2		ft^2
Wetted Perimeter:	3.93	ft		ft
Velocity:	4.04	fps	#DIV/0!	fps
Travel time, T_t:	0.2	minutes	0.0	minutes

Total Time of Concentration:	6.1	minutes	user input

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PROJECT NUMBER:	06C028T.003		
PROJECT NAME:	Penn Med Parking Garage		
CALCULATED BY:	SP	DATE:	11/18/2022
CHECKED BY:		DATE:	
REVISED BY:		DATE:	

TIME OF CONCENTRATION CALCULATOR

DRAINAGE AREA NAME:	existing drainage area b perv	DRAINAGE AREA NOTATION:	DA-B-PERV-EX

Sheet Flow: Segment 1

Surface Type:	Grass: Short-grass prairie	
Slope of land surface, S:	0.021	ft/ft
n-value (from Table 15-1):	0.15	---
Limiting Length of flow, *l*:	85.0	ft
2-year, 24 hours rainfall, P_2:	3.300	in
Travel time, T_t:	8.3	minutes

calculations for sheet flow based upon Equation 15-8 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{0.007(n l)^{0.8}}{(P_2)^{0.5} S^{0.4}} \qquad \text{(Eq 15-8)}$$

Open Channel Flow:

	Segment 2		Segment 3	
Hydraulic Length:	190	ft	45	ft
Slope:	0.010	ft/ft	0.016	ft/ft
Manning's n:	0.012	---	0.013	---
Flow Area:	1.227	ft^2	1.053	ft^2
Wetted Perimeter:	3.93	ft	2.77	ft
Velocity:	5.72	fps	7.61	fps
Travel time, T_t:	0.6	minutes	0.1	minutes

Continued on next sheet

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PROJECT NUMBER:	06C028T.003		
PROJECT NAME:	Penn Med Parking Garage		
CALCULATED BY:	SP	DATE:	11/18/2022
CHECKED BY:		DATE:	
REVISED BY:		DATE:	

TIME OF CONCENTRATION CALCULATOR

DRAINAGE AREA NAME:	existing drainage area b perv	DRAINAGE AREA NOTATION:	DA-B-PERV-EX

Open Channel Flow: Segment 4

Hydraulic Length:	90	ft		ft
Slope:	0.015	ft/ft		ft/ft
Manning's n:	0.013	---		---
Flow Area:	1.053	ft^2		ft^2
Wetted Perimeter:	2.77	ft		ft
Velocity:	7.25	fps	#DIV/0!	fps
Travel time, T_t:	0.2	minutes	0.0	minutes

Total Time of Concentration:	9.2	minutes	user input

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PROJECT NUMBER:	06C028T.003		
PROJECT NAME:	Penn Med Parking Garage		
CALCULATED BY:	SP	DATE:	11/18/2022
CHECKED BY:		DATE:	
REVISED BY:		DATE:	

Sheet: 1 of 1

TIME OF CONCENTRATION CALCULATOR

DRAINAGE AREA NAME:	PROPOSED drainage area b perv	DRAINAGE AREA NOTATION:	DA-B-PR-PERV

Sheet Flow: Segment 1

Surface Type:	Grass: Short-grass prairie	
Slope of land surface, S:	0.021	ft/ft
n-value (from Table 15-1):	0.15	---
Limiting Length of flow, *l*:	64.0	ft
2-year, 24 hours rainfall, P_2:	3.300	in
Travel time, T_t:	6.6	minutes

calculations for sheet flow based upon Equation 15-8 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{0.007(n l)^{0.8}}{(P_2)^{0.5} S^{0.4}} \qquad \text{(Eq 15-8)}$$

Open Channel Flow:

	Segment 4		Segment 5	
Hydraulic Length:	190	ft	45	ft
Slope:	0.010	ft/ft	0.016	ft/ft
Manning's n:	0.012	---	0.013	---
Flow Area:	1.227	ft^2	1.053	ft^2
Wetted Perimeter:	3.93	ft	2.77	ft
Velocity:	5.72	fps	7.61	fps
Travel time, T_t:	0.6	minutes	0.1	minutes

Open Channel Flow:

	Segment 6		Segment 7	
Hydraulic Length:	90	ft		ft
Slope:	0.015	ft/ft		ft/ft
Manning's n:	0.013	---		---
Flow Area:	1.053	ft^2		ft^2
Wetted Perimeter:	2.77	ft		ft
Velocity:	7.25	fps	#DIV/0!	fps
Travel time, T_t:	0.2	minutes	0.0	minutes

Total Time of Concentration:	7.5	minutes	user input

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PROJECT NUMBER:	06C028T.003		
PROJECT NAME:	Penn Med Parking Garage		
CALCULATED BY:	KN	DATE:	7/20/2023
CHECKED BY:		DATE:	
REVISED BY:		DATE:	

Sheet: 1 of 1

TIME OF CONCENTRATION CALCULATOR

DRAINAGE AREA NAME:	DRAINAGE AREA A PROPOSED P	DRAINAGE AREA NOTATION:	DA-A-PR-PER

Sheet Flow: Segment 1

Surface Type:	Grass: Short-grass prairie	
Slope of land surface, S:	0.024	ft/ft
n-value (from Table 15-1):	0.15	---
Limiting Length of flow, *l*:	100.0	ft
2-year, 24 hours rainfall, P_2:	3.300	in
Travel time, T_t:	8.9	minutes

calculations for sheet flow based upon Equation 15-8 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{0.007(n l)^{0.8}}{(P_2)^{0.5} S^{0.4}} \qquad \text{(Eq 15-8)}$$

Shallow Concentrated Flow: Segment 2

Surface Type:	Short-grass pasture	
Flow length, l:	101	ft
Slope of land surface, S:	0.024	ft/ft
n-value (from Table 15-3):	0.073	---
Average velocity, V:	1.079	ft/s
Travel time, T_t:	1.6	minutes

calculations for shallow concentrated flow based upon Equation 15-1 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{l}{3{,}600V} \qquad \text{(Eq 15-1)}$$

Shallow Concentrated Flow: Segment 3 Segment 4

Surface Type:				
Flow length, l:		ft		ft
Slope of land surface, S:		ft/ft		ft/ft
n-value (from Table 15-3):	0	---	0	---
Average velocity, V:	0.000	ft/s	0.000	ft/s
Travel time, T_t:	0.0	minutes	0.0	minutes

Total Time of Concentration:	10	minutes	user input

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CALCULATED BY:	KN	DATE:	7/20/2023
CHECKED BY:		DATE:	
REVISED BY:		DATE:	

Sheet: 1 of 1

TIME OF CONCENTRATION CALCULATOR

DRAINAGE AREA NAME:	DRAINAGE AREA A PROPOSED IM	DRAINAGE AREA NOTATION:	DA-A-PR-IMP

Sheet Flow: Segment 1

Surface Type:	Smooth surface (concrete, asphalt, gravel, or bare soil)	
Slope of land surface, S:	0.004	ft/ft
n-value (from Table 15-1):	0.011	---
Limiting Length of flow, *l* :	100.0	ft
2-year, 24 hours rainfall, P_2:	3.300	in
Travel time, T_t:	2.3	minutes

calculations for sheet flow based upon Equation 15-8 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{0.007(n l)^{0.8}}{(P_2)^{0.5} S^{0.4}} \qquad \text{(Eq 15-8)}$$

Shallow Concentrated Flow: Segment 2

Surface Type:	Pavement and small upland gullies	
Flow length, l:	135	ft
Slope of land surface, S:	0.007	ft/ft
n-value (from Table 15-3):	0.025	---
Average velocity, V:	1.718	ft/s
Travel time, T_t:	1.3	minutes

calculations for shallow concentrated flow based upon Equation 15-1 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{l}{3{,}600V} \qquad \text{(Eq 15-1)}$$

Shallow Concentrated Flow: Segment 3 Segment 4

Surface Type:	Pavement and small upland gullies		Pavement and small upland gullies	
Flow length, l:	100	ft	223	ft
Slope of land surface, S:	0.020	ft/ft	0.024	ft/ft
n-value (from Table 15-3):	0.025	---	0.025	---
Average velocity, V:	2.875	ft/s	3.175	ft/s
Travel time, T_t:	0.6	minutes	1.2	minutes

Open Channel Flow:

Hydraulic Length:	37	ft
Slope:	0.003	ft/ft
Manning's n:	0.013	---
Flow Area:	1.767	ft^2
Wetted Perimeter:	4.71	ft
Velocity:	3.40	fps
Travel time, T_t:	0.2	minutes

Total Time of Concentration:	5.5	minutes	user input

Parking Garage

Project Summary	
Title	Princeton Cancer Center Parking Garage
Engineer	Kiera Nissen
Company	French and Parrello Associates
Date	12/14/2022

Notes EXISTING CONDITIONS RUNOFF CALCULATIONS - TOTAL

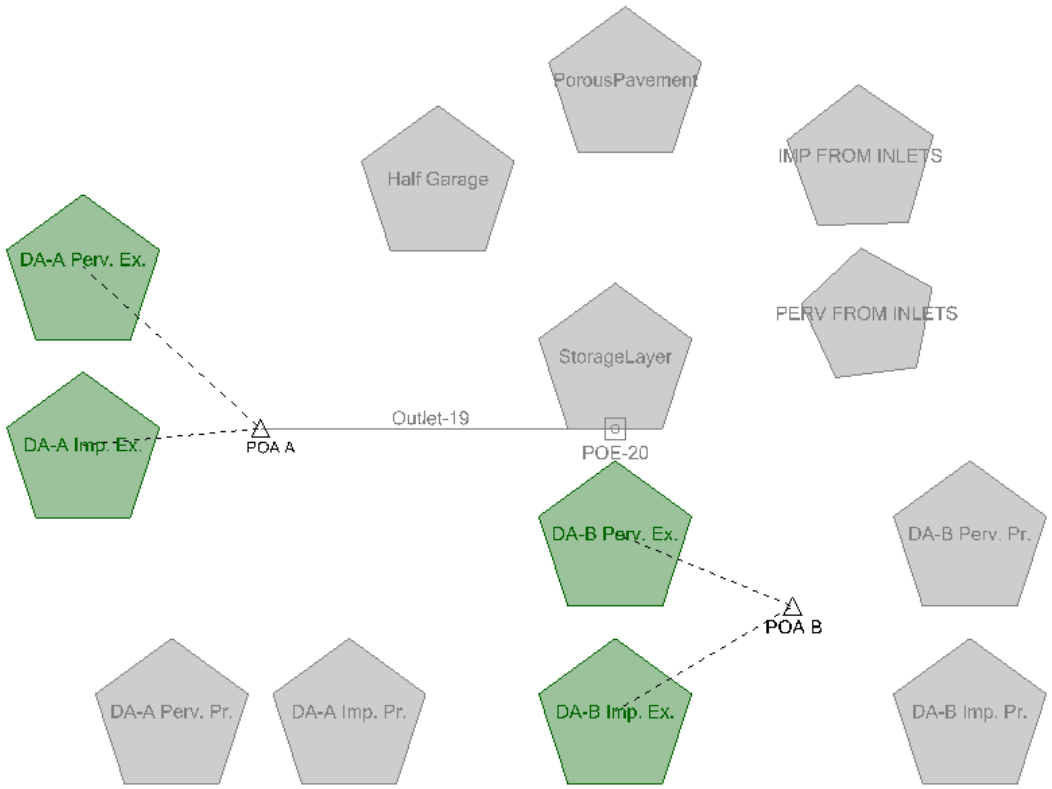


Table of Contents

	Master Network Summary	2
DA-A Imp. Ex.		
	Unit Hydrograph Summary, 2 years (Pre-Development 2 year)	4
	Unit Hydrograph Summary, 10 years (Pre-Development 10 year)	6
	Unit Hydrograph Summary, 25 years (Pre-Development 25 year)	8
	Unit Hydrograph Summary, 100 years (Pre-Development 100 year)	10
DA-A Perv. Ex.		
	Unit Hydrograph Summary, 2 years (Pre-Development 2 year)	12
	Unit Hydrograph Summary, 10 years (Pre-Development 10 year)	14
	Unit Hydrograph Summary, 25 years (Pre-Development 25 year)	16
	Unit Hydrograph Summary, 100 years (Pre-Development 100 year)	18
DA-B Imp. Ex.		
	Unit Hydrograph Summary, 2 years (Pre-Development 2 year)	20
	Unit Hydrograph Summary, 10 years (Pre-Development 10 year)	22
	Unit Hydrograph Summary, 25 years (Pre-Development 25 year)	24
	Unit Hydrograph Summary, 100 years (Pre-Development 100 year)	26
DA-B Perv. Ex.		
	Unit Hydrograph Summary, 2 years (Pre-Development 2 year)	28
	Unit Hydrograph Summary, 10 years (Pre-Development 10 year)	30
	Unit Hydrograph Summary, 25 years (Pre-Development 25 year)	32
	Unit Hydrograph Summary, 100 years (Pre-Development 100 year)	34

Parking Garage

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
DA-A Perv. Ex.	Pre-Development 2 year	2	3,545.000	734.000	0.50
DA-A Perv. Ex.	Pre-Development 10 year	10	8,924.000	733.000	1.50
DA-A Perv. Ex.	Pre-Development 25 year	25	13,371.000	733.000	2.31
DA-A Perv. Ex.	Pre-Development 100 year	100	22,362.000	733.000	3.95
DA-B Imp. Ex.	Pre-Development 2 year	2	11,431.000	728.000	2.60
DA-B Imp. Ex.	Pre-Development 10 year	10	17,909.000	728.000	4.00
DA-B Imp. Ex.	Pre-Development 25 year	25	22,451.000	728.000	4.97
DA-B Imp. Ex.	Pre-Development 100 year	100	30,771.000	728.000	6.76
DA-B Perv. Ex.	Pre-Development 2 year	2	1,900.000	730.000	0.34
DA-B Perv. Ex.	Pre-Development 10 year	10	4,678.000	730.000	0.97
DA-B Perv. Ex.	Pre-Development 25 year	25	6,955.000	730.000	1.48
DA-B Perv. Ex.	Pre-Development 100 year	100	11,534.000	730.000	2.49
DA-A Imp. Ex.	Pre-Development 2 year	2	33,106.000	727.000	8.73
DA-A Imp. Ex.	Pre-Development 10 year	10	51,847.000	727.000	12.43
DA-A Imp. Ex.	Pre-Development 25 year	25	64,998.000	727.000	15.47
DA-A Imp. Ex.	Pre-Development 100 year	100	89,114.000	727.000	22.71

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
POA A	Pre-Development 2 year	2	36,651.000	727.000	9.07
POA A	Pre-Development 10 year	10	60,771.000	727.000	13.59
POA A	Pre-Development 25 year	25	78,370.000	727.000	17.31
POA A	Pre-Development 100 year	100	111,476.000	727.000	25.94

Parking Garage

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
POA B	Pre-Development 2 year	2	13,331.000	728.000	2.92
POA B	Pre-Development 10 year	10	22,586.000	728.000	4.93
POA B	Pre-Development 25 year	25	29,406.000	728.000	6.40
POA B	Pre-Development 100 year	100	42,306.000	728.000	9.17

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Ex.
Scenario: Pre-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	3.700 min
Area (User Defined)	2.929 acres

Computational Time Increment	0.493 min
Time to Peak (Computed)	726.680 min
Flow (Peak, Computed)	8.81 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	8.73 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.929 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.12 in
Runoff Volume (Pervious)	33,140.322 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	33,106.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	3.700 min
Computational Time Increment	0.493 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Ex.
Scenario: Pre-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	31.40 ft³/s
Unit peak time, Tp	2.467 min
Unit receding limb, Tr	21.707 min
Total unit time, Tb	24.173 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Ex.
Scenario: Pre-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	3.700 min
Area (User Defined)	2.929 acres

Computational Time Increment	0.667 min
Time to Peak (Computed)	727.333 min
Flow (Peak, Computed)	12.45 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	12.43 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.929 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.88 in
Runoff Volume (Pervious)	51,917.213 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	51,847.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	3.700 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Ex.
Scenario: Pre-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	23.23 ft³/s
Unit peak time, Tp	3.333 min
Unit receding limb, Tr	29.333 min
Total unit time, Tb	32.667 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Ex.
Scenario: Pre-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	3.700 min
Area (User Defined)	2.929 acres

Computational Time Increment	0.667 min
Time to Peak (Computed)	727.333 min
Flow (Peak, Computed)	15.49 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	15.47 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.929 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.12 in
Runoff Volume (Pervious)	65,085.291 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	64,998.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	3.700 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Ex.
Scenario: Pre-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	23.23 ft³/s
Unit peak time, Tp	3.333 min
Unit receding limb, Tr	29.333 min
Total unit time, Tb	32.667 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Ex.
Scenario: Pre-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	3.700 min
Area (User Defined)	2.929 acres

Computational Time Increment	0.493 min
Time to Peak (Computed)	726.680 min
Flow (Peak, Computed)	22.92 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	22.71 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.929 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.39 in
Runoff Volume (Pervious)	89,203.024 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	89,114.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	3.700 min
Computational Time Increment	0.493 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Ex.
Scenario: Pre-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	31.40 ft³/s
Unit peak time, Tp	2.467 min
Unit receding limb, Tr	21.707 min
Total unit time, Tb	24.173 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	13.800 min
Area (User Defined)	1.368 acres

Computational Time Increment	1.840 min
Time to Peak (Computed)	734.160 min
Flow (Peak, Computed)	0.50 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	734.000 min
Flow (Peak Interpolated Output)	0.50 ft³/s

Drainage Area	
SCS CN (Composite)	66.000
Area (User Defined)	1.368 acres
Maximum Retention (Pervious)	5.15 in
Maximum Retention (Pervious, 20 percent)	1.03 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.72 in
Runoff Volume (Pervious)	3,576.549 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,545.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.800 min
Computational Time Increment	1.840 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	3.93 ft³/s
Unit peak time, Tp	9.200 min
Unit receding limb, Tr	80.960 min
Total unit time, Tb	90.160 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	13.800 min
Area (User Defined)	1.368 acres

Computational Time Increment	1.840 min
Time to Peak (Computed)	732.320 min
Flow (Peak, Computed)	1.50 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	733.000 min
Flow (Peak Interpolated Output)	1.50 ft³/s

Drainage Area	
SCS CN (Composite)	66.000
Area (User Defined)	1.368 acres
Maximum Retention (Pervious)	5.15 in
Maximum Retention (Pervious, 20 percent)	1.03 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.81 in
Runoff Volume (Pervious)	8,987.648 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	8,924.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.800 min
Computational Time Increment	1.840 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	3.93 ft³/s
Unit peak time, Tp	9.200 min
Unit receding limb, Tr	80.960 min
Total unit time, Tb	90.160 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	13.800 min
Area (User Defined)	1.368 acres

Computational Time Increment	1.840 min
Time to Peak (Computed)	732.320 min
Flow (Peak, Computed)	2.32 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	733.000 min
Flow (Peak Interpolated Output)	2.31 ft³/s

Drainage Area	
SCS CN (Composite)	66.000
Area (User Defined)	1.368 acres
Maximum Retention (Pervious)	5.15 in
Maximum Retention (Pervious, 20 percent)	1.03 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.71 in
Runoff Volume (Pervious)	13,458.176 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	13,371.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.800 min
Computational Time Increment	1.840 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	3.93 ft³/s
Unit peak time, Tp	9.200 min
Unit receding limb, Tr	80.960 min
Total unit time, Tb	90.160 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	13.800 min
Area (User Defined)	1.368 acres

Computational Time Increment	1.840 min
Time to Peak (Computed)	732.320 min
Flow (Peak, Computed)	3.96 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	733.000 min
Flow (Peak Interpolated Output)	3.95 ft³/s

Drainage Area	
SCS CN (Composite)	66.000
Area (User Defined)	1.368 acres
Maximum Retention (Pervious)	5.15 in
Maximum Retention (Pervious, 20 percent)	1.03 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.53 in
Runoff Volume (Pervious)	22,492.294 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	22,362.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.800 min
Computational Time Increment	1.840 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	3.93 ft³/s
Unit peak time, Tp	9.200 min
Unit receding limb, Tr	80.960 min
Total unit time, Tb	90.160 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Ex.
Scenario: Pre-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	6.100 min
Area (User Defined)	1.012 acres

Computational Time Increment	0.813 min
Time to Peak (Computed)	727.933 min
Flow (Peak, Computed)	2.60 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	728.000 min
Flow (Peak Interpolated Output)	2.60 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.012 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.12 in
Runoff Volume (Pervious)	11,450.325 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	11,431.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	6.100 min
Computational Time Increment	0.813 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Ex.
Scenario: Pre-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	6.58 ft³/s
Unit peak time, Tp	4.067 min
Unit receding limb, Tr	35.787 min
Total unit time, Tb	39.853 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Ex.
Scenario: Pre-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	6.100 min
Area (User Defined)	1.012 acres

Computational Time Increment	0.813 min
Time to Peak (Computed)	727.933 min
Flow (Peak, Computed)	4.00 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	728.000 min
Flow (Peak Interpolated Output)	4.00 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.012 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.88 in
Runoff Volume (Pervious)	17,937.939 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	17,909.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	6.100 min
Computational Time Increment	0.813 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Ex.
Scenario: Pre-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	6.58 ft³/s
Unit peak time, Tp	4.067 min
Unit receding limb, Tr	35.787 min
Total unit time, Tb	39.853 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Ex.
Scenario: Pre-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	6.100 min
Area (User Defined)	1.012 acres

Computational Time Increment	0.813 min
Time to Peak (Computed)	727.933 min
Flow (Peak, Computed)	4.98 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	728.000 min
Flow (Peak Interpolated Output)	4.97 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.012 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.12 in
Runoff Volume (Pervious)	22,487.649 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	22,451.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	6.100 min
Computational Time Increment	0.813 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Ex.
Scenario: Pre-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	6.58 ft³/s
Unit peak time, Tp	4.067 min
Unit receding limb, Tr	35.787 min
Total unit time, Tb	39.853 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Ex.
Scenario: Pre-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	6.100 min
Area (User Defined)	1.012 acres

Computational Time Increment	0.813 min
Time to Peak (Computed)	727.933 min
Flow (Peak, Computed)	6.77 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	728.000 min
Flow (Peak Interpolated Output)	6.76 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.012 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.39 in
Runoff Volume (Pervious)	30,820.575 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	30,771.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	6.100 min
Computational Time Increment	0.813 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Ex.
Scenario: Pre-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	6.58 ft³/s
Unit peak time, Tp	4.067 min
Unit receding limb, Tr	35.787 min
Total unit time, Tb	39.853 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Ex.
Scenario: Pre-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	9.200 min
Area (User Defined)	0.686 acres

Computational Time Increment	1.227 min
Time to Peak (Computed)	729.867 min
Flow (Peak, Computed)	0.34 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	730.000 min
Flow (Peak Interpolated Output)	0.34 ft³/s

Drainage Area	
SCS CN (Composite)	67.000
Area (User Defined)	0.686 acres
Maximum Retention (Pervious)	4.93 in
Maximum Retention (Pervious, 20 percent)	0.99 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.77 in
Runoff Volume (Pervious)	1,910.382 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,900.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	9.200 min
Computational Time Increment	1.227 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Ex.
Scenario: Pre-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	2.96 ft³/s
Unit peak time, Tp	6.133 min
Unit receding limb, Tr	53.973 min
Total unit time, Tb	60.107 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Ex.
Scenario: Pre-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	9.200 min
Area (User Defined)	0.686 acres

Computational Time Increment	1.227 min
Time to Peak (Computed)	729.867 min
Flow (Peak, Computed)	0.97 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	730.000 min
Flow (Peak Interpolated Output)	0.97 ft³/s

Drainage Area	
SCS CN (Composite)	67.000
Area (User Defined)	0.686 acres
Maximum Retention (Pervious)	4.93 in
Maximum Retention (Pervious, 20 percent)	0.99 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.89 in
Runoff Volume (Pervious)	4,699.196 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	4,678.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	9.200 min
Computational Time Increment	1.227 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Ex.
Scenario: Pre-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	2.96 ft³/s
Unit peak time, Tp	6.133 min
Unit receding limb, Tr	53.973 min
Total unit time, Tb	60.107 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Ex.
Scenario: Pre-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	9.200 min
Area (User Defined)	0.686 acres

Computational Time Increment	1.227 min
Time to Peak (Computed)	729.867 min
Flow (Peak, Computed)	1.48 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	730.000 min
Flow (Peak Interpolated Output)	1.48 ft³/s

Drainage Area	
SCS CN (Composite)	67.000
Area (User Defined)	0.686 acres
Maximum Retention (Pervious)	4.93 in
Maximum Retention (Pervious, 20 percent)	0.99 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.80 in
Runoff Volume (Pervious)	6,984.347 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	6,955.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	9.200 min
Computational Time Increment	1.227 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Ex.
Scenario: Pre-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	2.96 ft³/s
Unit peak time, Tp	6.133 min
Unit receding limb, Tr	53.973 min
Total unit time, Tb	60.107 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Ex.
Scenario: Pre-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	9.200 min
Area (User Defined)	0.686 acres

Computational Time Increment	1.227 min
Time to Peak (Computed)	729.867 min
Flow (Peak, Computed)	2.49 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	730.000 min
Flow (Peak Interpolated Output)	2.49 ft³/s

Drainage Area	
SCS CN (Composite)	67.000
Area (User Defined)	0.686 acres
Maximum Retention (Pervious)	4.93 in
Maximum Retention (Pervious, 20 percent)	0.99 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.65 in
Runoff Volume (Pervious)	11,577.949 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	11,534.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	9.200 min
Computational Time Increment	1.227 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Ex.
Scenario: Pre-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	2.96 ft³/s
Unit peak time, Tp	6.133 min
Unit receding limb, Tr	53.973 min
Total unit time, Tb	60.107 min

Parking Garage

Index

D

DA-A Imp. Ex. (Unit Hydrograph Summary, 10 years (Pre-Development 10 year))...6, 7
DA-A Imp. Ex. (Unit Hydrograph Summary, 100 years (Pre-Development 100 year))...10, 11
DA-A Imp. Ex. (Unit Hydrograph Summary, 2 years (Pre-Development 2 year))...4, 5
DA-A Imp. Ex. (Unit Hydrograph Summary, 25 years (Pre-Development 25 year))...8, 9
DA-A Perv. Ex. (Unit Hydrograph Summary, 10 years (Pre-Development 10 year))...14, 15
DA-A Perv. Ex. (Unit Hydrograph Summary, 100 years (Pre-Development 100 year))...18, 19
DA-A Perv. Ex. (Unit Hydrograph Summary, 2 years (Pre-Development 2 year))...12, 13
DA-A Perv. Ex. (Unit Hydrograph Summary, 25 years (Pre-Development 25 year))...16, 17
DA-B Imp. Ex. (Unit Hydrograph Summary, 10 years (Pre-Development 10 year))...22, 23
DA-B Imp. Ex. (Unit Hydrograph Summary, 100 years (Pre-Development 100 year))...26, 27
DA-B Imp. Ex. (Unit Hydrograph Summary, 2 years (Pre-Development 2 year))...20, 21
DA-B Imp. Ex. (Unit Hydrograph Summary, 25 years (Pre-Development 25 year))...24, 25
DA-B Perv. Ex. (Unit Hydrograph Summary, 10 years (Pre-Development 10 year))...30, 31
DA-B Perv. Ex. (Unit Hydrograph Summary, 100 years (Pre-Development 100 year))...34, 35
DA-B Perv. Ex. (Unit Hydrograph Summary, 2 years (Pre-Development 2 year))...28, 29
DA-B Perv. Ex. (Unit Hydrograph Summary, 25 years (Pre-Development 25 year))...32, 33

M

Master Network Summary...2, 3

Parking Garage

Project Summary	
Title	Princeton Cancer Center Parking Garage
Engineer	Kiera Nissen
Company	French and Parrello Associates
Date	12/14/2022

Notes EXISTING CONDITIONS RUNOFF CALCULATIONS - REDUCTION AREAS

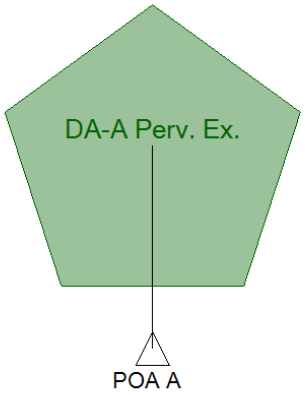


Table of Contents

Master Network Summary 2

DA-A Perv. Ex.

Unit Hydrograph Summary, 2 years (Pre-Development 2 year) 3

Unit Hydrograph Summary, 10 years (Pre-Development 10 year) 5

Unit Hydrograph Summary, 25 years (Pre-Development 25 year) 7

Unit Hydrograph Summary, 100 years (Pre-Development 100 year) 9

Parking Garage

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
DA-A Perv. Ex.	Pre-Development 2 year	2	1,539.000	734.000	0.24
DA-A Perv. Ex.	Pre-Development 10 year	10	3,643.000	733.000	0.62
DA-A Perv. Ex.	Pre-Development 25 year	25	5,355.000	732.000	1.30
DA-A Perv. Ex.	Pre-Development 100 year	100	8,720.000	732.000	1.54

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
POA A	Pre-Development 2 year	2	1,539.000	734.000	0.24
POA A	Pre-Development 10 year	10	3,643.000	733.000	0.62
POA A	Pre-Development 25 year	25	5,355.000	732.000	1.30
POA A	Pre-Development 100 year	100	8,720.000	732.000	1.54

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	13.800 min
Area (User Defined)	0.494 acres

Computational Time Increment	1.840 min
Time to Peak (Computed)	734.160 min
Flow (Peak, Computed)	0.24 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	734.000 min
Flow (Peak Interpolated Output)	0.24 ft³/s

Drainage Area	
SCS CN (Composite)	69.000
Area (User Defined)	0.494 acres
Maximum Retention (Pervious)	4.49 in
Maximum Retention (Pervious, 20 percent)	0.90 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.87 in
Runoff Volume (Pervious)	1,551.876 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,539.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.800 min
Computational Time Increment	1.840 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	1.42 ft³/s
Unit peak time, Tp	9.200 min
Unit receding limb, Tr	80.960 min
Total unit time, Tb	90.160 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	13.800 min
Area (User Defined)	0.494 acres

Computational Time Increment	1.840 min
Time to Peak (Computed)	732.320 min
Flow (Peak, Computed)	0.63 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	733.000 min
Flow (Peak Interpolated Output)	0.62 ft³/s

Drainage Area	
SCS CN (Composite)	69.000
Area (User Defined)	0.494 acres
Maximum Retention (Pervious)	4.49 in
Maximum Retention (Pervious, 20 percent)	0.90 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.05 in
Runoff Volume (Pervious)	3,667.153 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,643.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.800 min
Computational Time Increment	1.840 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	1.42 ft³/s
Unit peak time, Tp	9.200 min
Unit receding limb, Tr	80.960 min
Total unit time, Tb	90.160 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	13.800 min
Area (User Defined)	0.494 acres

Computational Time Increment	1.840 min
Time to Peak (Computed)	732.320 min
Flow (Peak, Computed)	1.30 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	732.000 min
Flow (Peak Interpolated Output)	1.30 ft³/s

Drainage Area	
SCS CN (Composite)	69.000
Area (User Defined)	0.494 acres
Maximum Retention (Pervious)	4.49 in
Maximum Retention (Pervious, 20 percent)	0.90 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.00 in
Runoff Volume (Pervious)	5,373.322 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	5,355.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.800 min
Computational Time Increment	1.840 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	2.43 ft³/s
Unit peak time, Tp	9.200 min
Unit receding limb, Tr	36.800 min
Total unit time, Tb	46.000 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	13.800 min
Area (User Defined)	0.494 acres

Computational Time Increment	1.840 min
Time to Peak (Computed)	732.320 min
Flow (Peak, Computed)	1.55 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	732.000 min
Flow (Peak Interpolated Output)	1.54 ft³/s

Drainage Area	
SCS CN (Composite)	69.000
Area (User Defined)	0.494 acres
Maximum Retention (Pervious)	4.49 in
Maximum Retention (Pervious, 20 percent)	0.90 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.89 in
Runoff Volume (Pervious)	8,768.693 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	8,720.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.800 min
Computational Time Increment	1.840 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Ex.
Scenario: Pre-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	1.42 ft³/s
Unit peak time, Tp	9.200 min
Unit receding limb, Tr	80.960 min
Total unit time, Tb	90.160 min

Parking Garage

Index

D

DA-A Perv. Ex. (Unit Hydrograph Summary, 10 years (Pre-Development 10 year))...5, 6

DA-A Perv. Ex. (Unit Hydrograph Summary, 100 years (Pre-Development 100 year))...9, 10

DA-A Perv. Ex. (Unit Hydrograph Summary, 2 years (Pre-Development 2 year))...3, 4

DA-A Perv. Ex. (Unit Hydrograph Summary, 25 years (Pre-Development 25 year))...7, 8

M

Master Network Summary...2

Appendix C
Water Quality Calculations

Parking Garage

Project Summary	
Title	Princeton Cancer Center Parking Garage
Engineer	Kiera Nissen
Company	French and Parrello Associates
Date	7/25/2023

Notes	WATER QUALITY CALCULATIONS

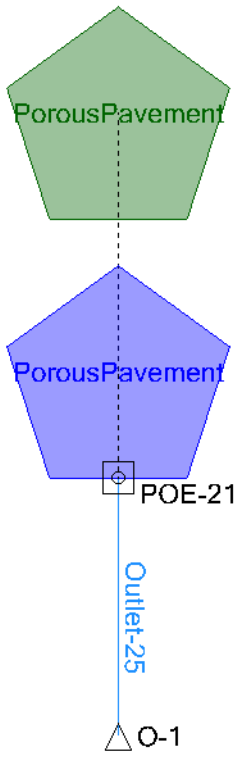


Table of Contents

	Master Network Summary	2
PorousPavement	Unit Hydrograph Summary, 1 years (Post-Development Water Quality Storm)	3
PorousPavement		
	Elevation-Volume-Flow Table (Pond), 1 years (Post-Development Water Quality Storm)	5
PorousPavement (IN)		
	Level Pool Pond Routing Summary, 1 years (Post-Development Water Quality Storm)	6

Parking Garage

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
PorousPavement	Post-Development Water Quality Storm	1	2,479.000	65.000	1.97

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
O-1	Post-Development Water Quality Storm	1	0.000	0.000	0.00

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
PorousPavement (IN)	Post-Development Water Quality Storm	1	2,479.000	65.000	1.97	(N/A)	(N/A)
PorousPavement (OUT)	Post-Development Water Quality Storm	1	0.000	0.000	0.00	0.22	2,479.000

WATER QUALITY CALCULATION LISTED ABOVE ASSUMED A BASE ELEVATION OF 0.00 AND TOP ELEVATION OF 0.25 FOR A TOTAL DEPTH OF THREE (3) INCHES OF STONE USE FOR WATER QUALITY. THEREFORE, MAXIMUM WATER SURFACE ELEVATIONS SHOWN ARE REQUIRED THICKNESS NEEDED FOR WATER QUALITY TREATMENT

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PorousPavement
Scenario: Post-Development Water Quality Storm

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

Storm Event	NJWQ (1.3 in)
Return Event	1 years
Duration	1,440.000 min
Depth	1.25 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	0.660 acres

Computational Time Increment	0.667 min
Time to Peak (Computed)	65.333 min
Flow (Peak, Computed)	1.97 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	65.000 min
Flow (Peak Interpolated Output)	1.97 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.660 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.03 in
Runoff Volume (Pervious)	2,478.628 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	2,479.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PorousPavement
Scenario: Post-Development Water Quality Storm

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	8.97 ft³/s
Unit peak time, Tp	3.333 min
Unit receding limb, Tr	13.333 min
Total unit time, Tb	16.667 min

Parking Garage

Subsection: Elevation-Volume-Flow Table (Pond)
Label: PorousPavement
Scenario: Post-Development Water Quality Storm

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	0.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	1.000 min

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.00	0.00	0.000	0.660	0.00	0.00	0.00
0.10	0.00	1,149.984	0.660	0.00	0.00	38.33
0.20	0.00	2,299.968	0.660	0.00	0.00	76.67
0.24	0.00	2,759.962	0.660	0.00	0.00	92.00
0.25	0.01	2,874.960	0.660	0.00	0.01	95.84

Parking Garage

Subsection: Level Pool Pond Routing Summary
Label: PorousPavement (IN)
Scenario: Post-Development Water Quality Storm

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	0.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	1.97 ft³/s	Time to Peak (Flow, In)	65.000 min
Flow (Peak Outlet)	0.00 ft³/s	Time to Peak (Flow, Outlet)	0.000 min

Elevation (Water Surface, Peak)	0.22 ft
Volume (Peak)	2,478.628 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	2,479.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	0.000 ft³
Volume (Retained)	2,479.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.000 %

Parking Garage

Index

M

Master Network Summary...2

P

PorousPavement (Elevation-Volume-Flow Table (Pond), 1 years (Post-Development Water Quality Storm))...5

PorousPavement (IN) (Level Pool Pond Routing Summary, 1 years (Post-Development Water Quality Storm))...6

PorousPavement (Unit Hydrograph Summary, 1 years (Post-Development Water Quality Storm))...3, 4

Appendix D
Proposed Conditions Calculations

Summary for Pond 1P: (new Pond)

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1A	81.40'	3,941 cf	**99.00'W x 41.17'L x 4.00'H Field A** 16,302 cf Overall - 6,449 cf Embedded = 9,853 cf x 40.0% Voids
#2A	81.90'	6,449 cf	**Cultec R-360HD** x 170 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap 170 Chambers in 17 Rows Cap Storage= 6.5 cf x 2 x 17 rows = 219.6 cf
		10,390 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation	Storage
81.4	0
81.5	163
81.6	326
81.7	489
81.8	652
81.9	815
82	1,155
82.1	1,493
82.2	1,831
82.3	2,167
82.4	2,501
82.5	2,833
82.6	3,163
82.7	3,492
82.8	3,818
82.9	4,142
83	4,463
83.1	4,781
83.2	5,096
83.3	5,409
83.4	5,717
83.5	6,023
83.6	6,324
83.7	6,621
83.8	6,913
83.9	7,200
84	7,482
84.1	7,758
84.2	8,026
84.3	8,287
84.4	8,539
84.5	8,780
84.6	9,006
84.7	9,213
84.8	9,401
84.9	9,575
85	9,738
85.1	9,901
85.2	10,064
85.3	10,227
85.4	10,390

Parking Garage

Project Summary	
Title	Princeton Cancer Center Parking Garage
Engineer	Kiera Nissen
Company	French and Parrello Associates
Date	7/25/2023

Notes	POST DEVELOPMENT WATER QUANTITY CALCULATIONS

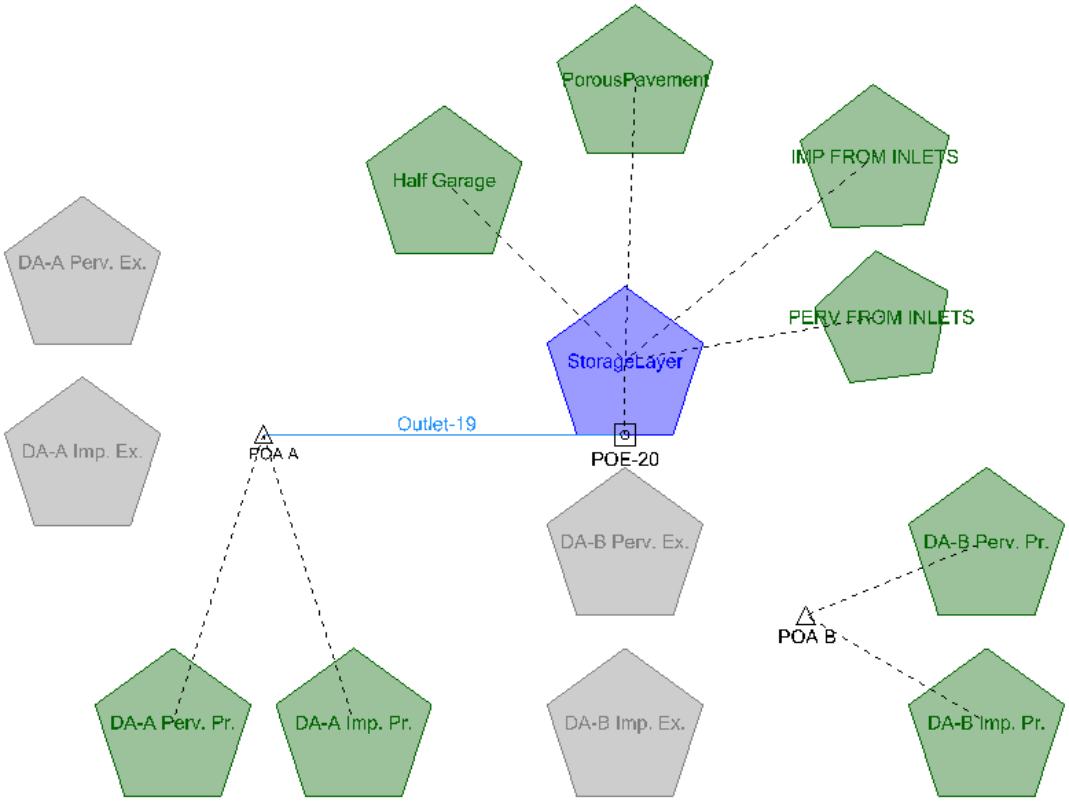


Table of Contents

	Master Network Summary	2
DA-A Imp. Pr.		
	Unit Hydrograph Summary, 2 years (Post-Development 2 year)	5
	Unit Hydrograph Summary, 10 years (Post-Development 10 year)	7
	Unit Hydrograph Summary, 25 years (Post-Development 25 year)	9
	Unit Hydrograph Summary, 100 years (Post-Development 100 year)	11
DA-A Perv. Pr.		
	Unit Hydrograph Summary, 2 years (Post-Development 2 year)	13
	Unit Hydrograph Summary, 10 years (Post-Development 10 year)	15
	Unit Hydrograph Summary, 25 years (Post-Development 25 year)	17
	Unit Hydrograph Summary, 100 years (Post-Development 100 year)	19
DA-B Imp. Pr.		
	Unit Hydrograph Summary, 2 years (Post-Development 2 year)	21
	Unit Hydrograph Summary, 10 years (Post-Development 10 year)	23
	Unit Hydrograph Summary, 25 years (Post-Development 25 year)	25
	Unit Hydrograph Summary, 100 years (Post-Development 100 year)	27
DA-B Perv. Pr.		
	Unit Hydrograph Summary, 2 years (Post-Development 2 year)	29
	Unit Hydrograph Summary, 10 years (Post-Development 10 year)	31
	Unit Hydrograph Summary, 25 years (Post-Development 25 year)	33
	Unit Hydrograph Summary, 100 years (Post-Development 100 year)	35
Half Garage		
	Unit Hydrograph Summary, 2 years (Post-Development 2 year)	37
	Unit Hydrograph Summary, 10 years (Post-Development 10 year)	39
	Unit Hydrograph Summary, 25 years (Post-Development 25 year)	41
	Unit Hydrograph Summary, 100 years (Post-Development 100 year)	43
IMP FROM INLETS		
	Unit Hydrograph Summary, 2 years (Post-Development 2 year)	45
	Unit Hydrograph Summary, 10 years (Post-Development 10 year)	47
	Unit Hydrograph Summary, 25 years (Post-Development 25 year)	49
	Unit Hydrograph Summary, 100 years (Post-Development 100 year)	51

Table of Contents

PERV FROM INLETS

Unit Hydrograph Summary, 2 years (Post-Development 2 year) 53
Unit Hydrograph Summary, 10 years (Post-Development 10 year) 55
Unit Hydrograph Summary, 25 years (Post-Development 25 year) 57
Unit Hydrograph Summary, 100 years (Post-Development 100 year) 59

PorousPavement

Unit Hydrograph Summary, 2 years (Post-Development 2 year) 61
Unit Hydrograph Summary, 10 years (Post-Development 10 year) 63
Unit Hydrograph Summary, 25 years (Post-Development 25 year) 65
Unit Hydrograph Summary, 100 years (Post-Development 100 year) 67

Storage Layer

Outlet Input Data, 100 years (Post-Development 100 year) 69
Individual Outlet Curves, 100 years (Post-Development 100 year) 71
Composite Rating Curve, 100 years (Post-Development 100 year) 81

StorageLayer

Elevation-Volume-Flow Table (Pond), 100 years (Post-Development 100 year) 84

StorageLayer (IN)

Level Pool Pond Routing Summary, 2 years (Post-Development 2 year) 86
Level Pool Pond Routing Summary, 10 years (Post-Development 10 year) 87
Level Pool Pond Routing Summary, 25 years (Post-Development 25 year) 88
Level Pool Pond Routing Summary, 100 years (Post-Development 100 year) 89

Parking Garage

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
DA-A Perv. Pr.	Post-Development 2 year	2	1,524.000	732.000	0.24
DA-A Perv. Pr.	Post-Development 10 year	10	4,014.000	731.000	0.78
DA-A Perv. Pr.	Post-Development 25 year	25	6,108.000	730.000	1.23
DA-A Perv. Pr.	Post-Development 100 year	100	10,389.000	730.000	2.14
PorousPavement	Post-Development 2 year	2	7,466.000	726.000	2.30
PorousPavement	Post-Development 10 year	10	11,695.000	726.000	3.54
PorousPavement	Post-Development 25 year	25	14,662.000	726.000	4.40
PorousPavement	Post-Development 100 year	100	20,095.000	726.000	5.98
DA-A Imp. Pr.	Post-Development 2 year	2	19,804.000	727.000	4.67
DA-A Imp. Pr.	Post-Development 10 year	10	31,026.000	727.000	7.19
DA-A Imp. Pr.	Post-Development 25 year	25	38,896.000	727.000	8.95
DA-A Imp. Pr.	Post-Development 100 year	100	53,310.000	727.000	12.16
Half Garage	Post-Development 2 year	2	8,698.000	726.000	2.68
Half Garage	Post-Development 10 year	10	13,627.000	726.000	4.12
Half Garage	Post-Development 25 year	25	17,083.000	726.000	5.13
Half Garage	Post-Development 100 year	100	23,414.000	726.000	6.97
DA-B Perv. Pr.	Post-Development 2 year	2	1,824.000	729.000	0.38
DA-B Perv. Pr.	Post-Development 10 year	10	4,400.000	729.000	1.02
DA-B Perv. Pr.	Post-Development 25 year	25	6,495.000	729.000	1.53
DA-B Perv. Pr.	Post-Development 100 year	100	10,685.000	729.000	2.53
DA-B Imp. Pr.	Post-Development 2 year	2	10,923.000	728.000	2.48
DA-B Imp. Pr.	Post-Development 10 year	10	17,112.000	728.000	3.82
DA-B Imp. Pr.	Post-Development 25 year	25	21,453.000	728.000	4.75

Parking Garage

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
DA-B Imp. Pr.	Post-Development 100 year	100	29,403.000	728.000	6.46
IMP FROM INLETS	Post-Development 2 year	2	2,896.000	726.000	0.89
IMP FROM INLETS	Post-Development 10 year	10	4,536.000	726.000	1.37
IMP FROM INLETS	Post-Development 25 year	25	5,687.000	726.000	1.71
IMP FROM INLETS	Post-Development 100 year	100	7,794.000	726.000	2.32
PERV FROM INLETS	Post-Development 2 year	2	1,024.000	728.000	0.27
PERV FROM INLETS	Post-Development 10 year	10	2,331.000	727.000	0.64
PERV FROM INLETS	Post-Development 25 year	25	3,369.000	727.000	0.93
PERV FROM INLETS	Post-Development 100 year	100	5,416.000	727.000	1.50

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
POA A	Post-Development 2 year	2	40,116.000	728.000	8.08
POA A	Post-Development 10 year	10	65,791.000	728.000	12.84
POA A	Post-Development 25 year	25	84,292.000	728.000	16.02
POA A	Post-Development 100 year	100	118,792.000	727.000	25.06
POA B	Post-Development 2 year	2	12,747.000	728.000	2.85
POA B	Post-Development 10 year	10	21,513.000	728.000	4.83
POA B	Post-Development 25 year	25	27,948.000	728.000	6.27
POA B	Post-Development 100 year	100	40,088.000	728.000	8.98

Pond Summary

Parking Garage

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
StorageLayer (IN)	Post-Development 2 year	2	20,084.000	726.000	6.13	(N/A)	(N/A)
StorageLayer (OUT)	Post-Development 2 year	2	18,788.000	728.000	3.23	83.12	4,836.000
StorageLayer (IN)	Post-Development 10 year	10	32,190.000	726.000	9.64	(N/A)	(N/A)
StorageLayer (OUT)	Post-Development 10 year	10	30,751.000	728.000	4.98	83.71	6,664.000
StorageLayer (IN)	Post-Development 25 year	25	40,802.000	726.000	12.13	(N/A)	(N/A)
StorageLayer (OUT)	Post-Development 25 year	25	39,288.000	728.000	5.98	84.19	8,007.000
StorageLayer (IN)	Post-Development 100 year	100	56,719.000	726.000	16.71	(N/A)	(N/A)
StorageLayer (OUT)	Post-Development 100 year	100	55,093.000	727.000	10.96	85.29	10,215.000

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Pr.
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	5.500 min
Area (User Defined)	1.753 acres

Computational Time Increment	0.733 min
Time to Peak (Computed)	727.467 min
Flow (Peak, Computed)	4.70 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	4.67 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.753 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.12 in
Runoff Volume (Pervious)	19,834.412 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	19,804.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.500 min
Computational Time Increment	0.733 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Pr.
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	12.64 ft³/s
Unit peak time, Tp	3.667 min
Unit receding limb, Tr	32.267 min
Total unit time, Tb	35.933 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Pr.
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	5.500 min
Area (User Defined)	1.753 acres

Computational Time Increment	0.733 min
Time to Peak (Computed)	727.467 min
Flow (Peak, Computed)	7.23 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	7.19 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.753 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.88 in
Runoff Volume (Pervious)	31,072.339 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	31,026.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.500 min
Computational Time Increment	0.733 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Pr.
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	12.64 ft³/s
Unit peak time, Tp	3.667 min
Unit receding limb, Tr	32.267 min
Total unit time, Tb	35.933 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Pr.
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	5.500 min
Area (User Defined)	1.753 acres

Computational Time Increment	0.733 min
Time to Peak (Computed)	727.467 min
Flow (Peak, Computed)	8.99 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	8.95 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.753 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.12 in
Runoff Volume (Pervious)	38,953.407 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	38,896.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.500 min
Computational Time Increment	0.733 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Pr.
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	12.64 ft³/s
Unit peak time, Tp	3.667 min
Unit receding limb, Tr	32.267 min
Total unit time, Tb	35.933 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Pr.
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	5.500 min
Area (User Defined)	1.753 acres

Computational Time Increment	0.733 min
Time to Peak (Computed)	727.467 min
Flow (Peak, Computed)	12.22 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	12.16 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.753 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.39 in
Runoff Volume (Pervious)	53,387.811 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	53,310.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.500 min
Computational Time Increment	0.733 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Imp. Pr.
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	12.64 ft³/s
Unit peak time, Tp	3.667 min
Unit receding limb, Tr	32.267 min
Total unit time, Tb	35.933 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Pr.
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	10.000 min
Area (User Defined)	0.670 acres

Computational Time Increment	1.333 min
Time to Peak (Computed)	732.000 min
Flow (Peak, Computed)	0.24 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	732.000 min
Flow (Peak Interpolated Output)	0.24 ft³/s

Drainage Area	
SCS CN (Composite)	64.000
Area (User Defined)	0.670 acres
Maximum Retention (Pervious)	5.63 in
Maximum Retention (Pervious, 20 percent)	1.13 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.63 in
Runoff Volume (Pervious)	1,533.811 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,524.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	10.000 min
Computational Time Increment	1.333 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Pr.
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	2.66 ft³/s
Unit peak time, Tp	6.667 min
Unit receding limb, Tr	58.667 min
Total unit time, Tb	65.333 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Pr.
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	10.000 min
Area (User Defined)	0.670 acres

Computational Time Increment	1.333 min
Time to Peak (Computed)	730.667 min
Flow (Peak, Computed)	0.78 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	731.000 min
Flow (Peak Interpolated Output)	0.78 ft³/s

Drainage Area	
SCS CN (Composite)	64.000
Area (User Defined)	0.670 acres
Maximum Retention (Pervious)	5.63 in
Maximum Retention (Pervious, 20 percent)	1.13 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.66 in
Runoff Volume (Pervious)	4,034.966 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	4,014.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	10.000 min
Computational Time Increment	1.333 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Pr.
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	2.66 ft³/s
Unit peak time, Tp	6.667 min
Unit receding limb, Tr	58.667 min
Total unit time, Tb	65.333 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Pr.
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	10.000 min
Area (User Defined)	0.670 acres

Computational Time Increment	1.333 min
Time to Peak (Computed)	730.667 min
Flow (Peak, Computed)	1.23 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	730.000 min
Flow (Peak Interpolated Output)	1.23 ft³/s

Drainage Area	
SCS CN (Composite)	64.000
Area (User Defined)	0.670 acres
Maximum Retention (Pervious)	5.63 in
Maximum Retention (Pervious, 20 percent)	1.13 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.52 in
Runoff Volume (Pervious)	6,137.408 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	6,108.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	10.000 min
Computational Time Increment	1.333 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Pr.
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	2.66 ft³/s
Unit peak time, Tp	6.667 min
Unit receding limb, Tr	58.667 min
Total unit time, Tb	65.333 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Pr.
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	10.000 min
Area (User Defined)	0.670 acres

Computational Time Increment	1.333 min
Time to Peak (Computed)	730.667 min
Flow (Peak, Computed)	2.14 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	730.000 min
Flow (Peak Interpolated Output)	2.14 ft³/s

Drainage Area	
SCS CN (Composite)	64.000
Area (User Defined)	0.670 acres
Maximum Retention (Pervious)	5.63 in
Maximum Retention (Pervious, 20 percent)	1.13 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.29 in
Runoff Volume (Pervious)	10,433.214 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	10,389.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	10.000 min
Computational Time Increment	1.333 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-A Perv. Pr.
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	2.66 ft³/s
Unit peak time, Tp	6.667 min
Unit receding limb, Tr	58.667 min
Total unit time, Tb	65.333 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Pr.
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	6.100 min
Area (User Defined)	0.967 acres

Computational Time Increment	0.813 min
Time to Peak (Computed)	727.933 min
Flow (Peak, Computed)	2.49 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	728.000 min
Flow (Peak Interpolated Output)	2.48 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.967 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.12 in
Runoff Volume (Pervious)	10,941.171 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	10,923.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	6.100 min
Computational Time Increment	0.813 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Pr.
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	6.29 ft³/s
Unit peak time, Tp	4.067 min
Unit receding limb, Tr	35.787 min
Total unit time, Tb	39.853 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Pr.
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	6.100 min
Area (User Defined)	0.967 acres

Computational Time Increment	0.813 min
Time to Peak (Computed)	727.933 min
Flow (Peak, Computed)	3.83 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	728.000 min
Flow (Peak Interpolated Output)	3.82 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.967 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.88 in
Runoff Volume (Pervious)	17,140.304 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	17,112.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	6.100 min
Computational Time Increment	0.813 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Pr.
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	6.29 ft³/s
Unit peak time, Tp	4.067 min
Unit receding limb, Tr	35.787 min
Total unit time, Tb	39.853 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Pr.
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	6.100 min
Area (User Defined)	0.967 acres

Computational Time Increment	0.813 min
Time to Peak (Computed)	727.933 min
Flow (Peak, Computed)	4.76 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	728.000 min
Flow (Peak Interpolated Output)	4.75 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.967 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.12 in
Runoff Volume (Pervious)	21,487.704 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	21,453.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	6.100 min
Computational Time Increment	0.813 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Pr.
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	6.29 ft³/s
Unit peak time, Tp	4.067 min
Unit receding limb, Tr	35.787 min
Total unit time, Tb	39.853 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Pr.
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	6.100 min
Area (User Defined)	0.967 acres

Computational Time Increment	0.813 min
Time to Peak (Computed)	727.933 min
Flow (Peak, Computed)	6.47 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	728.000 min
Flow (Peak Interpolated Output)	6.46 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.967 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.39 in
Runoff Volume (Pervious)	29,450.095 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	29,403.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	6.100 min
Computational Time Increment	0.813 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Imp. Pr.
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	6.29 ft³/s
Unit peak time, Tp	4.067 min
Unit receding limb, Tr	35.787 min
Total unit time, Tb	39.853 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Pr.
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	7.500 min
Area (User Defined)	0.619 acres

Computational Time Increment	1.000 min
Time to Peak (Computed)	729.000 min
Flow (Peak, Computed)	0.38 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	729.000 min
Flow (Peak Interpolated Output)	0.38 ft³/s

Drainage Area	
SCS CN (Composite)	68.000
Area (User Defined)	0.619 acres
Maximum Retention (Pervious)	4.71 in
Maximum Retention (Pervious, 20 percent)	0.94 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.82 in
Runoff Volume (Pervious)	1,832.527 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,824.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	7.500 min
Computational Time Increment	1.000 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Pr.
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	3.27 ft³/s
Unit peak time, Tp	5.000 min
Unit receding limb, Tr	44.000 min
Total unit time, Tb	49.000 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Pr.
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	7.500 min
Area (User Defined)	0.619 acres

Computational Time Increment	1.000 min
Time to Peak (Computed)	729.000 min
Flow (Peak, Computed)	1.02 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	729.000 min
Flow (Peak Interpolated Output)	1.02 ft³/s

Drainage Area	
SCS CN (Composite)	68.000
Area (User Defined)	0.619 acres
Maximum Retention (Pervious)	4.71 in
Maximum Retention (Pervious, 20 percent)	0.94 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.97 in
Runoff Volume (Pervious)	4,416.337 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	4,400.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	7.500 min
Computational Time Increment	1.000 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Pr.
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	3.27 ft³/s
Unit peak time, Tp	5.000 min
Unit receding limb, Tr	44.000 min
Total unit time, Tb	49.000 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Pr.
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	7.500 min
Area (User Defined)	0.619 acres

Computational Time Increment	1.000 min
Time to Peak (Computed)	729.000 min
Flow (Peak, Computed)	1.53 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	729.000 min
Flow (Peak Interpolated Output)	1.53 ft³/s

Drainage Area	
SCS CN (Composite)	68.000
Area (User Defined)	0.619 acres
Maximum Retention (Pervious)	4.71 in
Maximum Retention (Pervious, 20 percent)	0.94 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.90 in
Runoff Volume (Pervious)	6,516.657 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	6,495.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	7.500 min
Computational Time Increment	1.000 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Pr.
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	3.27 ft³/s
Unit peak time, Tp	5.000 min
Unit receding limb, Tr	44.000 min
Total unit time, Tb	49.000 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Pr.
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	7.500 min
Area (User Defined)	0.619 acres

Computational Time Increment	1.000 min
Time to Peak (Computed)	729.000 min
Flow (Peak, Computed)	2.53 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	729.000 min
Flow (Peak Interpolated Output)	2.53 ft³/s

Drainage Area	
SCS CN (Composite)	68.000
Area (User Defined)	0.619 acres
Maximum Retention (Pervious)	4.71 in
Maximum Retention (Pervious, 20 percent)	0.94 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.77 in
Runoff Volume (Pervious)	10,717.188 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	10,685.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	7.500 min
Computational Time Increment	1.000 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: DA-B Perv. Pr.
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	3.27 ft³/s
Unit peak time, Tp	5.000 min
Unit receding limb, Tr	44.000 min
Total unit time, Tb	49.000 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: Half Garage
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	1.000 min
Area (User Defined)	0.769 acres

Computational Time Increment	0.133 min
Time to Peak (Computed)	726.000 min
Flow (Peak, Computed)	2.68 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	2.68 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.769 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.12 in
Runoff Volume (Pervious)	8,700.875 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	8,698.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.000 min
Computational Time Increment	0.133 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: Half Garage
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	30.50 ft³/s
Unit peak time, Tp	0.667 min
Unit receding limb, Tr	5.867 min
Total unit time, Tb	6.533 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: Half Garage
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	1.000 min
Area (User Defined)	0.769 acres

Computational Time Increment	0.133 min
Time to Peak (Computed)	726.000 min
Flow (Peak, Computed)	4.12 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	4.12 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.769 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.88 in
Runoff Volume (Pervious)	13,630.698 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	13,627.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.000 min
Computational Time Increment	0.133 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: Half Garage
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	30.50 ft³/s
Unit peak time, Tp	0.667 min
Unit receding limb, Tr	5.867 min
Total unit time, Tb	6.533 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: Half Garage
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	1.000 min
Area (User Defined)	0.769 acres

Computational Time Increment	0.133 min
Time to Peak (Computed)	726.000 min
Flow (Peak, Computed)	5.13 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	5.13 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.769 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.12 in
Runoff Volume (Pervious)	17,087.942 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	17,083.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.000 min
Computational Time Increment	0.133 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: Half Garage
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	30.50 ft³/s
Unit peak time, Tp	0.667 min
Unit receding limb, Tr	5.867 min
Total unit time, Tb	6.533 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: Half Garage
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	1.000 min
Area (User Defined)	0.769 acres

Computational Time Increment	0.133 min
Time to Peak (Computed)	726.000 min
Flow (Peak, Computed)	6.97 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	6.97 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.769 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.39 in
Runoff Volume (Pervious)	23,419.980 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	23,414.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.000 min
Computational Time Increment	0.133 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: Half Garage
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	30.50 ft³/s
Unit peak time, Tp	0.667 min
Unit receding limb, Tr	5.867 min
Total unit time, Tb	6.533 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: IMP FROM INLETS
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	1.000 min
Area (User Defined)	0.256 acres

Computational Time Increment	0.133 min
Time to Peak (Computed)	726.000 min
Flow (Peak, Computed)	0.89 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	0.89 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.256 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.12 in
Runoff Volume (Pervious)	2,896.520 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	2,896.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.000 min
Computational Time Increment	0.133 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: IMP FROM INLETS
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	10.15 ft³/s
Unit peak time, Tp	0.667 min
Unit receding limb, Tr	5.867 min
Total unit time, Tb	6.533 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: IMP FROM INLETS
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	1.000 min
Area (User Defined)	0.256 acres

Computational Time Increment	0.133 min
Time to Peak (Computed)	726.000 min
Flow (Peak, Computed)	1.37 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	1.37 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.256 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.88 in
Runoff Volume (Pervious)	4,537.657 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	4,536.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.000 min
Computational Time Increment	0.133 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: IMP FROM INLETS
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	10.15 ft³/s
Unit peak time, Tp	0.667 min
Unit receding limb, Tr	5.867 min
Total unit time, Tb	6.533 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: IMP FROM INLETS
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	1.000 min
Area (User Defined)	0.256 acres

Computational Time Increment	0.133 min
Time to Peak (Computed)	726.000 min
Flow (Peak, Computed)	1.71 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	1.71 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.256 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.12 in
Runoff Volume (Pervious)	5,688.574 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	5,687.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.000 min
Computational Time Increment	0.133 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: IMP FROM INLETS
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	10.15 ft³/s
Unit peak time, Tp	0.667 min
Unit receding limb, Tr	5.867 min
Total unit time, Tb	6.533 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: IMP FROM INLETS
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	1.000 min
Area (User Defined)	0.256 acres

Computational Time Increment	0.133 min
Time to Peak (Computed)	726.000 min
Flow (Peak, Computed)	2.32 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	2.32 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.256 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.39 in
Runoff Volume (Pervious)	7,796.508 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	7,794.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.000 min
Computational Time Increment	0.133 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: IMP FROM INLETS
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	10.15 ft³/s
Unit peak time, Tp	0.667 min
Unit receding limb, Tr	5.867 min
Total unit time, Tb	6.533 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PERV FROM INLETS
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	0.291 acres

Computational Time Increment	0.667 min
Time to Peak (Computed)	727.333 min
Flow (Peak, Computed)	0.27 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	728.000 min
Flow (Peak Interpolated Output)	0.27 ft³/s

Drainage Area	
SCS CN (Composite)	71.052
Area (User Defined)	0.291 acres
Maximum Retention (Pervious)	4.07 in
Maximum Retention (Pervious, 20 percent)	0.81 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.97 in
Runoff Volume (Pervious)	1,027.164 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,024.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PERV FROM INLETS
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	2.31 ft³/s
Unit peak time, Tp	3.333 min
Unit receding limb, Tr	29.333 min
Total unit time, Tb	32.667 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PERV FROM INLETS
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	0.291 acres

Computational Time Increment	0.667 min
Time to Peak (Computed)	727.333 min
Flow (Peak, Computed)	0.65 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	0.64 ft³/s

Drainage Area	
SCS CN (Composite)	71.052
Area (User Defined)	0.291 acres
Maximum Retention (Pervious)	4.07 in
Maximum Retention (Pervious, 20 percent)	0.81 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.21 in
Runoff Volume (Pervious)	2,336.469 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	2,331.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PERV FROM INLETS
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	2.31 ft³/s
Unit peak time, Tp	3.333 min
Unit receding limb, Tr	29.333 min
Total unit time, Tb	32.667 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PERV FROM INLETS
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	0.291 acres

Computational Time Increment	0.667 min
Time to Peak (Computed)	727.333 min
Flow (Peak, Computed)	0.94 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	0.93 ft³/s

Drainage Area	
SCS CN (Composite)	71.052
Area (User Defined)	0.291 acres
Maximum Retention (Pervious)	4.07 in
Maximum Retention (Pervious, 20 percent)	0.81 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.20 in
Runoff Volume (Pervious)	3,376.568 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,369.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PERV FROM INLETS
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	2.31 ft³/s
Unit peak time, Tp	3.333 min
Unit receding limb, Tr	29.333 min
Total unit time, Tb	32.667 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PERV FROM INLETS
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	0.291 acres

Computational Time Increment	0.667 min
Time to Peak (Computed)	727.333 min
Flow (Peak, Computed)	1.50 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	1.50 ft³/s

Drainage Area	
SCS CN (Composite)	71.052
Area (User Defined)	0.291 acres
Maximum Retention (Pervious)	4.07 in
Maximum Retention (Pervious, 20 percent)	0.81 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	5.14 in
Runoff Volume (Pervious)	5,426.406 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	5,416.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PERV FROM INLETS
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	2.31 ft³/s
Unit peak time, Tp	3.333 min
Unit receding limb, Tr	29.333 min
Total unit time, Tb	32.667 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PorousPavement
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	1.000 min
Area (User Defined)	0.660 acres

Computational Time Increment	0.133 min
Time to Peak (Computed)	726.000 min
Flow (Peak, Computed)	2.30 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	2.30 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.660 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.12 in
Runoff Volume (Pervious)	7,467.591 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	7,466.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.000 min
Computational Time Increment	0.133 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PorousPavement
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	26.18 ft³/s
Unit peak time, Tp	0.667 min
Unit receding limb, Tr	5.867 min
Total unit time, Tb	6.533 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PorousPavement
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	1.000 min
Area (User Defined)	0.660 acres

Computational Time Increment	0.133 min
Time to Peak (Computed)	726.000 min
Flow (Peak, Computed)	3.54 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	3.54 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.660 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.88 in
Runoff Volume (Pervious)	11,698.648 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	11,695.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.000 min
Computational Time Increment	0.133 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PorousPavement
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	26.18 ft³/s
Unit peak time, Tp	0.667 min
Unit receding limb, Tr	5.867 min
Total unit time, Tb	6.533 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PorousPavement
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	1.000 min
Area (User Defined)	0.660 acres

Computational Time Increment	0.133 min
Time to Peak (Computed)	726.000 min
Flow (Peak, Computed)	4.40 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	4.40 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.660 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.12 in
Runoff Volume (Pervious)	14,665.854 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	14,662.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.000 min
Computational Time Increment	0.133 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PorousPavement
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	26.18 ft³/s
Unit peak time, Tp	0.667 min
Unit receding limb, Tr	5.867 min
Total unit time, Tb	6.533 min

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PorousPavement
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	1.000 min
Area (User Defined)	0.660 acres

Computational Time Increment	0.133 min
Time to Peak (Computed)	726.000 min
Flow (Peak, Computed)	5.98 ft³/s
Output Increment	1.002 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	5.98 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.660 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.39 in
Runoff Volume (Pervious)	20,100.373 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	20,095.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	1.000 min
Computational Time Increment	0.133 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544

Parking Garage

Subsection: Unit Hydrograph Summary
Label: PorousPavement
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

SCS Unit Hydrograph Parameters	
Unit peak, qp	26.18 ft³/s
Unit peak time, Tp	0.667 min
Unit receding limb, Tr	5.867 min
Total unit time, Tb	6.533 min

Parking Garage

Subsection: Outlet Input Data
Label: Storage Layer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Requested Pond Water Surface Elevations	
Minimum (Headwater)	81.40 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	85.40 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 2	Forward	TW	81.90	85.40
Orifice-Circular	Orifice - 3	Forward	TW	83.00	85.40
Rectangular Weir	Weir - 1	Forward	TW	84.90	85.40
Tailwater Settings	Tailwater			(N/A)	(N/A)

Parking Garage

Subsection: Outlet Input Data
Label: Storage Layer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Structure ID: Weir - 1 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	84.90 ft
Weir Length	4.00 ft
Weir Coefficient	3.30 (ft^0.5)/s

Structure ID: Orifice - 2 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	81.90 ft
Orifice Diameter	12.0 in
Orifice Coefficient	0.600

Structure ID: Orifice - 3 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	83.00 ft
Orifice Diameter	6.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Parking Garage

Subsection: Individual Outlet Curves
Label: Storage Layer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Weir - 1 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
81.40	0.00	(N/A)	0.00
81.50	0.00	(N/A)	0.00
81.60	0.00	(N/A)	0.00
81.70	0.00	(N/A)	0.00
81.80	0.00	(N/A)	0.00
81.90	0.00	(N/A)	0.00
82.00	0.00	(N/A)	0.00
82.10	0.00	(N/A)	0.00
82.20	0.00	(N/A)	0.00
82.30	0.00	(N/A)	0.00
82.40	0.00	(N/A)	0.00
82.50	0.00	(N/A)	0.00
82.60	0.00	(N/A)	0.00
82.70	0.00	(N/A)	0.00
82.80	0.00	(N/A)	0.00
82.90	0.00	(N/A)	0.00
83.00	0.00	(N/A)	0.00
83.10	0.00	(N/A)	0.00
83.20	0.00	(N/A)	0.00
83.30	0.00	(N/A)	0.00
83.40	0.00	(N/A)	0.00
83.50	0.00	(N/A)	0.00
83.60	0.00	(N/A)	0.00
83.70	0.00	(N/A)	0.00
83.80	0.00	(N/A)	0.00
83.90	0.00	(N/A)	0.00
84.00	0.00	(N/A)	0.00
84.10	0.00	(N/A)	0.00
84.20	0.00	(N/A)	0.00
84.30	0.00	(N/A)	0.00
84.40	0.00	(N/A)	0.00
84.50	0.00	(N/A)	0.00
84.60	0.00	(N/A)	0.00
84.70	0.00	(N/A)	0.00
84.80	0.00	(N/A)	0.00
84.90	0.00	(N/A)	0.00
85.00	0.42	(N/A)	0.00

Parking Garage

Subsection: Individual Outlet Curves
Label: Storage Layer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Weir - 1 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
85.10	1.17	(N/A)	0.00
85.20	2.14	(N/A)	0.00
85.30	3.27	(N/A)	0.00
85.40	4.55	(N/A)	0.00

Computation Messages
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
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HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900

Parking Garage

Subsection: Individual Outlet Curves
Label: Storage Layer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Weir - 1 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
HW & TW below Inv.El.=84.900
H=.00; Htw=.00; Qfree=.00;
H=.10; Htw=.00; Qfree=.42;

Parking Garage

Subsection: Individual Outlet Curves
Label: Storage Layer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Weir - 1 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
H=.20; Htw=.00; Qfree=1.17;
H=.30; Htw=.00; Qfree=2.14;
H=.40; Htw=.00; Qfree=3.27;
H=.50; Htw=.00; Qfree=4.55;

Parking Garage

Subsection: Individual Outlet Curves
Label: Storage Layer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
81.40	0.00	(N/A)	0.00
81.50	0.00	(N/A)	0.00
81.60	0.00	(N/A)	0.00
81.70	0.00	(N/A)	0.00
81.80	0.00	(N/A)	0.00
81.90	0.00	(N/A)	0.00
82.00	0.03	(N/A)	0.00
82.10	0.13	(N/A)	0.00
82.20	0.29	(N/A)	0.00
82.30	0.50	(N/A)	0.00
82.40	0.76	(N/A)	0.00
82.50	1.07	(N/A)	0.00
82.60	1.41	(N/A)	0.00
82.70	1.78	(N/A)	0.00
82.80	2.17	(N/A)	0.00
82.90	2.67	(N/A)	0.00
83.00	2.93	(N/A)	0.00
83.10	3.16	(N/A)	0.00
83.20	3.38	(N/A)	0.00
83.30	3.59	(N/A)	0.00
83.40	3.78	(N/A)	0.00
83.50	3.96	(N/A)	0.00
83.60	4.14	(N/A)	0.00
83.70	4.31	(N/A)	0.00
83.80	4.47	(N/A)	0.00
83.90	4.63	(N/A)	0.00
84.00	4.78	(N/A)	0.00
84.10	4.93	(N/A)	0.00
84.20	5.07	(N/A)	0.00
84.30	5.21	(N/A)	0.00
84.40	5.35	(N/A)	0.00
84.50	5.48	(N/A)	0.00
84.60	5.61	(N/A)	0.00
84.70	5.73	(N/A)	0.00
84.80	5.86	(N/A)	0.00
84.90	5.98	(N/A)	0.00
85.00	6.10	(N/A)	0.00

Parking Garage

Subsection: Individual Outlet Curves
Label: Storage Layer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
85.10	6.21	(N/A)	0.00
85.20	6.33	(N/A)	0.00
85.30	6.44	(N/A)	0.00
85.40	6.55	(N/A)	0.00

Computation Messages
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
Upstream HW & DNstream TW < Inv.El
CRIT.DEPTH CONTROL Vh= .026ft Dcr= .074ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .051ft Dcr= .149ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .078ft Dcr= .223ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .105ft Dcr= .294ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .135ft Dcr= .365ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .165ft Dcr= .435ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .198ft Dcr= .503ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .232ft Dcr= .568ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .270ft Dcr= .630ft CRIT.DEPTH Hev= .00ft

Parking Garage

Subsection: Individual Outlet Curves
Label: Storage Layer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
H =.50
H =.60
H =.70
H =.80
H =.90
H =1.00
H =1.10
H =1.20
H =1.30
H =1.40
H =1.50
H =1.60
H =1.70
H =1.80
H =1.90
H =2.00
H =2.10
H =2.20
H =2.30
H =2.40
H =2.50
H =2.60
H =2.70
H =2.80
H =2.90
H =3.00

Parking Garage

Subsection: Individual Outlet Curves
Label: Storage Layer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 3 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
81.40	0.00	(N/A)	0.00
81.50	0.00	(N/A)	0.00
81.60	0.00	(N/A)	0.00
81.70	0.00	(N/A)	0.00
81.80	0.00	(N/A)	0.00
81.90	0.00	(N/A)	0.00
82.00	0.00	(N/A)	0.00
82.10	0.00	(N/A)	0.00
82.20	0.00	(N/A)	0.00
82.30	0.00	(N/A)	0.00
82.40	0.00	(N/A)	0.00
82.50	0.00	(N/A)	0.00
82.60	0.00	(N/A)	0.00
82.70	0.00	(N/A)	0.00
82.80	0.00	(N/A)	0.00
82.90	0.00	(N/A)	0.00
83.00	0.00	(N/A)	0.00
83.10	0.02	(N/A)	0.00
83.20	0.09	(N/A)	0.00
83.30	0.19	(N/A)	0.00
83.40	0.31	(N/A)	0.00
83.50	0.47	(N/A)	0.00
83.60	0.56	(N/A)	0.00
83.70	0.63	(N/A)	0.00
83.80	0.70	(N/A)	0.00
83.90	0.76	(N/A)	0.00
84.00	0.82	(N/A)	0.00
84.10	0.87	(N/A)	0.00
84.20	0.92	(N/A)	0.00
84.30	0.97	(N/A)	0.00
84.40	1.01	(N/A)	0.00
84.50	1.06	(N/A)	0.00
84.60	1.10	(N/A)	0.00
84.70	1.14	(N/A)	0.00
84.80	1.18	(N/A)	0.00
84.90	1.21	(N/A)	0.00
85.00	1.25	(N/A)	0.00

Parking Garage

Subsection: Individual Outlet Curves
Label: Storage Layer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 3 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
85.10	1.29	(N/A)	0.00
85.20	1.32	(N/A)	0.00
85.30	1.35	(N/A)	0.00
85.40	1.39	(N/A)	0.00

Computation Messages
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
Upstream HW & DNstream TW < Inv.El
CRIT.DEPTH CONTROL Vh= .025ft Dcr= .074ft
CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .053ft Dcr= .146ft
CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .083ft Dcr= .217ft
CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .116ft Dcr= .283ft
CRIT.DEPTH Hev= .00ft
H =.25
H =.35
H =.45

Parking Garage

Subsection: Individual Outlet Curves
Label: Storage Layer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 3 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
H =.55
H =.65
H =.75
H =.85
H =.95
H =1.05
H =1.15
H =1.25
H =1.35
H =1.45
H =1.55
H =1.65
H =1.75
H =1.85
H =1.95
H =2.05
H =2.15

Parking Garage

Subsection: Composite Rating Curve
Label: Storage Layer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
81.40	0.00	(N/A)	0.00
81.50	0.00	(N/A)	0.00
81.60	0.00	(N/A)	0.00
81.70	0.00	(N/A)	0.00
81.80	0.00	(N/A)	0.00
81.90	0.00	(N/A)	0.00
82.00	0.03	(N/A)	0.00
82.10	0.13	(N/A)	0.00
82.20	0.29	(N/A)	0.00
82.30	0.50	(N/A)	0.00
82.40	0.76	(N/A)	0.00
82.50	1.07	(N/A)	0.00
82.60	1.41	(N/A)	0.00
82.70	1.78	(N/A)	0.00
82.80	2.17	(N/A)	0.00
82.90	2.67	(N/A)	0.00
83.00	2.93	(N/A)	0.00
83.10	3.19	(N/A)	0.00
83.20	3.47	(N/A)	0.00
83.30	3.77	(N/A)	0.00
83.40	4.09	(N/A)	0.00
83.50	4.44	(N/A)	0.00
83.60	4.70	(N/A)	0.00
83.70	4.94	(N/A)	0.00
83.80	5.17	(N/A)	0.00
83.90	5.39	(N/A)	0.00
84.00	5.60	(N/A)	0.00
84.10	5.80	(N/A)	0.00
84.20	5.99	(N/A)	0.00
84.30	6.18	(N/A)	0.00
84.40	6.36	(N/A)	0.00
84.50	6.53	(N/A)	0.00
84.60	6.70	(N/A)	0.00
84.70	6.87	(N/A)	0.00
84.80	7.03	(N/A)	0.00
84.90	7.19	(N/A)	0.00
85.00	7.76	(N/A)	0.00
85.10	8.67	(N/A)	0.00
85.20	9.78	(N/A)	0.00
85.30	11.06	(N/A)	0.00
85.40	12.48	(N/A)	0.00

Contributing Structures

Parking Garage

Subsection: Composite Rating Curve
Label: Storage Layer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Composite Outflow Summary

Contributing Structures
None Contributing
None Contributing
None Contributing
None Contributing
None Contributing
None Contributing
Orifice - 2
Orifice - 2
Orifice - 2
Orifice - 2
Orifice - 2
Orifice - 2
Orifice - 2
Orifice - 2
Orifice - 2
Orifice - 2
Orifice - 2
Orifice - 2 + Orifice - 3
Orifice - 2 + Orifice - 3
Orifice - 2 + Orifice - 3
Orifice - 2 + Orifice - 3
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Orifice - 2 + Orifice - 3
Orifice - 2 + Orifice - 3
Orifice - 2 + Orifice - 3
Orifice - 2 + Orifice - 3 + Weir - 1
Orifice - 2 + Orifice - 3 + Weir - 1
Orifice - 2 + Orifice - 3 + Weir - 1
Orifice - 2 + Orifice - 3 + Weir - 1

Parking Garage

Subsection: Composite Rating Curve
Label: Storage Layer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Composite Outflow Summary

Contributing Structures
Orifice - 2 + Orifice - 3 + Weir - 1
Orifice - 2 + Orifice - 3 + Weir - 1

Parking Garage

Subsection: Elevation-Volume-Flow Table (Pond)
Label: StorageLayer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	81.40 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	1.000 min

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
81.40	0.00	0.000	0.000	0.00	0.00	0.00
81.50	0.00	163.000	0.000	0.00	0.00	5.43
81.60	0.00	326.000	0.000	0.00	0.00	10.87
81.70	0.00	489.000	0.000	0.00	0.00	16.30
81.80	0.00	652.000	0.000	0.00	0.00	21.73
81.90	0.00	815.000	0.000	0.00	0.00	27.17
82.00	0.03	1,155.000	0.000	0.00	0.03	38.53
82.10	0.13	1,493.000	0.000	0.00	0.13	49.90
82.20	0.29	1,831.000	0.000	0.00	0.29	61.33
82.30	0.50	2,167.000	0.000	0.00	0.50	72.73
82.40	0.76	2,501.000	0.000	0.00	0.76	84.13
82.50	1.07	2,833.000	0.000	0.00	1.07	95.50
82.60	1.41	3,163.000	0.000	0.00	1.41	106.84
82.70	1.78	3,492.000	0.000	0.00	1.78	118.18
82.80	2.17	3,818.000	0.000	0.00	2.17	129.44
82.90	2.67	4,142.000	0.000	0.00	2.67	140.74
83.00	2.93	4,463.000	0.000	0.00	2.93	151.69
83.10	3.19	4,781.000	0.000	0.00	3.19	162.55
83.20	3.47	5,096.000	0.000	0.00	3.47	173.34
83.30	3.77	5,409.000	0.000	0.00	3.77	184.07
83.40	4.09	5,717.000	0.000	0.00	4.09	194.66
83.50	4.44	6,023.000	0.000	0.00	4.44	205.20
83.60	4.70	6,324.000	0.000	0.00	4.70	215.50
83.70	4.94	6,621.000	0.000	0.00	4.94	225.64
83.80	5.17	6,913.000	0.000	0.00	5.17	235.61
83.90	5.39	7,200.000	0.000	0.00	5.39	245.39
84.00	5.60	7,482.000	0.000	0.00	5.60	255.00
84.10	5.80	7,758.000	0.000	0.00	5.80	264.40
84.20	5.99	8,026.000	0.000	0.00	5.99	273.53

Parking Garage

Subsection: Elevation-Volume-Flow Table (Pond)
Label: StorageLayer
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
84.30	6.18	8,287.000	0.000	0.00	6.18	282.41
84.40	6.36	8,539.000	0.000	0.00	6.36	290.99
84.50	6.53	8,780.000	0.000	0.00	6.53	299.20
84.60	6.70	9,006.000	0.000	0.00	6.70	306.90
84.70	6.87	9,213.000	0.000	0.00	6.87	313.97
84.80	7.03	9,401.000	0.000	0.00	7.03	320.40
84.90	7.19	9,575.000	0.000	0.00	7.19	326.36
85.00	7.76	9,738.000	0.000	0.00	7.76	332.36
85.10	8.67	9,901.000	0.000	0.00	8.67	338.70
85.20	9.78	10,064.000	0.000	0.00	9.78	345.25
85.30	11.06	10,227.000	0.000	0.00	11.06	351.96
85.40	12.48	10,390.000	0.000	0.00	12.48	358.82

Parking Garage

Subsection: Level Pool Pond Routing Summary
Label: StorageLayer (IN)
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	81.40 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	6.13 ft³/s	Time to Peak (Flow, In)	726.000 min
Flow (Peak Outlet)	3.23 ft³/s	Time to Peak (Flow, Outlet)	728.000 min

Elevation (Water Surface, Peak)	83.12 ft
Volume (Peak)	4,835.585 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	20,084.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	18,788.000 ft³
Volume (Retained)	1,291.000 ft³
Volume (Unrouted)	-4.000 ft³
Error (Mass Balance)	0.022 %

Parking Garage

Subsection: Level Pool Pond Routing Summary
Label: StorageLayer (IN)
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	81.40 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	9.64 ft³/s	Time to Peak (Flow, In)	726.000 min
Flow (Peak Outlet)	4.98 ft³/s	Time to Peak (Flow, Outlet)	728.000 min

Elevation (Water Surface, Peak)	83.71 ft
Volume (Peak)	6,663.939 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	32,190.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	30,751.000 ft³
Volume (Retained)	1,432.000 ft³
Volume (Unrouted)	-7.000 ft³
Error (Mass Balance)	0.022 %

Parking Garage

Subsection: Level Pool Pond Routing Summary
Label: StorageLayer (IN)
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	81.40 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	12.13 ft³/s	Time to Peak (Flow, In)	726.000 min
Flow (Peak Outlet)	5.98 ft³/s	Time to Peak (Flow, Outlet)	728.000 min

Elevation (Water Surface, Peak)	84.19 ft
Volume (Peak)	8,007.062 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	40,802.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	39,288.000 ft³
Volume (Retained)	1,505.000 ft³
Volume (Unrouted)	-8.000 ft³
Error (Mass Balance)	0.021 %

Parking Garage

Subsection: Level Pool Pond Routing Summary
Label: StorageLayer (IN)
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	81.40 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	16.71 ft³/s	Time to Peak (Flow, In)	726.000 min
Flow (Peak Outlet)	10.96 ft³/s	Time to Peak (Flow, Outlet)	727.000 min

Elevation (Water Surface, Peak)	85.29 ft
Volume (Peak)	10,214.508 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	56,719.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	55,093.000 ft³
Volume (Retained)	1,614.000 ft³
Volume (Unrouted)	-12.000 ft³
Error (Mass Balance)	0.020 %

Parking Garage

Index

D

DA-A Imp. Pr. (Unit Hydrograph Summary, 10 years (Post-Development 10 year))...7, 8
DA-A Imp. Pr. (Unit Hydrograph Summary, 100 years (Post-Development 100 year))...11, 12
DA-A Imp. Pr. (Unit Hydrograph Summary, 2 years (Post-Development 2 year))...5, 6
DA-A Imp. Pr. (Unit Hydrograph Summary, 25 years (Post-Development 25 year))...9, 10
DA-A Perv. Pr. (Unit Hydrograph Summary, 10 years (Post-Development 10 year))...15, 16
DA-A Perv. Pr. (Unit Hydrograph Summary, 100 years (Post-Development 100 year))...19, 20
DA-A Perv. Pr. (Unit Hydrograph Summary, 2 years (Post-Development 2 year))...13, 14
DA-A Perv. Pr. (Unit Hydrograph Summary, 25 years (Post-Development 25 year))...17, 18
DA-B Imp. Pr. (Unit Hydrograph Summary, 10 years (Post-Development 10 year))...23, 24
DA-B Imp. Pr. (Unit Hydrograph Summary, 100 years (Post-Development 100 year))...27, 28
DA-B Imp. Pr. (Unit Hydrograph Summary, 2 years (Post-Development 2 year))...21, 22
DA-B Imp. Pr. (Unit Hydrograph Summary, 25 years (Post-Development 25 year))...25, 26
DA-B Perv. Pr. (Unit Hydrograph Summary, 10 years (Post-Development 10 year))...31, 32
DA-B Perv. Pr. (Unit Hydrograph Summary, 100 years (Post-Development 100 year))...35, 36
DA-B Perv. Pr. (Unit Hydrograph Summary, 2 years (Post-Development 2 year))...29, 30
DA-B Perv. Pr. (Unit Hydrograph Summary, 25 years (Post-Development 25 year))...33, 34

H

Half Garage (Unit Hydrograph Summary, 10 years (Post-Development 10 year))...39, 40
Half Garage (Unit Hydrograph Summary, 100 years (Post-Development 100 year))...43, 44
Half Garage (Unit Hydrograph Summary, 2 years (Post-Development 2 year))...37, 38
Half Garage (Unit Hydrograph Summary, 25 years (Post-Development 25 year))...41, 42

I

IMP FROM INLETS (Unit Hydrograph Summary, 10 years (Post-Development 10 year))...47, 48
IMP FROM INLETS (Unit Hydrograph Summary, 100 years (Post-Development 100 year))...51, 52
IMP FROM INLETS (Unit Hydrograph Summary, 2 years (Post-Development 2 year))...45, 46

Parking Garage

IMP FROM INLETS (Unit Hydrograph Summary, 25 years (Post-Development 25 year))...49, 50

M

Master Network Summary...2, 3, 4

P

PERV FROM INLETS (Unit Hydrograph Summary, 10 years (Post-Development 10 year))...55, 56
PERV FROM INLETS (Unit Hydrograph Summary, 100 years (Post-Development 100 year))...59, 60
PERV FROM INLETS (Unit Hydrograph Summary, 2 years (Post-Development 2 year))...53, 54
PERV FROM INLETS (Unit Hydrograph Summary, 25 years (Post-Development 25 year))...57, 58
PorousPavement (Unit Hydrograph Summary, 10 years (Post-Development 10 year))...63, 64
PorousPavement (Unit Hydrograph Summary, 100 years (Post-Development 100 year))...67, 68
PorousPavement (Unit Hydrograph Summary, 2 years (Post-Development 2 year))...61, 62
PorousPavement (Unit Hydrograph Summary, 25 years (Post-Development 25 year))...65, 66

S

Storage Layer (Composite Rating Curve, 100 years (Post-Development 100 year))...81, 82, 83
Storage Layer (Individual Outlet Curves, 100 years (Post-Development 100 year))...71, 72, 73, 74, 75, 76, 77, 78, 79, 80

Storage Layer (Outlet Input Data, 100 years (Post-Development 100 year))...69, 70

StorageLayer (Elevation-Volume-Flow Table (Pond), 100 years (Post-Development 100 year))...84, 85
StorageLayer (IN) (Level Pool Pond Routing Summary, 10 years (Post-Development 10 year))...87
StorageLayer (IN) (Level Pool Pond Routing Summary, 100 years (Post-Development 100 year))...89
StorageLayer (IN) (Level Pool Pond Routing Summary, 2 years (Post-Development 2 year))...86
StorageLayer (IN) (Level Pool Pond Routing Summary, 25 years (Post-Development 25 year))...88

P23-03 Penn Med PB Submission Reports 08/09/23

STORM SEWER DESIGN WORK SHEET

LOCATION		RUNOFF DATA									SEWER DESIGN DATA							
STRUCTURE NUMBER		INCREMENTAL AREA				TIME OF CONCENTRATION					PIPE MATERIAL : RCP MANNINGS 'n' = 0.013							
UPSTREAM	DOWNSTREAM	AREA	WEIGHTED RUNOFF COEFFICIENT	SUBAREA Ac x C	TOTAL AREA	OVERLAND THROUGH AREA, Ta	THROUGH PIPE, Tp	TOTAL Tc OR LONGEST ACCUMULATED Tc	RAINFALL INTENSITY,	RUNOFF PEAK, Q	DIAMETER	LENGTH	SLOPE	CAPACITY AT FULL FLOW, Qf	VELOCITY AT FULL FLOW, Vf	VELOCITY ACTUAL, Va	FLOW TIME THROUGH PIPE	
		Ac	C		Ac X C	MIN.	MIN.	MIN.	IN/HR	CFS	INCHES	FEET	%	CFS	FPS	FPS	MIN.	
A 1	A 2	0.09	0.64	0.06	0.06	5.0		5.0	7.20	0.4	15	137	0.50	4.6	3.7	2.3	1.0	
A 2	A Trench Drain	0.02	0.45	0.01	0.07	0.8	1.0	1.0	7.20	0.5	15	17	0.50	4.6	3.7	2.4	0.1	
A trench drain	A 3	0.03	0.98	0.03	0.09	0.5	1.1	1.1	7.20	0.7	15	60	0.50	4.6	3.7	2.6	0.4	1. SEE CONSTRUCTION PLANS FOR
A 3	A 4	0.03	0.61	0.02	0.11	1.0	1.5	1.5	7.20	0.8	15	31	0.50	4.6	3.7	2.7	0.2	
A 4	A 5	0.03	0.82	0.02	0.14	1.0	1.7	1.7	7.20	1.0	15	131	2.00	9.1	7.4	4.8	0.5	
A 5	A 6	0.21	0.75	0.16	0.29	2.0	2.2	2.2	7.20	2.1	15	16	4.00	12.9	10.5	7.7	0.0	
A 6	A 7	0.18	0.87	0.16	0.45	2.0	2.2	2.2	7.20	3.2	15	79	1.00	6.5	5.3	5.5	0.2	
A 7A	A 7	0.00	0.20	0.00	0.00	5.3		5.3	7.20	0.0	15	8	1.01	6.5	5.3	0.4	0.4	2.. SEE PLANS FOR PIPE PROFILE
A 7	Storage Layer	0.04	0.81	0.03	0.48	0.4	2.2	2.2	7.20	3.5	15	11	1.00	6.5	5.3	5.3	0.0	
b 1	b 2	0.20	0.88	0.18	0.18	0.8		0.8	7.20	1.3	15	88	1.00	6.5	5.3	4.1	0.4	INFORMATION.
b 2	storage layer	0.21	0.82	0.17	0.35	0.8	0.4	0.8	7.20	2.5	15	8	1.00	6.5	5.3	4.9	0.0	
b 3	storage layer	0.24	0.83	0.20	0.20	1.0		1.0	7.20	1.4	10	6	1.00	2.2	4.0	4.1	0.0	
Roof	Up Flo Filter	0.77	0.98	0.75	0.75	5.0		5.0	7.20	5.4	18	2	0.50	7.4	4.2	4.6	0.0	
Storage Layer	ocs	0.00	0.00	0.00				0.0	7.20	8.5	24	5	1.00	22.6	7.2	6.6	0.0	PROJECT NAME : Penn Medicine Parking Garage
ocs	A 8	0.03	0.48	0.01	0.01			0.0	7.20	5.2	24	114	0.50	16.0	5.1	4.5	0.4	
Roof	C 1	0.90	0.99	0.88	0.88	5.0		5.0	7.20	6.3	18	7	0.50	7.4	4.2	4.7	0.0	
C 1	FirstDefenseOptimum	0.00	0.00	0.00	0.88		0.0	0.0	7.20	6.3	18	13	0.50	7.4	4.2	4.7	0.0	PROJECT NO. : 06C028T.003
FirstDefenseOptimum	A 8	0.00	0.00	0.00	0.88		0.1	0.1	7.20	6.3	18	96	0.50	7.4	4.2	4.7	0.3	
a 8	existing	0.00	0.00	0.00	0.00			0.0	7.20	11.6	24	22	1.22	25.0	8.0	8.1	0.0	STORM FREQUENCY 25 YEAR
																		COMPUTED BY : KN DATE : 11-30-2022
																		CHECKED BY : DATE :
																		REVISED BY : KN DATE : 7/24/23

P23-03 Penn Med PB Submission Reports 08/09/23

STORM SEWER DESIGN WORK SHEET

LOCATION		RUNOFF DATA									SEWER DESIGN DATA							
STRUCTURE NUMBER		INCREMENTAL AREA				TIME OF CONCENTRATION					PIPE MATERIAL : RCP MANNINGS 'n' = 0.013							
UPSTREAM	DOWNSTREAM	AREA	WEIGHTED RUNOFF COEFFICIENT	SUBAREA Ac x C	TOTAL AREA	OVERLAND THROUGH AREA, Ta	THROUGH PIPE, Tp	TOTAL Tc OR LONGEST ACCUMULATED Tc	RAINFALL INTENSITY,	RUNOFF PEAK, Q	DIAMETER	LENGTH	SLOPE	CAPACITY AT FULL FLOW, Qf	VELOCITY AT FULL FLOW, Vf	VELOCITY ACTUAL, Va	FLOW TIME THROUGH PIPE	
		Ac	C		Ac X C	MIN.	MIN.	MIN.	IN/HR	CFS	INCHES	FEET	%	CFS	FPS	FPS	MIN.	
A 1	A 2	0.09	0.64	0.06	0.06	5.0		5.0	8.39	0.5	15	137	0.50	4.6	3.7	2.4	0.9	
A 2	A Trench Drain	0.02	0.45	0.01	0.07	0.8	0.9	0.9	8.39	0.6	15	17	0.50	4.6	3.7	2.5	0.1	
A trench drain	A 3	0.03	0.98	0.03	0.09	0.5	1.1	1.1	8.39	0.8	15	60	0.50	4.6	3.7	2.7	0.4	1. SEE CONSTRUCTION PLANS FOR
A 3	A 4	0.03	0.61	0.02	0.11	1.0	1.4	1.4	8.39	0.9	15	31	0.50	4.6	3.7	2.8	0.2	
A 4	A 5	0.03	0.82	0.02	0.14	1.0	1.6	1.6	8.39	1.1	15	131	2.00	9.1	7.4	4.8	0.5	
A 5	A 6	0.21	0.75	0.16	0.29	2.0	2.1	2.1	8.39	2.5	15	16	4.00	12.9	10.5	7.9	0.0	
A 6	A 7	0.18	0.87	0.16	0.45	2.0	2.1	2.1	8.39	3.8	15	79	1.00	6.5	5.3	5.5	0.2	
yard drain	ard drain 7	0.00	0.20	0.00	0.00	5.3		5.3	8.39	0.0	15	8	1.01	6.5	5.3	0.4	0.4	2.. SEE PLANS FOR PIPE PROFILE
A 7	storage layer	0.04	0.81	0.03	0.48	0.4	2.1	2.1	8.39	4.0	15	11	1.00	6.5	5.3	5.5	0.0	
b 1	b 2	0.20	0.88	0.18	0.18	0.8		0.8	8.39	1.5	15	88	1.00	6.5	5.3	4.3	0.3	INFORMATION.
b 2	storage layer	0.21	0.82	0.17	0.35	0.8	0.3	0.8	8.39	2.9	15	8	1.00	6.5	5.3	5.1	0.0	
b 3	storage layer	0.24	0.83	0.20	0.20	1.0		1.0	8.39	1.7	10	6	1.00	2.2	4.0	4.4	0.0	
Roof	Storage Layer	0.77	0.98	0.75	0.75	5.0		5.0	8.39	6.3	18	2	0.50	7.4	4.2	4.7	0.0	
Storage Layer	ocs	0.00	0.00	0.00				0.0	8.39	12.0	24	5	1.00	22.6	7.2	7.2	0.0	PROJECT NAME : Penn Medicine Parking Garage
ocs	A 8	0	0.00	0.00	0.00			0.0	8.39	7.9	24	114	0.50	16.0	5.1	5.1	0.4	
Roof	C 1	0.90	0.99	0.88	0.88	5.0		5.0	8.39	7.4	18	7	0.50	7.4	4.2	4.8	0.0	
C 1	FirstDefenseOptimum	0.00	0.00	0.00	0.88		0.0	0.0	8.39	7.4	18	13	0.50	7.4	4.2	4.8	0.0	PROJECT NO. : 06C028T.003
FirstDefenseOptimum	A 8	0.00	0.00	0.00	0.88		0.1	0.1	8.39	7.4	18	96	0.50	7.4	4.2	4.8	0.3	
A 8	existing	0.00	0.00	0.00	0.00			0.0	8.39	15.3	24	22	1.22	25.0	8.0	8.3	0.0	STORM FREQUENCY 100 YEAR
																		COMPUTED BY : KN DATE : 11-30-2022
																		CHECKED BY : DATE :
																		REVISED BY : KN DATE : 7/24/2023

FPA
FRENCH & PARRELLO
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Appendix E
Delaware and Raritan Canal Commission

NJDEP Nonstructural Strategies Points System (NSPS)

Version: January 31, 2006

Note: Input Values in Yellow Cells Only

Project:	Parking Garage
Date:	December 6, 2022
User:	FPA
Notes:	

Step 1 - Provide Basic Major Development Site Information

A. Specify Total Area in Acres of Development Site Described in Steps 2 and 3 = 5.2 **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				Use/Cover Subtotals	Points
		HSG A	HSG B	HSG C	HSG D		
1	Wetlands and Undisturbed Stream Buffers					0.0	0
2	Lawn and Open Space		0.7	0.8		1.5	80
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		1.8	1.9		3.7	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	2.5	2.7	0.0	**Total Area:**	5.2
	HSG Subtotals (%):	0.0%	48.1%	51.9%	0.0%	**Total % Area:**	100.0%

Points Subtotal: **80**

Total Existing Site Points: **80**

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				Use/Cover Subtotals		Points
		HSG A	HSG B	HSG C	HSG D			
1	Wetlands and Undisturbed Stream Buffers					0.0		0
2	Lawn and Open Space		0.5	0.6		1.1		58
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			0.7		0.7		31
13	Directly Connected Impervious		2.0	1.4		3.4		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	2.5	2.7	0.0		**Total Area:**	5.2
	HSG Subtotals (%):	0.0%	48.1%	51.9%	0.0%		**Total % Area:**	100.0%
							Points Subtotal:	**89**

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

Total Directly Connected Impervious Coverage =	65%	% 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 =	65%	% of Site
Effective Site Impervious Coverage =	65%	% 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 =	100%	% of Site
Maximum Allowable Site Disturbance by Municipal Ordinance =	100%	% of Site

Points Subtotal: 0

D. Describe Proposed Runoff Conveyance System:

Total Length of Runoff Conveyance System =		Feet
Length of Vegetated Runoff Conveyance System =		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.

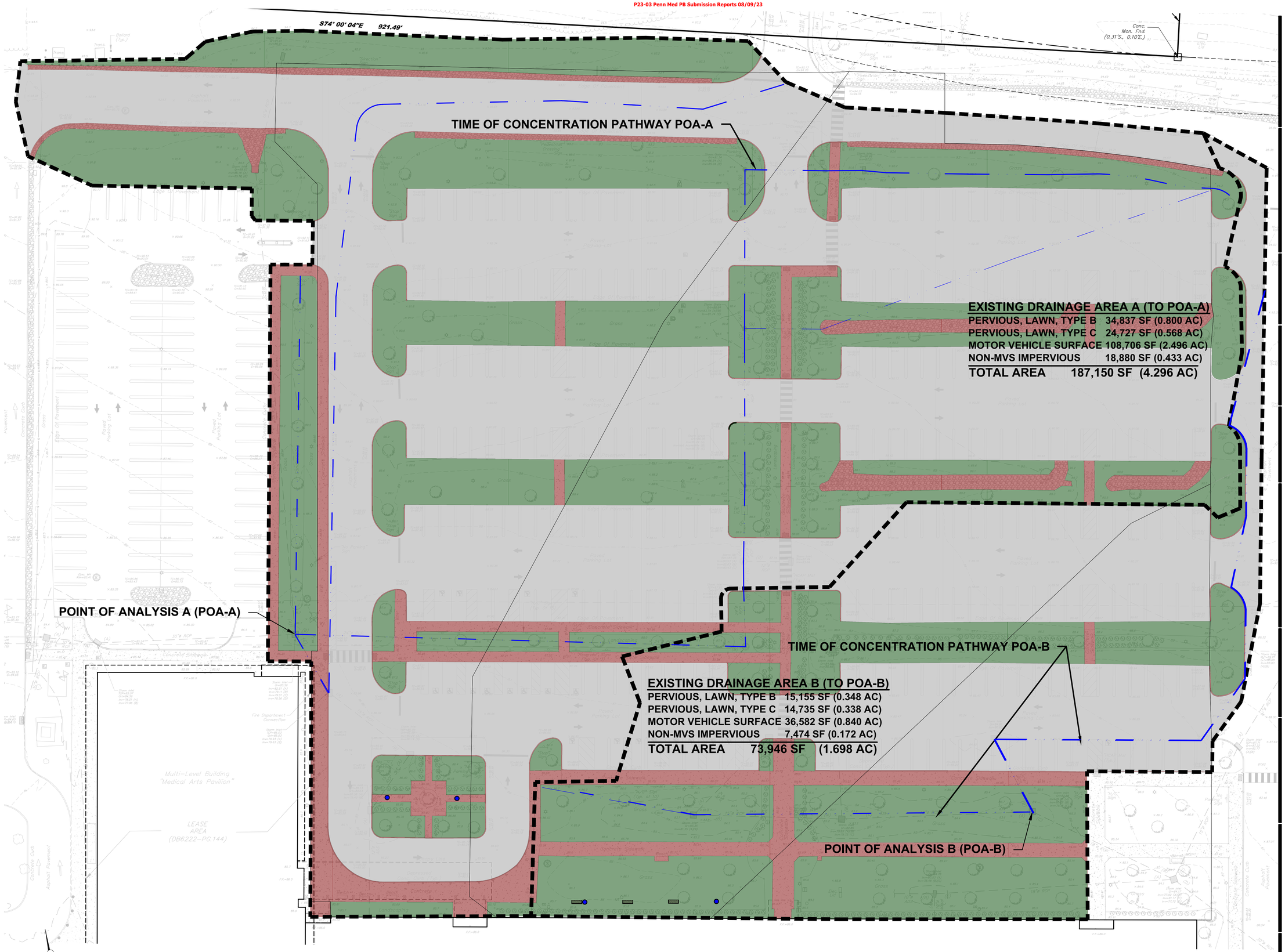
Total Proposed Site Points: 89

Ratio of Proposed to Existing Site Points: 112%

Required Site Points Ratio: 88%

Nonstructural Point System Results: Proposed Nonstructural Measures are Adequate

Appendix F
Drainage Area Maps



Princeton Forward

Penn Medicine Princeton Health

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New Jersey ▲ New York ▲ Pennsylvania ▲ Georgia

NO.	DATE	DESCRIPTION
3	07.25.23	Revised Per DRC, DRCC and FSCD Comments
2	06.14.23	Revised Surface at Island
1	05.05.23	Title Block Updated

Penn Medicine Princeton Health Cancer Center Garage

1 Plainsboro Rd.
Princeton, NJ 08540
JOB NO. NBR2119.00

PHASE 1C

EXISTING DRAINAGE AREA PLAN

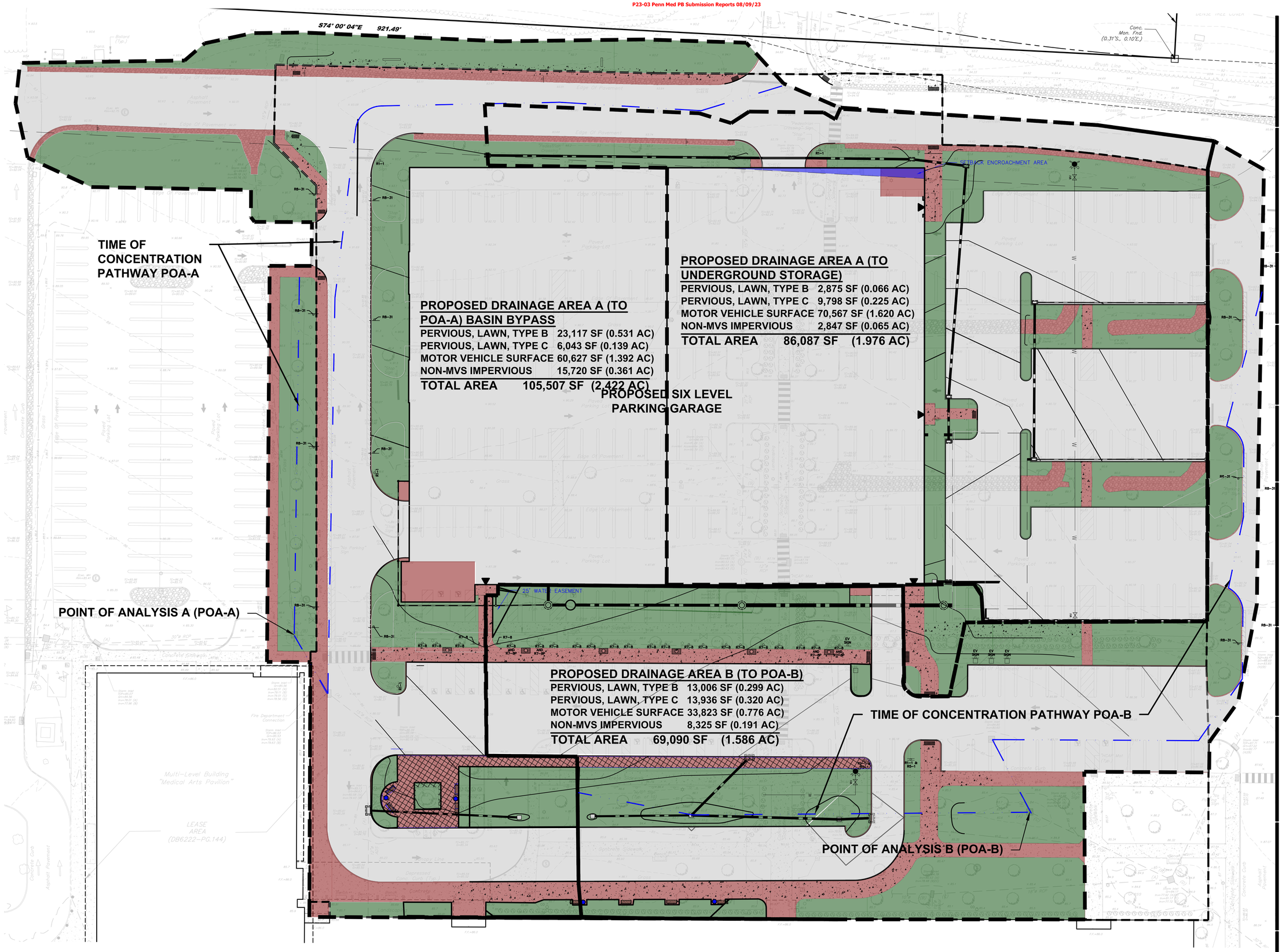
1" = 20'

04/14/2023 SITE PLAN SUBMISSION

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SCALE IN FEET

3/14/2023 10:55:08 AM
Autodesk Docs://1287 Penn Medicine Princeton Health/UPHS-PMPH-CAN-AR.rvt
Penn Medicine Princeton Health Cancer Center Garage

THE ORIGINAL OF THIS DRAWING IS 30" X 42". IF THIS COPY IS ANY OTHER SIZE, IT HAS EITHER BEEN REDUCED OR ENLARGED. TAKE APPROPRIATE PRECAUTIONS ACCORDINGLY.



20 0 20 40
SCALE IN FEET

3/14/2023 10:55:06 AM
Autodesk Docs://5267 Penn Medicine Princeton Health/UPHS-PMPH-SAK-Arc.rvt
Penn Medicine Princeton Health Cancer Center Garage

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1	05.05.23	Title Block Updated

N

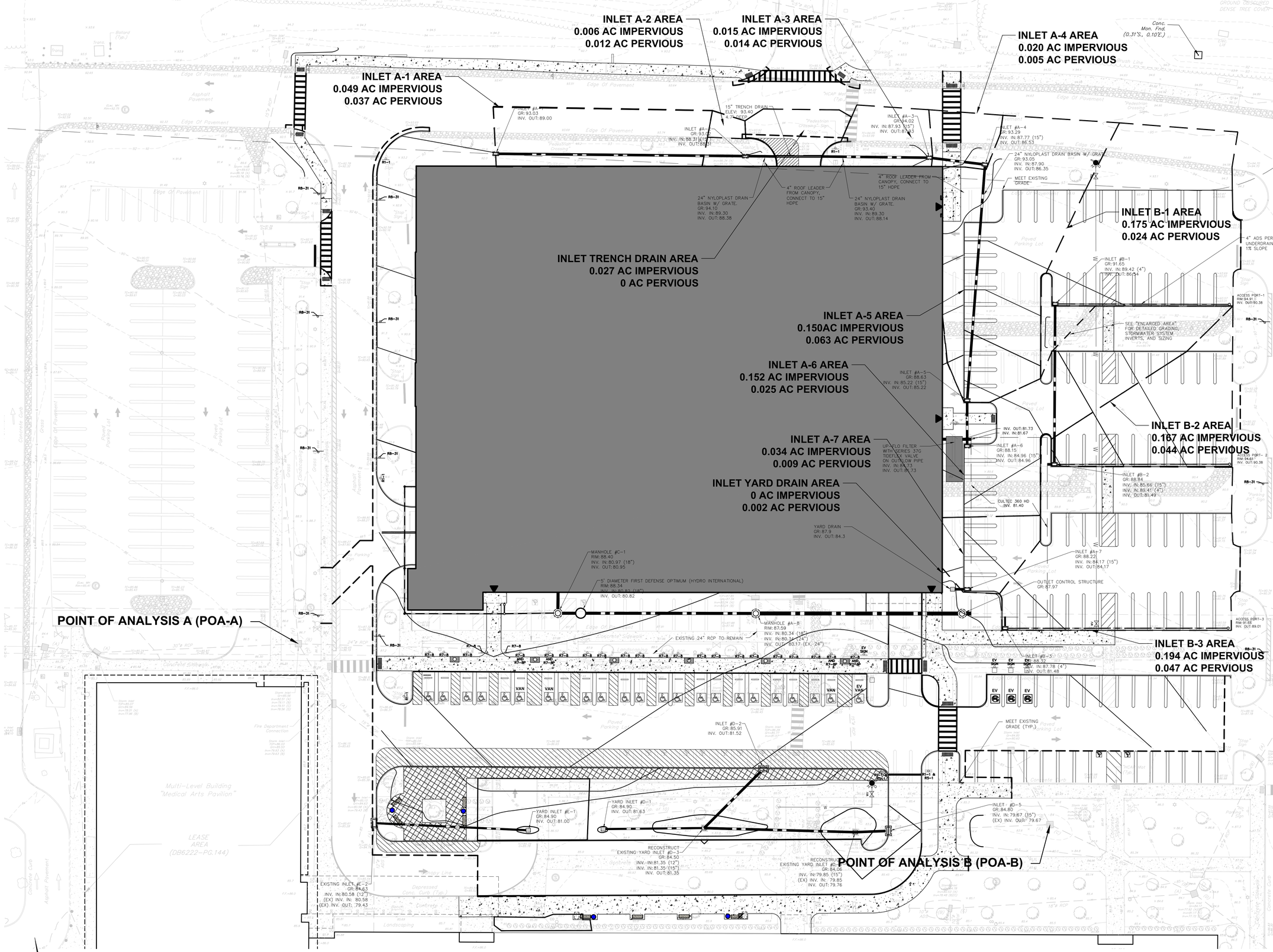
Penn Medicine Princeton Health Cancer Center Garage

1 Plainsboro Rd.
Princeton, NJ 08540
JOB NO. NBR2119.00

PHASE 1C

1" = 20'

04/14/2023 SITE PLAN SUBMISSION



3/14/2023 10:55:06 AM
Autodesk Docs://5267 Penn Medicine Princeton Health/PMPH-CAR-XR.rvt
Penn Medicine Princeton Health Cancer Center Garage

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Penn Medicine Princeton Health Cancer Center Garage

1 Plainsboro Rd.
Princeton, NJ 08540
JOB NO: NBR22119.00

PHASE 1C

1" = 20'

04/14/2023 SITE PLAN SUBMISSION

FRENCH & PARRELLO ASSOCIATES

ENGINEERING AND CONSULTING **SINCE 1974**

STORMWATER MANAGEMENT REPORT

For

Punia Boulevard Parking Lot
Block 1701, Lot 4.04
Township of Plainsboro
Middlesex County, New Jersey





Prepared For:

Princeton HealthCare System
A New Jersey Nonprofit Corporation
d/b/a Penn Medicine Princeton Health
1 Plainsboro Road
Plainsboro, NJ 08536

_____

Andrew L. French
Professional Engineer, NJ License No # 42894

April 14, 2023, Revised July 25, 2023| FPA No. 06C028T.003
1800 Route 34, Suite 101, Wall Township, NJ 07719

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 BASIS OF ENGINEERING ANALYSIS 1

3.0 EXISTING CONDITIONS 2

4.0 PROPOSED CONDITIONS 3

5.0 COMPLIANCE 3

5.1 Groundwater Recharge 3

5.2 Water Quality 4

5.3 Water Quantity 5

5.4 Delaware and Raritan Canal Commission 6

5.5 Soil Erosion and Sediment Control 6

6.0 CONCLUSION 7

Appendix A

Supporting Documents

- NRCS Soils Map
- NJ 24 Hour Rainfall Frequency Data
- Soils Testing Data

Appendix B

Present Conditions Runoff Calculations

- Time of Concentration Calculations
- Existing Condition Runoff Calculations

Appendix C

Water Quality Calculations

Appendix D

Proposed Conditions Calculations

- Basin Volume Calculations
- Proposed Conditions Runoff Calculations

FPA

TABLE OF CONTENTS

- Storm Sewer Calculations (25 Year Storm)
- Storm Sewer Calculations (100 Year Storm)

Appendix E

Delaware and Raritan Canal Commission

- Nonstructural Stormwater Strategies Point System (NSPS) worksheet

Appendix F

Drainage Area Maps

1.0 INTRODUCTION

The applicant/owner Princeton Healthcare System, a New Jersey nonprofit corporation, d/b/a Penn Medicine Princeton Health, is proposing to construct a new Cancer Center and Parking Garage on the hospital site known as Block 1701, Lot 3.01 in Plainsboro, New Jersey. Since existing parking spaces will be displaced during the construction of the Cancer Center and Parking Garage, the applicant/owner is proposing to construct a Temporary Parking Area on the east side of Punia Boulevard on Lot 4.04 to manage the parking during construction. The project proposes the construction of a temporary parking lot on Lot 4.04 with approximately 304 parking stalls, and other site improvements, such as sidewalks, landscaping, lighting and stormwater management facilities. An additional temporary 324 space stone parking lot will be constructed on the east side of the porous pavement area and shall be operational for a duration of less than six months.

This report contains the stormwater management calculations demonstrating compliance with the requirements of the Stormwater Management Rules at N.J.A.C. 7:8 for the proposed Punia Boulevard Parking Area on Lot 4.04 in the Township of Plainsboro, Middlesex County, New Jersey.

2.0 BASIS OF ENGINEERING ANALYSIS

The stormwater management systems, including collection and conveyance structures, groundwater recharge, water quality, and detention measures (BMP'S) have been designed in accordance with the provisions outlined in N.J.A.C. 7:8 New Jersey Stormwater Management Rules and the Plainsboro Township Stormwater Management Ordinance. The New Jersey Best Management Practices Manual dated April 2004 and last updated March 2021 was used for technical guidance to comply with the above regulations.

The soils map located in Appendix A, published by Natural Resources Conservation Service Web Soil Survey, National Cooperative Soil Survey, was used to obtain the required soil information for the project, including soil types and hydrologic soil groups. A subsurface soil assessment was performed to obtain site specific information to determine the seasonal high water table and on-site soil permeability conditions; see Appendix A for supporting documentation.

The calculation of the stormwater runoff rates and volumes were performed utilizing the procedures outlined in the New Jersey Best Management Practices Manual. The PondPack Connect Edition Update 2 Computer Program developed by the Haested Methods was used to generate the runoff hydrographs and hydrologic model for project site. Peak discharges, run-off volumes, and hydrographs were computed for the 2, 10, 25, and 100-year storm events utilizing the USDA Natural Resources Conservation Service (NRCS) methodology, as found in the NRCS National Engineering Handbook, Part 630-Hydrology. The NOAA Type D, 24-hour rainfall distribution, and 24-hour rainfall frequency data for Middlesex County, New Jersey published in August 2012 by NRCS were used in the computations. Runoff calculations and precipitation losses were calculated using the NRCS Curve Numbers (CNs), based upon the present and proposed watershed conditions. Times of Concentration (TC) were based

upon estimates of overland, shallow concentrated, and open channel flow utilizing methods presented in Chapter 15 of the NEH, Part 630-Hydrology.

The rainfall distribution for the NJDEP Water Quality Design Storm (1.25 inches of rain falling nonuniformly in a 2-hour storm event), as shown on Table 5-2 of the New Jersey Stormwater Best Management Practices Manual was used to compute the peak runoff rate and runoff volume for this storm.

3.0 EXISTING CONDITIONS

The subject property consists of 8.80 acres and is located in the Township of Plainsboro, Middlesex County, New Jersey. The property is known as Block 1701, Lot 4.04. The site currently contains open fields that are being farmed with trees in the middle and an existing Regional Detention Basin located in the rear of the project site. The property fronts on Punia Boulevard to the northwest. The Maplewood at Princeton, an assisted living facility, is adjacent to property on the northeast. CHOP Specialty Care Center, Princeton at Plainsboro is adjacent to property on the southwest. Stormwater currently drains overland to the south and outlets to an existing detention basin shared by the Maplewood. The Regional Detention Basin was designed and approved by Plainsboro Township to manage the stormwater runoff quantity reductions for the full build out of the Day Care property, Maplewood property and Lot 4.04.

The following table summarizes the existing conditions peak runoff rates and establishes the allowable proposed conditions peak runoff rates in accordance with N.J.A.C. 7:8 New Jersey Stormwater Management Rules. Detailed calculations are presented in Appendix B of this report. We conservatively used CN values for the existing condition as Lawn area even though the property is used for farming and recently as staging area for Maplewood Sales Trailer and the construction of the Regional Detention Basin.

Table 3.1

Summary of Present Conditions Peak Runoff Rates			
Storm Frequency	**Peak Runoff (cfs)**	**Required Reduction**	**Allowable Proposed Conditions Runoff (cfs)**
2-Year	0.67	50%	0.50*0.67 = **0.34**
10-Year	2.21	75%	0.75*2.21 = **1.66**
25-Year	3.51	---	**3.51**
100-Year	6.16	80%	0.80*6.16 = **4.93**

4.0 PROPOSED CONDITIONS

The applicant is proposing to construct a temporary parking area to manage the displacement of parking spaces during the construction of the Cancer Center and Parking Garage. The project proposes the construction of a temporary parking lot on Lot 4.04 with approximately 304 parking stalls, and other site improvements, such as sidewalks, landscaping, lighting and stormwater management facilities. This temporary lot will be operational for approximately three years. The 304 space lot will be constructed with porous pavement and an underground stormwater management system.

An additional 324 space stone parking lot will be constructed on the east side of the porous pavement area and shall be operational for less than six months to accommodate the peak parking demand resulting from construction workers who will be working on both the parking garage and cancer center. Once the parking garage is opened, it will provide over more than adequate parking and the temporary stone lot will no longer be required. Since the 324 space stone lot will be operational less than six months, per the NJDEP, this is considered a temporary structure and does not require stormwater management. Therefore, no stormwater management system is proposed for the 324 space stone lot. After the completion and operation of the Cancer Center and Parking Garage, the applicant shall remove the temporary 304 space lot and the 324 space stone lot and restore the project site to its existing condition.

Existing trees separate the open farm fields and the applicant is proposing to construct two parking areas to minimize the impact on the existing trees. The front parking area is intended to be used by Penn Medicine staff and the rear parking area shall be used by the contractors working on the Cancer Center and Parking Garage. The 304 space temporary parking lot will be designed to comply with the Township Stormwater Management requirements, which include stormwater quantity reductions, water quality treatment and groundwater recharge using Green Infrastructure (GI) elements.

The proposed stormwater management facilities consist of a pervious pavement system with underground storage areas. For water quality purposes, pervious pavement systems are being provided, which shall include 3-inch-thick stone with underdrains to handle the entire water quality storm. For water quantity purposes, the pervious pavement system includes one underground storage basin with Cultec 360HD Chambers and associated underdrains to handle the control and reductions of the 2, 10, and 100-year storm events.

5.0 COMPLIANCE

5.1 Groundwater Recharge

N.J.A.C. 7:8 New Jersey Stormwater Management Rules requires that the proposed project maintain the present conditions average annual groundwater recharge volume for the project site.

The property has been previously used as a temporary parking area during the construction of the Princeton Medical Center, temporary construction for the Maplewood Sales Trailer, staging area for

the construction of the Regional Detention Basin and continues to be actively farmed. Over the past 15 years, the soil conditions of the property have been heavily disturbed and compacted where the soils are not providing infiltration of the groundwater. Throughout the property, we performed twenty-three (23) soil logs to approximate depth of 10 feet below the surface to assess the subsurface soil conditions, estimate the seasonal high water table, and perform soil percolation testing of the surface soils. The results of the soil logs were consistent with the subsurface soil conditions on the surrounding properties within the Redevelopment area, which included mostly silty clay loam. Based on the soil logs, the seasonal high water table was not encountered in any of the soil excavations, which is consistent with the findings of the subsurface soil conditions performed for the Regional Detention Basin located at the rear of the property. Also, on-site percolation testing was performed at each soil log excavation at depths from 7" to 14" below the surface and all percolation testing failed during the pre-soak where the water elevation either did not drop at all or insignificantly after 1 hour. The on-site percolation testing results indicated that the existing surface soil conditions do not provide any infiltration of stormwater runoff into the groundwater. Therefore, the annual pre-construction groundwater recharge is zero and the requirement for post-construction recharge would be the same. Since there is no groundwater recharge under the existing conditions, the project meets the recharge requirements of N.J.A.C. 7:8 New Jersey Stormwater Management Rules or a waiver is hereby requested. Soil Logs and on-site percolation testing results are included in Appendix A of this report.

5.2 Water Quality

N.J.A.C. 7:8 New Jersey Stormwater Management Rules require that an 80% reduction of total suspended solids (TSS) must be achieved if the net increase in regulated motor vehicle surface is more than 0.25 acres. Currently, there is no existing motor vehicle surface within the proposed disturbance area. A total of 2.274 acres (99,042 sf) new impervious surface is proposed. This contains the porous pavement, sidewalks and bituminous bike path. 2.138 acres of new motor vehicle surface (304 space parking lot only) is proposed which will require 80% TSS removal. Water Quality treatment of 80% TSS removal will be achieved through the use of pervious pavement systems, which are an approved Green Infrastructure BMP. The pervious pavement systems are being provided to include 3-inch-thick stone below the pavement with underdrains to handle and treat the entire water quality storm. Therefore, the project complies with the Water Quality requirements of N.J.A.C. 7:8 New Jersey Stormwater Management Rules. The following provides a summary of the stone thickness required to contain the water quality storm volume below the pervious pavement:

Table 5.1

Water Quality Calculations Summary						
Pavement Section	**Pervious Pavement Area (SF)**	**Stone Void Space**	**Void Area (SF)**	**Thickness Required***		**Thickness Provided (in)**
				ft	**in**	
West Pervious Pavement	91,781 *(2.107 ac.)*	40%	36,712 *(0.843 ac.)*	0.22	2.6	3.0

*Detailed computations are presented in Appendix C of this report.

5.3 Water Quantity

The governing regulations require that the proposed peak runoff rates for the 2-year, 10-year, and 100-year storm events from the proposed development be reduced to 50, 75, and 80 percent, respectively, of the projects present conditions peak runoff rates for the same storms. The proposed stormwater management facility for the 304 space lot consists of a pervious pavement system with underground storage areas. The pervious pavement system includes one underground storage area with Cultec 360HD Chambers and associated underdrains to handle the control and reductions of the 2, 10, and 100-year storm events.

The proposed pervious pavement system is an approved Green Infrastructure BMPs that has been designed to meet the peak runoff reductions of N.J.A.C. 7:8 New Jersey Stormwater Management Rules.

The basin routing summary and the overall peak runoff rate reductions for the site are shown in the following table:

Table 5.2

Proposed West Pervious Pavement Routing Summary			
Storm Frequency	**Peak Inflow (cfs)**	**Peak Outflow (cfs)**	**Maximum Water Surface Elevation (ft)**
2-Year Storm	6.62	0.30	79.44
10-Year Storm	10.52	1.47	80.14
25-Year Storm	13.30	2.64	80.67
100-Year Storm	18.45	4.50	82.24

Table 5.3

Comparison of Present Conditions vs. Proposed Conditions Peak Runoff Rates			
Storm Frequency	**Maximum Allowable Proposed Conditions Peak Runoff Rate (From Table 3.1) (cfs)**	**Estimated Proposed Conditions Peak Runoff Rate* (cfs)**	
2-Year Storm	0.34	0.30	OK
10-Year Storm	1.66	1.47	OK
25-Year Storm	3.51	2.64	OK
100-Year Storm	4.93	4.50	OK

Detailed computations are presented in Appendix D of this report.

*Addition is with respect to time.

5.4 Delaware and Raritan Canal Commission

This project is located within the Delaware and Raritan Canal Commission (DRCC) jurisdiction area. It is located in Review Zone B. The DRCC regulations, NJAC 7:45-8.5, have the same requirements as N.J.A.C. 7:8 for water quantity and recharge. For water quality, N.J.A.C. 7:45-8.5 requires that the post-construction load of total suspended solids (TSS) in stormwater runoff generated from the water quality design storm be reduced by 80% of the anticipated load from the developed site, expressed as an annual average. This requirement differs from N.J.A.C. 7:8 in that the 80% TSS reduction is applicable to the impervious for the development, not just the increase in motor vehicle surfaces.

For the parking lot, the increase in impervious is equal to the increase in motor vehicle surfaces, therefore, the requirement for this project is the same.

The DRCC requires that the nonstructural stormwater management strategies be incorporated into the site design. A Nonstructural Stormwater Strategies Point System (NSPS) worksheet can be provided to demonstrate compliance. It should be noted that since the 324 space stone lot will be temporary and will be restored to a vegetative condition, therefore, this area was modeled as lawn and open space. The NSPS worksheet can be found in Appendix E.

5.5 Soil Erosion and Sediment Control

The project proposes to discharge into the existing storm sewer system located near the existing stormwater basin to the southeast. The existing system discharges into the stormwater basin via two 24”-inch pipes that each outfall into separate riprap aprons. Therefore, per The Standards for Soil Erosion and Sediment Control in New Jersey, 7th Edition, January 2014, Revised July 2017; Chapter 21:

Standard for Off-Site Stability, off-site stability conditions are stable due to the stormwater discharging into a stable conveyance pipe.

6.0 CONCLUSION

The proposed Temporary Parking Area on Lot 4.04 has been designed with a pervious pavement system including an underground storage area to comply with the Township Stormwater Management requirements, which include stormwater quantity reductions, water quality treatment and groundwater recharge using Green Infrastructure (GI) elements.

Based upon the calculations present in this report, the proposed stormwater management system meets the requirements of the N.J.A.C. 7:8 - New Jersey Stormwater Management Rules and the Plainsboro Township Stormwater Management Ordinance.

Appendix A
Supporting Documents

Hydrologic Soil Group—Middlesex County, New Jersey
(LOD)



Map Scale: 1:1,680 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

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 Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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: Middlesex County, New Jersey
Survey Area Data: Version 18, Aug 30, 2022

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.

P23-03 Penn Med PB Submission Reports 08/09/23

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
NknB	Nixon loam, 2 to 5 percent slopes	B	4.2	62.7%
NkrA	Nixon moderately well drained variant loam, 0 to 2 percent slopes	C	2.5	37.3%
Totals for Area of Interest			**6.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

NEW JERSEY 24 HOUR RAINFALL FREQUENCY DATA

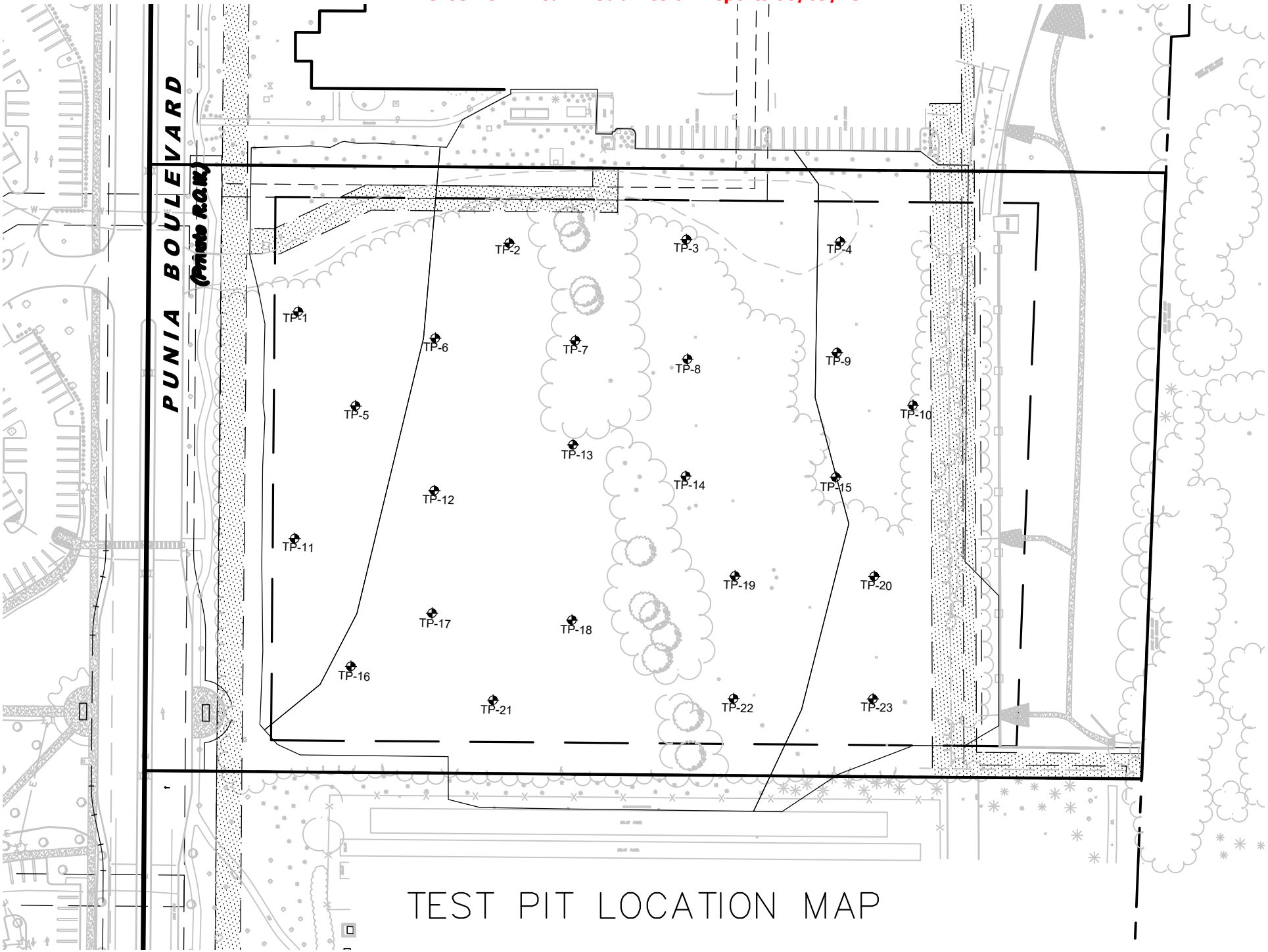
Rainfall amounts in Inches

County	1 year	2 year	5 year	10 year	25 year	50 year	100 year
Atlantic	2.72	3.31	4.30	5.16	6.46	7.61	8.90
Bergen	2.75	3.34	4.27	5.07	6.28	7.32	8.47
Burlington	2.77	3.36	4.34	5.18	6.45	7.56	8.81
Camden	2.73	3.31	4.25	5.06	6.28	7.34	8.52
Cape May	2.67	3.25	4.22	5.07	6.34	7.47	8.73
Cumberland	2.69	3.27	4.25	5.09	6.37	7.49	8.76
Essex	2.85	3.44	4.40	5.22	6.44	7.49	8.66
Gloucester	2.71	3.29	4.24	5.05	6.29	7.36	8.55
Hudson	2.73	3.31	4.23	5.02	6.19	7.20	8.31
Hunterdon	2.80	3.38	4.26	5.00	6.09	7.02	8.03
Mercer	2.74	3.31	4.23	5.01	6.19	7.20	8.33
Middlesex	2.76	3.35	4.30	5.12	6.36	7.43	8.63
Monmouth	2.79	3.38	4.38	5.23	6.53	7.66	8.94
Morris	2.94	3.54	4.47	5.24	6.37	7.32	8.35
Ocean	2.81	3.42	4.45	5.33	6.68	7.87	9.20
Passaic	2.87	3.47	4.42	5.23	6.43	7.47	8.62
Salem	2.69	3.26	4.20	5.00	6.22	7.28	8.45
Somerset	2.76	3.34	4.25	5.01	6.15	7.13	8.21
Sussex	2.68	3.22	4.02	4.70	5.72	6.60	7.58
Union	2.80	3.39	4.35	5.17	6.42	7.49	8.69
Warren	2.78	3.34	4.18	4.89	5.93	6.83	7.82

Notes: The average point rainfall amounts listed above were developed from data contained in NOAA Atlas 14 Volume 2.

Point rainfall estimates for specific locations may be obtained from the Precipitation Frequency Data Server located at http://www.nws.noaa.gov/ohd/hdsc/

For most hydrologic design procedures, the rainfall amounts listed above may be rounded to the nearest tenth of an inch.



TEST PIT LOCATION MAP

FRENCH & PARRELLO ASSOCIATES, P.A.
1800 State Highway 34, Suite 101
Wall, New Jersey 07719

SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-1

SHEET NO.: 1 OF 1

DATE: 11/15/2022

GROUND ELEVATION: 87.2
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0" - 10"	Topsoil/Organic Material
10"- 43"	Yellowish Brown *(10YR 5/6)* **silty clay loam**; angular blocky, firm
43"-70"	Dark Yellowish Brown *(10YR 3/6)* **silty clay loam**; subangular blocky, friable
70"- 120"	Dark Reddish Brown *(5YR 3/3)* **silty clay**; subangular blocky, firm
120"- 130"	Dark Yellowish Brown *(10YR 4/6)* **loam**; subangular blocky, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

FRENCH & PARRELLO ASSOCIATES, P.A.
1800 State Highway 34, Suite 101
Wall, New Jersey 07719

SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-2

SHEET NO.: 1 OF 1

DATE: 11/15/2022

GROUND ELEVATION: 87.5
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0" - 13"	Topsoil/Organic Material
13"- 40"	Yellowish Brown *(10YR 5/6)* **silty clay loam**; angular blocky, firm
40"-126"	Brownish Yellow *(10YR 6/6)* **sandy clay loam**; subangular blocky, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-3

SHEET NO.: 1 OF 1

DATE: 11/15/2022

GROUND ELEVATION: 84.9
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 12”	Topsoil/Organic Material
12”- 48”	Yellowish Brown *(10YR 5/6)* **silty clay loam**; angular blocky, firm
48”-128”	Brownish Yellow *(10YR 6/6)* **sandy clay loam**; subangular blocky, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-4

SHEET NO.: 1 OF 1

DATE: 11/15/2022

GROUND ELEVATION: 83.2
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 12”	Topsoil/Organic Material
12”- 45”	Yellowish Brown *(10YR 5/4)* **silty clay loam**; subangular blocky, firm
45”-72”	Yellowish Brown *(10YR 5/4)* **silty clay loam**; subangular blocky, extremely firm
72”-128”	Brownish Yellow *(10YR 5/6)* **sandy clay loam**; subangular blocky, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-5

SHEET NO.: 1 OF 1

DATE: 11/15/2022

GROUND ELEVATION: 86.0
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 12”	Topsoil/Organic Material
12”- 36”	Yellowish Brown *(10YR 5/6)* **silty clay loam**; subangular blocky, firm
36”-88”	Yellowish Brown *(10YR 5/4)* **silty clay loam**; subangular blocky, firm
88”-125”	Dark Reddish Brown *(5YR 3/3)* **silty clay**; angular blocky, very firm

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-6

SHEET NO.: 1 OF 1

DATE: 11/15/2022

GROUND ELEVATION: 86.5
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 12”	Topsoil/Organic Material
12”- 53”	Yellowish Brown *(10YR 5/4)* **silty clay loam**; angular blocky, firm
53”-126”	Light Yellowish Brown *(10YR 6/4)* **sandy clay loam**; subangular blocky, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-7

SHEET NO.: 1 OF 1

DATE: 11/15/2022

GROUND ELEVATION: 86.5
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 12”	Topsoil/Organic Material
12”- 46”	Brown *(10YR 5/3)* **silty clay loam**; subangular blocky, firm
46”-126”	Dark Reddish Brown *(5YR 3/4)* **sandy clay loam**; subangular blocky, extremely firm, with 20% gravel

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-8

SHEET NO.: 1 OF 1

DATE: 11/15/2022

GROUND ELEVATION: 83.4
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 9”	Topsoil/Organic Material
9”- 44”	Brown *(10YR 4/3)* **silty clay loam**; subangular blocky, very firm
44”-79”	Yellowish Brown *(10YR 5/4)* **sandy clay loam**; subangular blocky, friable
79”-122”	Dark Reddish Brown *(5YR 3/4)* **silty clay**; angular blocky, extremely firm

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-9

SHEET NO.: 1 OF 1

DATE: 11/15/2022

GROUND ELEVATION: 82.3
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 12”	Topsoil/Organic Material
12”- 128”	Brown *(10YR 5/3)* **silty clay loam**; subangular blocky, very firm

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: / /

Mark Kalusz, EIT

Signature of Professional Engineer: _____

Andrew French, P.E. Date: / /
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-10

SHEET NO.: 1 OF 1

DATE: 11/15/2022

GROUND ELEVATION: 79.9
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0" - 9"	Topsoil/Organic Material
9"- 40"	Brown *(10YR 5/3)* **silty clay loam**; subangular blocky, very firm
40"-126"	Dark Reddish Brown *(5YR 3/4)* **silty clay**; angular blocky, extremely firm

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: / /
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: / /
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-11

SHEET NO.: 1 OF 1

DATE: 11/15/2022

GROUND ELEVATION: 85.8
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0" - 11"	Topsoil/Organic Material
11"- 44"	Dark Yellowish Brown *(10YR 3/6)* **silty clay loam**; subangular blocky, firm
44"-128"	Light Yellowish Brown *(10YR 6/4)* **sandy clay loam**; subangular blocky, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: / /____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: / /____
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-12

SHEET NO.: 1 OF 1

DATE: 11/15/2022

GROUND ELEVATION: 85.0
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 12”	Topsoil/Organic Material
12”- 30”	Dark Yellowish Brown *(10YR 4/4)* **silty clay**; angular blocky, very firm
30”-61”	Brown *(10YR 4/3)* **silty clay loam**; subangular blocky, very firm
61”-126”	Yellowish Brown *(10YR 5/6)* **sandy clay loam**; angular blocky, very firm

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-13

SHEET NO.: 1 OF 1

DATE: 11/16/2022

GROUND ELEVATION: 85.2
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0" - 12"	Topsoil/Organic Material
12"- 66"	Brown *(10YR 4/3)* **silty clay loam**; subangular blocky, firm
66"-122"	Yellowish Brown *(10YR 5/6)* **sandy clay loam**; subangular blocky, firm

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-14

SHEET NO.: 1 OF 1

DATE: 11/16/2022

GROUND ELEVATION: 82.5
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 10”	Topsoil/Organic Material
10”- 33”	Brown *(10YR 4/3)* **silty clay loam**; subangular blocky, firm
33”-120”	Dark Reddish Brown *(5YR 3/4)* **silty loam**; angular blocky, extremely firm

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-15

SHEET NO.: 1 OF 1

DATE: 11/16/2022

GROUND ELEVATION: 82.5
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 12”	Topsoil/Organic Material
12”- 126”	Brown *(10YR 5/3)* **silty clay loam**; subangular blocky, firm

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: / /

Mark Kalusz, EIT

Signature of Professional Engineer: _____

Andrew French, P.E. Date: / /
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-16

SHEET NO.: 1 OF 1

DATE: 11/16/2022

GROUND ELEVATION: 82.8
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 12”	Topsoil/Organic Material
12”- 58”	Dark Yellowish Brown *(10YR 3/6)* **silty clay loam**; subangular blocky, firm
58”-128”	Light Yellowish Brown *(10YR 6/4)* **sandy clay loam**; subangular blocky, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

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P23-03 Penn Med PB Submission Reports 08/09/23
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Wall, New Jersey 07719

SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-17

SHEET NO.: 1 OF 1

DATE: 11/16/2022

GROUND ELEVATION: 83.8
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 14”	Topsoil/Organic Material
14”- 42”	Dark Yellowish Brown *(10YR 3/6)* **silty clay loam**; subangular blocky, firm
42”-103”	Light Yellowish Brown *(10YR 6/4)* **silty clay**; subangular blocky, very firm
103”-128”	Yellowish Brown *(10YR 5/6)* **silty clay**; massive, cemented

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-18

SHEET NO.: 1 OF 1

DATE: 11/16/2022

GROUND ELEVATION: 83.4
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 12”	Topsoil/Organic Material
12”- 51”	Dark Yellowish Brown *(10YR 3/6)* **silty clay loam**; subangular blocky, firm
51”-96”	Light Yellowish Brown *(10YR 6/4)* **silty clay**; platy, cemented with 40% gravel

END OF SOIL LOG

Notes:

Soil too firm to continue after 96”

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

FRENCH & PARRELLO ASSOCIATES, P.A.
P23-03 Penn Med PB Submission Reports 08/09/23
1800 State Highway 34, Suite 101
Wall, New Jersey 07719

SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-19

SHEET NO.: 1 OF 1

DATE: 11/16/2022

GROUND ELEVATION: 80.8
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 8”	Topsoil/Organic Material
8”- 44”	Brown *(10YR 4/3)* **silty clay loam**; subangular blocky, firm
44”-49”	Yellowish Brown *(10YR 5/4)* **sandy clay loam**; subangular blocky, friable
49”-130”	Dark Reddish Brown *(5YR 3/4)* **silty clay**; angular blocky, very firm

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

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SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-20

SHEET NO.: 1 OF 1

DATE: 11/16/2022

GROUND ELEVATION: 79.6
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 10”	Topsoil/Organic Material
10”- 42”	Brown *(10YR 4/3)* **silty clay loam**; subangular blocky, firm
42”-54”	Yellowish Brown *(10YR 5/4)* **sandy clay loam**; subangular blocky, friable
54”-128”	Dark Reddish Brown *(5YR 3/4)* **silty clay**; angular blocky, very firm

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

FRENCH & PARRELLO ASSOCIATES, P.A.
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Wall, New Jersey 07719

SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-21

SHEET NO.: 1 OF 1

DATE: 11/16/2022

GROUND ELEVATION: 82.8
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 13”	Topsoil/Organic Material
13”- 67”	Dark Yellowish Brown *(10YR 3/6)* **silty clay loam**; subangular blocky, firm
67”-125”	Light Yellowish Brown *(10YR 6/4)* **sandy clay loam**; subangular blocky, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

FRENCH & PARRELLO ASSOCIATES, P.A.
P23-09 Penn Med PB Submission Reports 08/09/23
1800 State Highway 34, Suite 101
Wall, New Jersey 07719

SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-22

SHEET NO.: 1 OF 1

DATE: 11/16/2022

GROUND ELEVATION: 79.9
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 8”	Topsoil/Organic Material
8”- 41”	Dark Yellowish Brown *(10YR 4/4)* **silty clay loam**; subangular blocky, firm
41”-122”	Dark Reddish Brown *(5YR 3/4)* **silty clay**; angular blocky, extremely firm

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

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P23-03 Penn Med PB Submission Reports 08/09/23
1800 State Highway 34, Suite 101
Wall, New Jersey 07719

SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-23

SHEET NO.: 1 OF 1

DATE: 11/16/2022

GROUND ELEVATION: 79.9
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0" - 7"	Topsoil/Organic Material
7"- 40"	Brown *(10YR 4/3)* **silty clay loam**; subangular blocky, firm
40"-53"	Yellowish Brown *(10YR 5/4)* **sandy clay loam**; subangular blocky, friable
53"-126"	Dark Reddish Brown *(5YR 3/4)* **silty clay**; angular blocky, extremely firm

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: / /
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: / /
N.J.P.E. License No. 42894

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **1 (TP-1)** Date Tested **11/15**

2. Depth **10" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation did not drop after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

7. I hereby certify that the information furnished on Form 3d of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data: Block **1701** Lot **4.04**

1. Test Number **2 (TP-2)** Date Tested **11/15**

2. Depth **13" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation fell 1/4 an inch after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____
Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____
Andrew L. French, PE

License No. _____

Percolation Test Data: Block **1701** Lot **4.04**

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

1. Test Number **3 (TP-3)** Date Tested **11/15**

2. Depth **12" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____Four Hour Pre-soak completed - Indicate result:
   _____Test Hole Drained within 15 to 24 hours after Pre-soak
   __X__Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation did not drop after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____
Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____
Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **4 (TP-4)** Date Tested **11/15**

2. Depth **12" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation fell 1/8 an inch after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **5 (TP-5)** Date Tested **11/15**

2. Depth **12" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation did not drop after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **6(TP-6)** Date Tested **11/15**

2. Depth **12" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation did not drop after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **7 (TP-7)** Date Tested **11/15**

2. Depth **12" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation did not drop after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

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   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **8 (TP-8)** Date Tested **11/15**

2. Depth **9" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation fell 1/8 an inch after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **9 (TP-9)** Date Tested **11/15**

2. Depth **12" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation fell 1/4 an inch after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data: Block 1701 Lot 4.04

1. Test Number **10 (TP-10)** Date Tested **11/15**

2. Depth **9" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation did not drop after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

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   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____
Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____
Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **11 (TP-11)** Date Tested **11/15**

2. Depth **11" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation fell 1/4 an inch after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **12 (TP-12)** Date Tested **11/15**

2. Depth **12" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation fell 1/4 an inch after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **13 (TP-13)** Date Tested **11/15**

2. Depth **12" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation fell 1/8 an inch after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

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Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **14 (TP-14)** Date Tested **11/15**

2. Depth **10" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation did not drop after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **15 (TP-15)** Date Tested **11/15**

2. Depth **12" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation did not drop after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **16 (TP-16)** Date Tested **11/15**

2. Depth **12" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation did not drop after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____
Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____
Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **17 (TP-17)** Date Tested **11/15**

2. Depth **14" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation did not drop after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **18 (TP-18)** Date Tested **11/15**

2. Depth **12" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation fell 1/8 an inch after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **19 (TP-19)** Date Tested **11/15**

2. Depth **8" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation fell 1/8 an inch after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____
Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____
Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **20 (TP-20)** Date Tested **11/15**

2. Depth **10" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation fell 1/4 an inch after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

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Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **21 (TP-21)** Date Tested **11/15**

2. Depth **13" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation did not drop after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **22 (TP-22)** Date Tested **11/15**

2. Depth **8" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation did not drop after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

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   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **23 (TP-23)** Date Tested **11/15**

2. Depth 7**" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____Four Hour Pre-soak completed - Indicate result:
   _____Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation fell 1/4 an inch after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

Appendix B
Present Conditions and Runoff Calculations

FRENCH & PARRELLO ASSOCIATES

TELEPHONE : (732) 312-9800
FAX : (732) 312-9801

1800 ROUTE 34, SUITE 101
WALL, NEW JERSEY 07719

PROJECT NUMBER:	06C028T.003		
PROJECT NAME:	Punia Boulevard Parking Lot		
CALCULATED BY:	SP	DATE:	10/4/2022
CHECKED BY:		DATE:	
REVISED BY:		DATE:	

TIME OF CONCENTRATION CALCULATOR

DRAINAGE AREA NAME:	Existing Drainage Area Pervious	DRAINAGE AREA NOTATION:	ex-perv

Sheet Flow: Segment 1

Surface Type:	Grass: Dense grasses	
Slope of land surface, S:	0.042	ft/ft
n-value (from Table 15-1):	0.24	---
Limiting Length of flow, *l*:	85.4	ft
2-year, 24 hours rainfall, P_2:	3.300	in
Travel time, T_t:	9.2	minutes

calculations for sheet flow based upon Equation 15-8 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{0.007(n l)^{0.8}}{(P_2)^{0.5} S^{0.4}} \quad \text{(Eq 15-8)}$$

Shallow Concentrated Flow: Segment 2

Surface Type:	Minimum tillage cultivation, contour or strip-cropped, and woodlands	
Flow length, l:	279	ft
Slope of land surface, S:	0.011	ft/ft
n-value (from Table 15-3):	0.101	---
Average velocity, V:	0.528	ft/s
Travel time, T_t:	8.8	minutes

calculations for shallow concentrated flow based upon Equation 15-1 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{l}{3{,}600V} \quad \text{(Eq 15-1)}$$

Shallow Concentrated Flow: Segment 3

Surface Type:	Minimum tillage cultivation, contour or strip-cropped, and woodlands	
Flow length, l:	119	ft
Slope of land surface, S:	0.021	ft/ft
n-value (from Table 15-3):	0.101	---
Average velocity, V:	0.729	ft/s
Travel time, T_t:	2.7	minutes

Total Time of Concentration:	21	minutes	user input

FRENCH & PARRELLO ASSOCIATES

TELEPHONE : (732) 312-9800
FAX : (732) 312-9801

1800 ROUTE 34, SUITE 101
WALL, NEW JERSEY 07719

PROJECT NUMBER:	06C028T.003		
PROJECT NAME:	Punia Boulevard Parking Lot		
CALCULATED BY:	SP	DATE:	10/4/2022
CHECKED BY:		DATE:	
REVISED BY: KN		DATE:	7/12/2023

Sheet: 1 of 1

TIME OF CONCENTRATION CALCULATOR

DRAINAGE AREA NAME:	West Pervious	DRAINAGE AREA NOTATION:	West Pervious

Sheet Flow: Segment 1

Surface Type:	Grass: Dense grasses	
Slope of land surface, S:	0.027	ft/ft
n-value (from Table 15-1):	0.24	---
Limiting Length of flow, *l*:	69.1	ft
2-year, 24 hours rainfall, P_2:	3.300	in
Travel time, T_t:	9.2	minutes

calculations for sheet flow based upon Equation 15-8 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{0.007(n l)^{0.8}}{(P_2)^{0.5} S^{0.4}} \qquad \text{(Eq 15-8)}$$

Shallow Concentrated Flow: Segment 2

Surface Type:	Minimum tillage cultivation, contour or strip-cropped, and woodlands	
Flow length, l:	21.9	ft
Slope of land surface, S:	0.027	ft/ft
n-value (from Table 15-3):	0.101	---
Average velocity, V:	0.834	ft/s
Travel time, T_t:	0.4	minutes

calculations for shallow concentrated flow based upon Equation 15-1 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{l}{3{,}600V} \qquad \text{(Eq 15-1)}$$

Shallow Concentrated Flow: Segment 3

Surface Type:	Pavement and small upland gullies	
Flow length, l:	339.0	ft
Slope of land surface, S:	0.013	ft/ft
n-value (from Table 15-3):	0.025	---
Average velocity, V:	2.342	ft/s
Travel time, T_t:	2.4	minutes

Total Time of Concentration:	12	minutes	user input

FRENCH & PARRELLO ASSOCIATES

TELEPHONE : (732) 312-9800
FAX : (732) 312-9801

1800 ROUTE 34, SUITE 101
WALL, NEW JERSEY 07719

PROJECT NUMBER:	06C028T.003		
PROJECT NAME:	Punia Boulevard Parking Lot		
CALCULATED BY:	SP	DATE:	10/4/2022
CHECKED BY:		DATE:	
REVISED BY: KN		DATE:	7/12/2023

Sheet: 1 of 1

TIME OF CONCENTRATION CALCULATOR

DRAINAGE AREA NAME:	West Impervious	DRAINAGE AREA NOTATION:	West Impervious

Sheet Flow: Segment 1

Surface Type:	Smooth surface (concrete, asphalt, gravel, or bare soil)	
Slope of land surface, S:	0.012	ft/ft
n-value (from Table 15-1):	0.011	---
Limiting Length of flow, *l*:	100.0	ft
2-year, 24 hours rainfall, P_2:	3.300	in
Travel time, T_t:	1.5	minutes

calculations for sheet flow based upon Equation 15-8 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{0.007(n l)^{0.8}}{(P_2)^{0.5} S^{0.4}} \qquad \text{(Eq 15-8)}$$

Shallow Concentrated Flow: Segment 2

Surface Type:	Pavement and small upland gullies	
Flow length, l:	312	ft
Slope of land surface, S:	0.014	ft/ft
n-value (from Table 15-3):	0.025	---
Average velocity, V:	2.373	ft/s
Travel time, T_t:	2.2	minutes

calculations for shallow concentrated flow based upon Equation 15-1 from "Part 630 Hydrology, National Engineering Handbook: Chapter 15 - Time of Concentration" issued by the United States Department of Agriculture, Natural Resources Conservation Service.

$$T_t = \frac{l}{3{,}600V} \qquad \text{(Eq 15-1)}$$

Shallow Concentrated Flow: Segment 3

Surface Type:		
Flow length, l:		ft
Slope of land surface, S:		ft/ft
n-value (from Table 15-3):	0	---
Average velocity, V:	0.000	ft/s
Travel time, T_t:	0.0	minute

Total Time of Concentration:	4	minutes	user input

Project Summary	
Title	Punia Boulevard Parking
Engineer	Stefanie Pacifico
Company	French and Parrello Associates
Date	6/14/2023

Notes EXISTING WATER QUANTITY CALCULATIONS

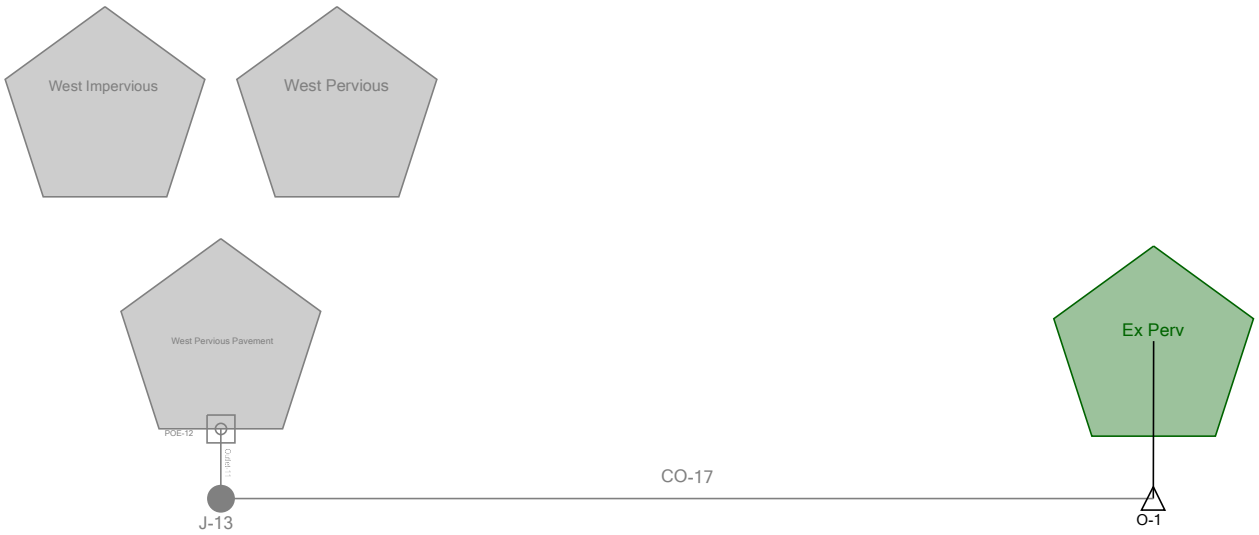


Table of Contents

Master Network Summary 2

Ex Perv

Unit Hydrograph Summary, 2 years (Pre-Development 2 year) 3

Unit Hydrograph Summary, 10 years (Pre-Development 10 year) 5

Unit Hydrograph Summary, 25 years (Pre-Development 25 year) 7

Unit Hydrograph Summary, 100 years (Pre-Development 100 year) 9

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
Ex Perv	Pre-Development 2 year	2	6,388.000	742.000	0.67
Ex Perv	Pre-Development 10 year	10	16,857.000	739.200	2.21
Ex Perv	Pre-Development 25 year	25	25,667.000	739.200	3.51
Ex Perv	Pre-Development 100 year	100	43,682.000	736.400	6.16

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
O-1	Pre-Development 2 year	2	7,294.000	742.000	0.67
O-1	Pre-Development 10 year	10	18,936.000	739.200	2.21
O-1	Pre-Development 25 year	25	28,640.000	739.200	3.51
O-1	Pre-Development 100 year	100	48,355.000	736.400	6.16

Subsection: Unit Hydrograph Summary
Label: Ex Perv
Scenario: Pre-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	21.000 min
Area (User Defined)	2.831 acres

Computational Time Increment	2.800 min
Time to Peak (Computed)	742.000 min
Flow (Peak, Computed)	0.67 ft³/s
Output Increment	0.050 min
Time to Flow (Peak Interpolated Output)	742.000 min
Flow (Peak Interpolated Output)	0.67 ft³/s

Drainage Area	
SCS CN (Composite)	64.000
Area (User Defined)	2.831 acres
Maximum Retention (Pervious)	5.63 in
Maximum Retention (Pervious, 20 percent)	1.13 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.63 in
Runoff Volume (Pervious)	6,480.923 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	6,388.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	21.000 min
Computational Time Increment	2.800 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544
Unit peak, qp	5.35 ft³/s

Subsection: Unit Hydrograph Summary
Label: Ex Perv
Scenario: Pre-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	14.000 min
Unit receding limb, Tr	123.200 min
Total unit time, Tb	137.200 min

Subsection: Unit Hydrograph Summary
Label: Ex Perv
Scenario: Pre-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	21.000 min
Area (User Defined)	2.831 acres

Computational Time Increment	2.800 min
Time to Peak (Computed)	739.200 min
Flow (Peak, Computed)	2.21 ft³/s
Output Increment	0.050 min
Time to Flow (Peak Interpolated Output)	739.200 min
Flow (Peak Interpolated Output)	2.21 ft³/s

Drainage Area	
SCS CN (Composite)	64.000
Area (User Defined)	2.831 acres
Maximum Retention (Pervious)	5.63 in
Maximum Retention (Pervious, 20 percent)	1.13 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.66 in
Runoff Volume (Pervious)	17,049.239 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	16,857.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	21.000 min
Computational Time Increment	2.800 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544
Unit peak, qp	5.35 ft³/s

Subsection: Unit Hydrograph Summary
Label: Ex Perv
Scenario: Pre-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	14.000 min
Unit receding limb, Tr	123.200 min
Total unit time, Tb	137.200 min

Subsection: Unit Hydrograph Summary
Label: Ex Perv
Scenario: Pre-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	21.000 min
Area (User Defined)	2.831 acres

Computational Time Increment	2.800 min
Time to Peak (Computed)	739.200 min
Flow (Peak, Computed)	3.51 ft³/s
Output Increment	0.050 min
Time to Flow (Peak Interpolated Output)	739.200 min
Flow (Peak Interpolated Output)	3.51 ft³/s

Drainage Area	
SCS CN (Composite)	64.000
Area (User Defined)	2.831 acres
Maximum Retention (Pervious)	5.63 in
Maximum Retention (Pervious, 20 percent)	1.13 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.52 in
Runoff Volume (Pervious)	25,932.838 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	25,667.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	21.000 min
Computational Time Increment	2.800 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544
Unit peak, qp	5.35 ft³/s

Subsection: Unit Hydrograph Summary
Label: Ex Perv
Scenario: Pre-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	14.000 min
Unit receding limb, Tr	123.200 min
Total unit time, Tb	137.200 min

Subsection: Unit Hydrograph Summary
Label: Ex Perv
Scenario: Pre-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	21.000 min
Area (User Defined)	2.831 acres

Computational Time Increment	2.800 min
Time to Peak (Computed)	736.400 min
Flow (Peak, Computed)	6.16 ft³/s
Output Increment	0.050 min
Time to Flow (Peak Interpolated Output)	736.400 min
Flow (Peak Interpolated Output)	6.16 ft³/s

Drainage Area	
SCS CN (Composite)	64.000
Area (User Defined)	2.831 acres
Maximum Retention (Pervious)	5.63 in
Maximum Retention (Pervious, 20 percent)	1.13 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.29 in
Runoff Volume (Pervious)	44,084.218 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	43,682.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	21.000 min
Computational Time Increment	2.800 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544
Unit peak, qp	5.35 ft³/s

Subsection: Unit Hydrograph Summary
Label: Ex Perv
Scenario: Pre-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	14.000 min
Unit receding limb, Tr	123.200 min
Total unit time, Tb	137.200 min

Index

E

Ex Perv (Unit Hydrograph Summary, 10 years (Pre-Development 10 year))...5, 6

Ex Perv (Unit Hydrograph Summary, 100 years (Pre-Development 100 year))...9, 10

Ex Perv (Unit Hydrograph Summary, 2 years (Pre-Development 2 year))...3, 4

Ex Perv (Unit Hydrograph Summary, 25 years (Pre-Development 25 year))...7, 8

M

Master Network Summary...2

Appendix C
Water Quality Calculations

Project Summary	
Title	Punia Boulevard Parking
Engineer	Stefanie Pacifico
Company	French and Parrello Associates
Date	7/20/2023

Notes	WATER QUALITY CALCULATIONS

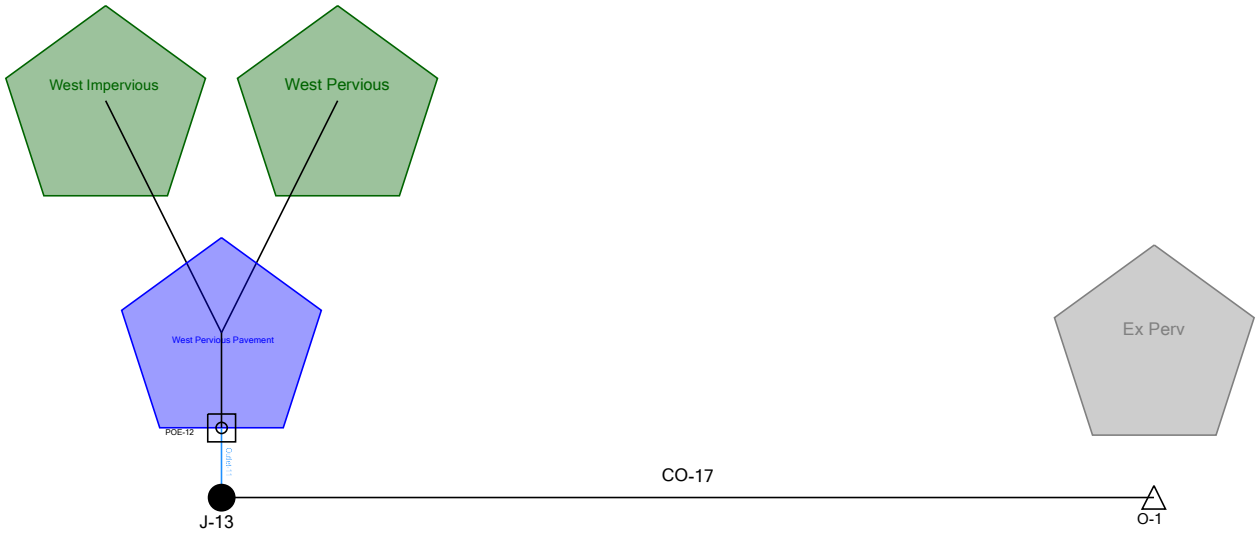


Table of Contents

Master Network Summary 2

West Impervious

Unit Hydrograph Summary, 1 years (WQ) 3

West Pervious

Unit Hydrograph Summary, 1 years (WQ) 5

West Pervious Pavement

Elevation-Volume-Flow Table (Pond), 1 years (WQ) 7

West Pervious Pavement (IN)

Level Pool Pond Routing Summary, 1 years (WQ) 8

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
West Impervious	WQ	1	8,134.000	66.000	5.52
West Pervious	WQ	1	46.000	107.200	0.02

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
J-13	WQ	1	0.000	0.000	0.00
O-1	WQ	1	0.000	0.000	0.00

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
West Pervious Pavement (IN)	WQ	1	8,180.000	66.000	5.52	(N/A)	(N/A)
West Pervious Pavement (OUT)	WQ	1	0.000	0.000	0.00	0.22	8,180.000

WATER QUALITY CALCULATION LISTED ABOVE ASSUMED A BASE ELEVATION OF 0.00 AND TOP ELEVATION OF 0.25 FOR A TOTAL DEPTH OF THREE (3) INCHES OF STONE USE FOR WATER QUALITY. THEREFORE, MAXIMUM WATER SURFACE ELEVATIONS SHOWN ARE REQUIRED THICKNESS NEEDED FOR WATER QUALITY TREATMENT

Subsection: Unit Hydrograph Summary
Label: West Impervious
Scenario: WQ

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

Storm Event	NJWQ (1.3 in)
Return Event	1 years
Duration	1,440.000 min
Depth	1.25 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	2.166 acres

Computational Time Increment	0.667 min
Time to Peak (Computed)	66.000 min
Flow (Peak, Computed)	5.52 ft³/s
Output Increment	0.050 min
Time to Flow (Peak Interpolated Output)	66.000 min
Flow (Peak Interpolated Output)	5.52 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.166 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.03 in
Runoff Volume (Pervious)	8,134.408 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	8,134.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544
Unit peak, qp	17.18 ft³/s

Subsection: Unit Hydrograph Summary
Label: West Impervious
Scenario: WQ

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	3.333 min
Unit receding limb, Tr	29.333 min
Total unit time, Tb	32.667 min

Subsection: Unit Hydrograph Summary
Label: West Pervious
Scenario: WQ

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

Storm Event	NJWQ (1.3 in)
Return Event	1 years
Duration	1,440.000 min
Depth	1.25 in
Time of Concentration (Composite)	12.000 min
Area (User Defined)	0.665 acres

Computational Time Increment	1.600 min
Time to Peak (Computed)	107.200 min
Flow (Peak, Computed)	0.02 ft³/s
Output Increment	0.050 min
Time to Flow (Peak Interpolated Output)	107.200 min
Flow (Peak Interpolated Output)	0.02 ft³/s

Drainage Area	
SCS CN (Composite)	68.000
Area (User Defined)	0.665 acres
Maximum Retention (Pervious)	4.71 in
Maximum Retention (Pervious, 20 percent)	0.94 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.02 in
Runoff Volume (Pervious)	45.910 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	46.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	12.000 min
Computational Time Increment	1.600 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544
Unit peak, qp	2.20 ft³/s

Subsection: Unit Hydrograph Summary
Label: West Pervious
Scenario: WQ

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	8.000 min
Unit receding limb, Tr	70.400 min
Total unit time, Tb	78.400 min

Subsection: Elevation-Volume-Flow Table (Pond)
Label: West Pervious Pavement
Scenario: WQ

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	0.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 min

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.00	0.00	0.000	0.843	0.00	0.00	0.00
0.10	0.00	3,672.108	0.843	0.00	0.00	2,448.07
0.20	0.00	7,344.216	0.843	0.00	0.00	4,896.14
0.25	0.00	9,180.270	0.843	0.00	0.00	6,120.18

Subsection: Level Pool Pond Routing Summary
Label: West Pervious Pavement (IN)
Scenario: WQ

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	0.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	5.52 ft³/s	Time to Peak (Flow, In)	66.000 min
Flow (Peak Outlet)	0.00 ft³/s	Time to Peak (Flow, Outlet)	0.000 min

Elevation (Water Surface, Peak)	0.22 ft
Volume (Peak)	8,180.313 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	8,180.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	0.000 ft³
Volume (Retained)	8,180.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.000 %

Index

M

Master Network Summary...2

W

West Impervious (Unit Hydrograph Summary, 1 years (WQ))...3, 4

West Pervious (Unit Hydrograph Summary, 1 years (WQ))...5, 6

West Pervious Pavement (Elevation-Volume-Flow Table (Pond), 1 years (WQ))...7

West Pervious Pavement (IN) (Level Pool Pond Routing Summary, 1 years (WQ))...8

Appendix D
Proposed Conditions Calculations

P23-03 Penn Med PB Submission Reports 08/09/23

CULTEC

CULTEC Recharger 360HD Stormwater System Calculations

Consulting Engineer:

French & Parrello Associates

Calculations Performed By:

Gabrielle Cioffi-Henry
Cultec, Inc.
878 Federal Rd.
Brookfield, CT 06804
PH: 203-775-4416
FX: 203-775-5887

Project Information:

Penn Medicine Princeton Health Punia Blvd
Plainsboro, NJ
West UDS-1

Date: 3/29/23

Project Number: 23-0371.01

System Information

Rectangular Bed Inputs — **No. of Rows:** 9 — **No. of Chambers/Row:** 64

Given:

Storage required	38179	CF	1081.23	m^3
No. 4800 Fabric For Internal/External Manifolds	80	feet		
Number of Inlet/Outlet Pipes (Do Not Include Separator Rows)	5			
Stone **Base**	6	inches	152	mm
Stone **Above**	18	inches	457	mm
Spacing **Between** Rows	9	inches	229	mm
No. of HVLV FC-48 Feed Connectors	16	units		
24"x10" CULTEC Inspection Port Kit w/ Round Frame/Grate	1	units		
Stone Porosity	40	%		
Stone Border Width	15	inches	381	mm

☐ Discount stone base from Total storage provided (If Applicable)
☐ Discount stone above from Total storage provided (If Applicable)

Other Parameters:

Length of Separator Row	0	feet	0.000	m
Type of Lining	None			
☐ Sand Filter Depth (If Applicable)		feet	0.000	m
☐ Slopped Sides (1:1) (If Applicable)				

Maximum Finished Grade Elevation:	93.00
Minimum Finished Grade Elevation (Unpaved):	84.00
Minimum Finished Grade Elevation (Base of Flexible Pavement):	83.50
Minimum Finished Grade Elevation (Top of Rigid Pavement):	83.50
Top of Stone Elevation:	82.50
Top of Chamber Elevation:	81.00
Bottom of Chamber Elevation:	78.00
Bottom of Stone Elevation:	77.50

Assumptions

Model Name		Chamber Height (inches / mm)	Design Unit Height (feet / m)	Chamber Width (inches / mm)	Chamber Spacing (inches / mm)	Design Unit Width (feet / m)	Chamber Volume per Linear Foot (cu. ft/ft / cu. m/m)	Design Unit Volume (cu. ft/ft / cu. m/m)	Installed Chamber Length (feet / m)
Recharger® 360HD Chamber	English	36	5.000	60	9	5.75	10.00	17.499	3.670
	Metric	914	1.524	1524	229	1.75	0.929	1.626	1.119
Recharger® 360HD End Cap	English	36.5	5.000	60	9	5.75	5.168	14.601	1.250
	Metric	927	1.524	1524	229	1.75	0.480	1.356	0.381
HVLV™ FC-48 Feed Connectors	English	12	n/a	16	n/a	n/a	0.913	n/a	0.750
	Metric	305	n/a	406	n/a	n/a	0.085	n/a	0.229

Storage Provided within CULTEC Recharger 360HD Stormwater Chamber, End Caps and HVLV FC-48 Feed Connector Internal Manifold System - *not including stone*

Number of Recharger 360HD chambers by design			=	576	pcs		
576	pcs x	3.670	=	2113.92	feet	644.32	m
Number of Recharger 360HD end caps			=	18	pcs		
18	pcs x	1.250	=	22.50	feet	6.86	m
Number of HVLV FC-48 Feed Connectors			=	16	pcs		
16	pcs x	0.750	=	12.00	feet	3.66	m
Total footage of Recharger 360HD chambers			=	2113.92	feet	644.32	m
Total footage of Recharger 360HD end caps			=	22.50	feet		
Total footage of HVLV FC-48 Feed Connectors			=	12.00	feet	3.66	m
Storage provided within Recharger 360HD chambers			=	21133.92	CF	598.51	m^3
Storage provided within Recharger 360HD end caps				116.28	CF	3.29	m^3
Storage provided within HVLV FC-48 Feed Connectors			=	10.96	CF	0.31	m^3
Total Storage within chambers and feed connectors			=	**21261.15**	**CF**	**602.12**	**m^3**

Storage Provided within Entire CULTEC Stormwater System - *including stone*

Bed width	53.50	feet	16.31	m
Bed length	239.88	feet	73.12	m
Bed Depth	5.00	feet	1.52	m
Total Area	12833.58	sq. ft.	1192.24	m^2
Volume of Effective Excavation *(not including additional cover)*	64167.90	CF	1817.23	m^3
Perimeter of Bed	586.76	feet	178.84	m
Total Storage within CULTEC Recharger 360HD chambers, end caps and feed connectors	21261.15	CF	602.12	m^3
Total Stone Required	42906.75	CF	1215.12	m^3
	1589	CY		
	2225	tons		
Storage provided within stone	17162.70	CF	486.05	m^3
Total Storage within CULTEC Stormwater System =	**38424**	**CF**	**1088.04**	**m^3**

Req. storage attained.

CULTEC MATERIALS LIST

Model	Model #	Quantity	Unit of Measure	Quantity	Unit of Measure
Recharger 360HD Heavy Duty Chamber	360HD	576	pcs		
Recharger 360HD End Cap	360HD EC	18	pcs		
HVLV FC-48 Feed Connectors	FC-48	16	pcs		
CULTEC No. 410 Non-Woven Geotextile	NWG410	4449	Sq. Yards	3720	m2
CULTEC No. 4800 Woven Geotextile 7.5' x 100' (2.29 m x 30.48 m)	75WG4800	154	feet	47	m
24"x10" CULTEC Inspection Port Kit w/ Round Frame/Grate	INSP KIT 2410C	1	pcs		
Total Stone		1589	cubic yards	1215	m^3

☐ DISCLAIMER: If this is a value-engineered project based on a competitor's design.
The following inputs and calculations are based upon limited design information provided to CULTEC by a third-party. An engineer should review the inputs to confirm accuracy of the assumptions.

CULTEC, Inc.
P.O. Box 280
Brookfield, CT 06804

Phone: 203-775-4416
Fax: 203-775-7462
800-662-4703
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P23-03 Penn Med PB Submission Reports 08/09/23

CULTEC Recharger 360HD Stormwater Incremental Storage

Date: March 29, 2023

Project Information
Penn Medicine Princeton Health Punia Blvd
Plainsboro, NJ
West UDS-1

Project Number
23-0371.01

Base of Stone Elevation- 77.50

Recharger 360HD Incremental Storage Volumes

Height of System		End Cap Volume		Chamber Volume		HVLV FC-48 Feed Connector Volume		Stone Volume		Cumulative Storage Volume		Total Cumulative Storage Volume		Stage/Area		Elevation		
in	mm	ft³	m³	ft³	m³	ft³	m³	ft³	m³	ft³	m³	ft³	m³	ft²	m²	ft	m	
60.00	1524	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	38423.89	1088.04	5133.43	476.90	82.50	79.02	Top of Stone Elevation
59.00	1499	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	37996.10	1075.93	5133.43	476.90	82.42	79.00	
58.00	1473	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	37568.31	1063.81	5133.43	476.90	82.33	78.97	
57.00	1448	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	37140.53	1051.70	5133.43	476.90	82.25	78.95	
56.00	1422	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	36712.74	1039.59	5133.43	476.90	82.17	78.92	
55.00	1397	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	36284.96	1027.47	5133.43	476.90	82.08	78.90	
54.00	1372	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	35857.17	1015.36	5133.43	476.90	82.00	78.87	
53.00	1346	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	35429.38	1003.25	5133.43	476.90	81.92	78.85	
52.00	1321	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	35001.60	991.13	5133.43	476.90	81.83	78.82	
51.00	1295	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	34573.81	979.02	5133.43	476.90	81.75	78.80	
50.00	1270	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	34146.03	966.91	5133.43	476.90	81.67	78.77	
49.00	1245	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	33718.24	954.79	5133.43	476.90	81.58	78.74	
48.00	1219	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	33290.45	942.68	5133.43	476.90	81.50	78.72	
47.00	1194	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	32862.67	930.57	5133.43	476.90	81.42	78.69	
46.00	1168	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	32434.88	918.45	5133.43	476.90	81.33	78.67	
45.00	1143	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	32007.10	906.34	5133.43	476.90	81.25	78.64	
44.00	1118	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	31579.31	894.22	5133.43	476.90	81.17	78.62	
43.00	1092	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	31151.52	882.11	5133.43	476.90	81.08	78.59	
42.00	1067	0.18	0.01	46.24	1.31	0.00	0.00	409.22	11.59	455.64	12.90	30723.74	870.00	5467.64	507.94	81.00	78.57	Top of Chamber Elevation
41.00	1041	0.36	0.01	98.07	2.78	0.00	0.00	388.42	11.00	486.84	13.79	30268.10	857.10	5842.10	542.73	80.92	78.54	
40.00	1016	0.54	0.02	145.80	4.13	0.00	0.00	369.25	10.46	515.59	14.60	29781.26	843.31	6187.10	574.78	80.83	78.52	
39.00	991	0.72	0.02	246.98	6.99	0.00	0.00	328.70	9.31	576.41	16.32	29265.67	828.71	6916.89	642.58	80.75	78.49	
38.00	965	0.90	0.03	311.90	8.83	0.00	0.00	302.67	8.57	615.47	17.43	28689.26	812.39	7385.59	686.12	80.67	78.47	
37.00	940	1.08	0.03	360.56	10.21	0.00	0.00	283.13	8.02	644.77	18.26	28073.79	794.96	7737.22	718.79	80.58	78.44	
36.00	914	1.26	0.04	400.97	11.35	0.00	0.00	266.89	7.56	669.13	18.95	27429.03	776.70	8029.50	745.94	80.50	78.41	
35.00	889	1.44	0.04	435.91	12.34	0.00	0.00	252.85	7.16	690.20	19.54	26759.90	757.75	8282.35	769.43	80.42	78.39	
34.00	864	1.62	0.05	466.81	13.22	0.00	0.00	240.41	6.81	708.84	20.07	26069.70	738.21	8506.14	790.22	80.33	78.36	
33.00	838	1.80	0.05	494.54	14.00	0.00	0.00	229.25	6.49	725.59	20.55	25360.86	718.14	8707.09	808.89	80.25	78.34	
32.00	813	1.98	0.06	519.74	14.72	0.00	0.00	219.10	6.20	740.82	20.98	24635.27	697.59	8889.79	825.86	80.17	78.31	
31.00	787	2.16	0.06	542.68	15.37	0.00	0.00	209.85	5.94	754.69	21.37	23894.45	676.61	9056.29	841.33	80.08	78.29	
30.00	762	2.52	0.07	563.78	15.96	0.00	0.00	201.27	5.70	767.57	21.74	23139.76	655.24	9210.81	855.68	80.00	78.26	
29.00	737	2.70	0.08	583.27	16.52	0.00	0.00	193.40	5.48	779.37	22.07	22372.19	633.51	9352.41	868.84	79.92	78.24	
28.00	711	2.88	0.08	601.26	17.03	0.00	0.00	186.13	5.27	790.27	22.38	21592.83	611.44	9483.21	880.99	79.83	78.21	
27.00	686	3.06	0.09	618.03	17.50	0.00	0.00	179.35	5.08	800.44	22.67	20802.56	589.06	9605.30	892.33	79.75	78.19	
26.00	660	3.24	0.09	633.71	17.94	0.00	0.00	173.00	4.90	809.96	22.94	20002.12	566.40	9719.51	902.94	79.67	78.16	
25.00	635	3.42	0.10	648.42	18.36	0.00	0.00	167.05	4.73	818.89	23.19	19192.16	543.46	9826.65	912.90	79.58	78.14	
24.00	610	3.60	0.10	662.20	18.75	0.00	0.00	161.47	4.57	827.26	23.43	18373.27	520.27	9927.16	922.23	79.50	78.11	
23.00	584	3.60	0.10	675.22	19.12	0.00	0.00	156.26	4.42	835.08	23.65	17546.01	496.85	10020.97	930.95	79.42	78.08	
22.00	559	3.78	0.11	687.45	19.47	0.00	0.00	151.30	4.28	842.52	23.86	16710.93	473.20	10110.26	939.24	79.33	78.06	
21.00	533	3.96	0.11	699.03	19.79	0.00	0.00	146.59	4.15	849.58	24.06	15868.40	449.34	10195.00	947.12	79.25	78.03	
20.00	508	4.14	0.12	709.93	20.10	0.00	0.00	142.16	4.03	856.23	24.25	15018.82	425.28	10274.74	954.52	79.17	78.01	
19.00	483	4.32	0.12	720.19	20.39	0.00	0.00	137.98	3.91	862.49	24.42	14162.59	401.04	10349.93	961.51	79.08	77.98	
18.00	457	4.32	0.12	729.88	20.67	0.05	0.00	134.09	3.80	868.33	24.59	13300.10	376.62	10420.01	968.02	79.00	77.96	
17.00	432	4.50	0.13	739.05	20.93	0.37	0.01	130.22	3.69	874.14	24.75	12431.76	352.03	10489.64	974.49	78.92	77.93	
16.00	406	4.68	0.13	747.69	21.17	0.72	0.02	126.55	3.58	879.64	24.91	11557.63	327.28	10555.71	980.63	78.83	77.91	
15.00	381	4.68	0.13	755.88	21.40	0.88	0.02	123.21	3.49	884.65	25.05	10677.99	302.37	10615.77	986.21	78.75	77.88	
14.00	356	4.86	0.14	763.55	21.62	0.97	0.03	120.03	3.40	889.41	25.19	9793.34	277.32	10672.97	991.52	78.67	77.86	
13.00	330	5.04	0.14	770.81	21.83	1.02	0.03	117.04	3.31	893.91	25.31	8903.92	252.13	10726.91	996.53	78.58	77.83	
12.00	305	5.22	0.15	777.62	22.02	1.07	0.03	114.22	3.23	898.13	25.43	8010.02	226.82	10777.53	1001.23	78.50	77.80	
11.00	279	5.22	0.15	784.07	22.20	1.12	0.03	111.62	3.16	902.03	25.54	7111.89	201.39	10824.37	1005.58	78.42	77.78	
10.00	254	5.40	0.15	790.07	22.37	1.14	0.03	109.14	3.09	905.75	25.65	6209.86	175.84	10869.01	1009.73	78.33	77.75	
9.00	229	5.40	0.15	795.72	22.53	1.16	0.03	106.87	3.03	909.16	25.74	5304.11	150.20	10909.86	1013.53	78.25	77.73	
8.00	203	5.58	0.16	801.08	22.68	1.19	0.03	104.65	2.96	912.49	25.84	4394.95	124.45	10949.93	1017.25	78.17	77.70	
7.00	178	6.12	0.17	805.86	22.82	1.27	0.04	102.48	2.90	915.74	25.93	3482.46	98.61	10988.88	1020.87	78.08	77.68	
6.00	152	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	2566.72	72.68	5133.43	476.90	78.00	77.65	Bottom of Chamber Elevation
5.00	127	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	2138.93	60.57	5133.43	476.90	77.92	77.63	
4.00	102	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	1711.14	48.45	5133.43	476.90	77.83	77.60	
3.00	76	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	1283.36	36.34	5133.43	476.90	77.75	77.58	
2.00	51	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	855.57	24.23	5133.43	476.90	77.67	77.55	
1.00	25	0.00	0.00	0.00	0.00	0.00	0.00	427.79	12.11	427.79	12.11	427.79	12.11	5133.43	476.90	77.58	77.53	
0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77.50	77.50	Bottom of Stone Elevation
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Project Summary	
Title	Punia Boulevard Parking
Engineer	Stefanie Pacifico
Company	French and Parrello Associates
Date	7/21/2023

Notes POST-DEVELOPMENT CALCULATIONS

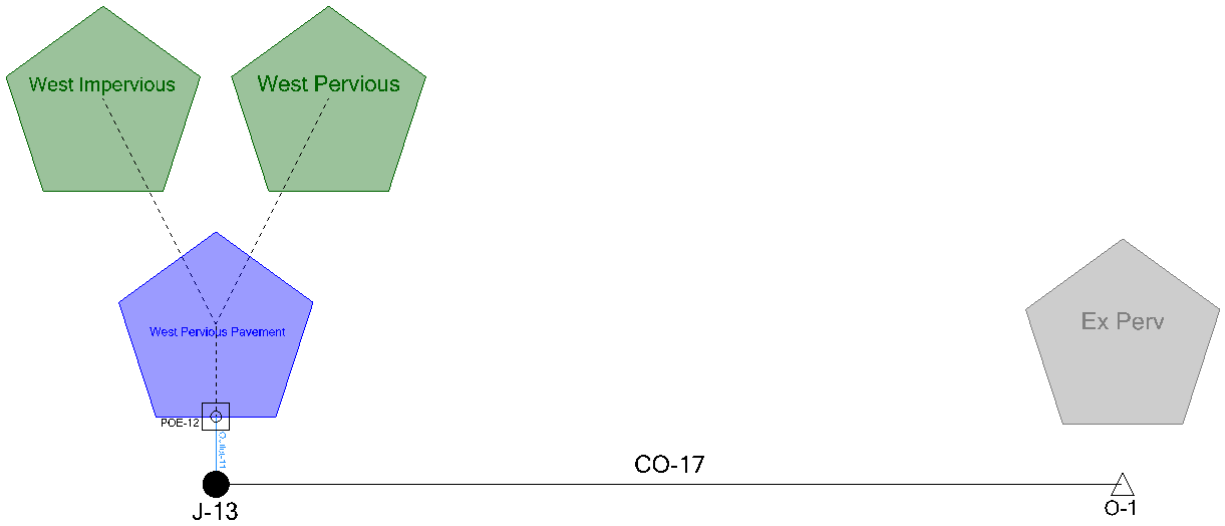


Table of Contents

	Master Network Summary	2
West Impervious		
	Unit Hydrograph Summary, 2 years (Post-Development 2 year)	4
	Unit Hydrograph Summary, 10 years (Post-Development 10 year)	5
	Unit Hydrograph Summary, 25 years (Post-Development 25 year)	6
	Unit Hydrograph Summary, 100 years (Post-Development 100 year)	7
West Pervious		
	Unit Hydrograph Summary, 2 years (Post-Development 2 year)	8
	Unit Hydrograph Summary, 10 years (Post-Development 10 year)	9
	Unit Hydrograph Summary, 25 years (Post-Development 25 year)	10
	Unit Hydrograph Summary, 100 years (Post-Development 100 year)	11
West Outlet		
	Outlet Input Data, 100 years (Post-Development 100 year)	12
	Individual Outlet Curves, 100 years (Post-Development 100 year)	14
	Composite Rating Curve, 100 years (Post-Development 100 year)	17
West Pervious Pavement		
	Elevation-Volume-Flow Table (Pond), 100 years (Post-Development 100 year)	18
West Pervious Pavement (IN)		
	Level Pool Pond Routing Summary, 2 years (Post-Development 2 year)	19
	Level Pool Pond Routing Summary, 10 years (Post-Development 10 year)	20
	Level Pool Pond Routing Summary, 25 years (Post-Development 25 year)	21
	Level Pool Pond Routing Summary, 100 years (Post-Development 100 year)	22

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
West Pervious	Post-Development 2 year	2	1,954.000	732.800	0.32
West Pervious	Post-Development 10 year	10	4,717.000	731.200	0.87
West Pervious	Post-Development 25 year	25	6,963.000	731.200	1.31
West Pervious	Post-Development 100 year	100	11,458.000	731.200	2.18
West Impervious	Post-Development 2 year	2	24,480.000	726.900	6.38
West Impervious	Post-Development 10 year	10	38,351.000	726.900	9.81
West Impervious	Post-Development 25 year	25	48,079.000	726.900	12.21
West Impervious	Post-Development 100 year	100	65,896.000	726.900	16.59

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
O-1	Post-Development 2 year	2	14,487.000	893.050	0.30
O-1	Post-Development 10 year	10	31,005.000	775.850	1.47
O-1	Post-Development 25 year	25	43,378.000	758.350	2.64
O-1	Post-Development 100 year	100	68,784.000	752.800	4.50
J-13	Post-Development 2 year	2	14,488.000	893.000	0.30
J-13	Post-Development 10 year	10	31,005.000	775.800	1.47
J-13	Post-Development 25 year	25	43,377.000	758.300	2.64
J-13	Post-Development 100 year	100	68,781.000	752.750	4.50

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
West Pervious Pavement (IN)	Post-Development 2 year	2	28,318.000	726.900	6.62	(N/A)	(N/A)

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
West Pervious Pavement (OUT)	Post-Development 2 year	2	14,214.000	893.000	0.30	79.44	16,512.000
West Pervious Pavement (IN)	Post-Development 10 year	10	46,099.000	726.900	10.52	(N/A)	(N/A)
West Pervious Pavement (OUT)	Post-Development 10 year	10	28,518.000	775.800	1.47	80.14	23,086.000
West Pervious Pavement (IN)	Post-Development 25 year	25	58,887.000	726.900	13.30	(N/A)	(N/A)
West Pervious Pavement (OUT)	Post-Development 25 year	25	40,343.000	758.300	2.64	80.67	27,420.000
West Pervious Pavement (IN)	Post-Development 100 year	100	82,697.000	726.900	18.45	(N/A)	(N/A)
West Pervious Pavement (OUT)	Post-Development 100 year	100	62,938.000	752.750	4.50	82.24	36,078.000

Subsection: Unit Hydrograph Summary
Label: West Impervious
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	4.000 min
Area (User Defined)	2.166 acres

Computational Time Increment	0.533 min
Time to Peak (Computed)	726.933 min
Flow (Peak, Computed)	6.38 ft³/s
Output Increment	0.050 min
Time to Flow (Peak Interpolated Output)	726.900 min
Flow (Peak Interpolated Output)	6.38 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.166 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.12 in
Runoff Volume (Pervious)	24,507.321 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	24,480.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	4.000 min
Computational Time Increment	0.533 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544
Unit peak, qp	21.48 ft³/s
Unit peak time, Tp	2.667 min
Unit receding limb, Tr	23.467 min
Total unit time, Tb	26.133 min

Subsection: Unit Hydrograph Summary
Label: West Impervious
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	4.000 min
Area (User Defined)	2.166 acres

Computational Time Increment	0.533 min
Time to Peak (Computed)	726.933 min
Flow (Peak, Computed)	9.81 ft³/s
Output Increment	0.050 min
Time to Flow (Peak Interpolated Output)	726.900 min
Flow (Peak Interpolated Output)	9.81 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.166 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.88 in
Runoff Volume (Pervious)	38,392.859 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	38,351.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	4.000 min
Computational Time Increment	0.533 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544
Unit peak, qp	21.48 ft³/s
Unit peak time, Tp	2.667 min
Unit receding limb, Tr	23.467 min
Total unit time, Tb	26.133 min

Subsection: Unit Hydrograph Summary
Label: West Impervious
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	4.000 min
Area (User Defined)	2.166 acres

Computational Time Increment	0.533 min
Time to Peak (Computed)	726.933 min
Flow (Peak, Computed)	12.21 ft³/s
Output Increment	0.050 min
Time to Flow (Peak Interpolated Output)	726.900 min
Flow (Peak Interpolated Output)	12.21 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.166 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.12 in
Runoff Volume (Pervious)	48,130.673 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	48,079.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	4.000 min
Computational Time Increment	0.533 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544
Unit peak, qp	21.48 ft³/s
Unit peak time, Tp	2.667 min
Unit receding limb, Tr	23.467 min
Total unit time, Tb	26.133 min

Subsection: Unit Hydrograph Summary
Label: West Impervious
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	4.000 min
Area (User Defined)	2.166 acres

Computational Time Increment	0.533 min
Time to Peak (Computed)	726.933 min
Flow (Peak, Computed)	16.59 ft³/s
Output Increment	0.050 min
Time to Flow (Peak Interpolated Output)	726.900 min
Flow (Peak Interpolated Output)	16.59 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.166 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.39 in
Runoff Volume (Pervious)	65,965.775 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	65,896.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	4.000 min
Computational Time Increment	0.533 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544
Unit peak, qp	21.48 ft³/s
Unit peak time, Tp	2.667 min
Unit receding limb, Tr	23.467 min
Total unit time, Tb	26.133 min

Subsection: Unit Hydrograph Summary
Label: West Pervious
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Storm Event	NOAA-D (3.35 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.35 in
Time of Concentration (Composite)	12.000 min
Area (User Defined)	0.665 acres

Computational Time Increment	1.600 min
Time to Peak (Computed)	732.800 min
Flow (Peak, Computed)	0.32 ft³/s
Output Increment	0.050 min
Time to Flow (Peak Interpolated Output)	732.800 min
Flow (Peak Interpolated Output)	0.32 ft³/s

Drainage Area	
SCS CN (Composite)	68.000
Area (User Defined)	0.665 acres
Maximum Retention (Pervious)	4.71 in
Maximum Retention (Pervious, 20 percent)	0.94 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.82 in
Runoff Volume (Pervious)	1,968.708 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,954.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	12.000 min
Computational Time Increment	1.600 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544
Unit peak, qp	2.20 ft³/s
Unit peak time, Tp	8.000 min
Unit receding limb, Tr	70.400 min
Total unit time, Tb	78.400 min

Subsection: Unit Hydrograph Summary
Label: West Pervious
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Storm Event	NOAA-D (5.12 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.12 in
Time of Concentration (Composite)	12.000 min
Area (User Defined)	0.665 acres

Computational Time Increment	1.600 min
Time to Peak (Computed)	731.200 min
Flow (Peak, Computed)	0.87 ft³/s
Output Increment	0.050 min
Time to Flow (Peak Interpolated Output)	731.200 min
Flow (Peak Interpolated Output)	0.87 ft³/s

Drainage Area	
SCS CN (Composite)	68.000
Area (User Defined)	0.665 acres
Maximum Retention (Pervious)	4.71 in
Maximum Retention (Pervious, 20 percent)	0.94 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.97 in
Runoff Volume (Pervious)	4,744.531 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	4,717.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	12.000 min
Computational Time Increment	1.600 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544
Unit peak, qp	2.20 ft³/s
Unit peak time, Tp	8.000 min
Unit receding limb, Tr	70.400 min
Total unit time, Tb	78.400 min

Subsection: Unit Hydrograph Summary
Label: West Pervious
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Storm Event	NOAA-D (6.36 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.36 in
Time of Concentration (Composite)	12.000 min
Area (User Defined)	0.665 acres

Computational Time Increment	1.600 min
Time to Peak (Computed)	731.200 min
Flow (Peak, Computed)	1.31 ft³/s
Output Increment	0.050 min
Time to Flow (Peak Interpolated Output)	731.200 min
Flow (Peak Interpolated Output)	1.31 ft³/s

Drainage Area	
SCS CN (Composite)	68.000
Area (User Defined)	0.665 acres
Maximum Retention (Pervious)	4.71 in
Maximum Retention (Pervious, 20 percent)	0.94 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.90 in
Runoff Volume (Pervious)	7,000.932 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	6,963.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	12.000 min
Computational Time Increment	1.600 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544
Unit peak, qp	2.20 ft³/s
Unit peak time, Tp	8.000 min
Unit receding limb, Tr	70.400 min
Total unit time, Tb	78.400 min

Subsection: Unit Hydrograph Summary
Label: West Pervious
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Storm Event	NOAA-D (8.63 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.63 in
Time of Concentration (Composite)	12.000 min
Area (User Defined)	0.665 acres

Computational Time Increment	1.600 min
Time to Peak (Computed)	731.200 min
Flow (Peak, Computed)	2.18 ft³/s
Output Increment	0.050 min
Time to Flow (Peak Interpolated Output)	731.200 min
Flow (Peak Interpolated Output)	2.18 ft³/s

Drainage Area	
SCS CN (Composite)	68.000
Area (User Defined)	0.665 acres
Maximum Retention (Pervious)	4.71 in
Maximum Retention (Pervious, 20 percent)	0.94 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.77 in
Runoff Volume (Pervious)	11,513.617 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	11,458.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	12.000 min
Computational Time Increment	1.600 min
Unit Hydrograph Shape Factor	284.057
K Factor	0.440
Receding/Rising, Tr/Tp	3.544
Unit peak, qp	2.20 ft³/s
Unit peak time, Tp	8.000 min
Unit receding limb, Tr	70.400 min
Total unit time, Tb	78.400 min

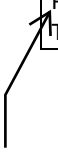
Subsection: Outlet Input Data
Label: West Outlet
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Requested Pond Water Surface Elevations	
Minimum (Headwater)	77.75 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	82.50 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	77.75	82.50
Orifice-Circular	Orifice - 2	Forward	TW	79.50	82.50
Rectangular Weir	Weir - 2	Forward	TW	82.25	82.50
Tailwater Settings	Tailwater			(N/A)	(N/A)



TOP OF BAFFLE WALL

Subsection: Outlet Input Data
Label: West Outlet
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	77.75 ft
Orifice Diameter	3.0 in
Orifice Coefficient	0.600

Structure ID: Orifice - 2 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	79.50 ft
Orifice Diameter	10.0 in
Orifice Coefficient	0.600

Structure ID: Weir - 2 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	82.25 ft
Weir Length	4.00 ft
Weir Coefficient	3.20 (ft^0.5)/s

TOP OF BAFFLE WALL

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Subsection: Individual Outlet Curves
Label: West Outlet
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)	Computation Messages
77.75	0.00	(N/A)	0.00	Upstream HW & DNstream TW < Inv.El
78.25	0.14	(N/A)	0.00	H =.38
78.75	0.22	(N/A)	0.00	H =.88
79.25	0.28	(N/A)	0.00	H =1.38
79.50	0.30	(N/A)	0.00	H =1.63
79.75	0.32	(N/A)	0.00	H =1.88
80.25	0.36	(N/A)	0.00	H =2.38
80.75	0.40	(N/A)	0.00	H =2.88
81.25	0.43	(N/A)	0.00	H =3.38
81.75	0.47	(N/A)	0.00	H =3.88
82.25	0.49	(N/A)	0.00	H =4.38
82.50	0.51	(N/A)	0.00	H =4.63

Subsection: Individual Outlet Curves
Label: West Outlet
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)	Computation Messages
77.75	0.00	(N/A)	0.00	HW & TW below invert
78.25	0.00	(N/A)	0.00	HW & TW below invert
78.75	0.00	(N/A)	0.00	HW & TW below invert
79.25	0.00	(N/A)	0.00	HW & TW below invert
79.50	0.00	(N/A)	0.00	Upstream HW & DNstream TW < Inv.El
79.75	0.19	(N/A)	0.00	CRIT.DEPTH CONTROL Vh= .065ft Dcr= .185ft CRIT.DEPTH Hev= .00ft
80.25	1.38	(N/A)	0.00	CRIT.DEPTH CONTROL Vh= .225ft Dcr= .525ft CRIT.DEPTH Hev= .00ft
80.75	2.40	(N/A)	0.00	H =.83
81.25	3.03	(N/A)	0.00	H =1.33
81.75	3.55	(N/A)	0.00	H =1.83
82.25	4.01	(N/A)	0.00	H =2.33
82.50	4.22	(N/A)	0.00	H =2.58

Subsection: Individual Outlet Curves
Label: West Outlet
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Weir - 2 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)	Computation Messages
77.75	0.00	(N/A)	0.00	HW & TW below Inv.El.=82.250
78.25	0.00	(N/A)	0.00	HW & TW below Inv.El.=82.250
78.75	0.00	(N/A)	0.00	HW & TW below Inv.El.=82.250
79.25	0.00	(N/A)	0.00	HW & TW below Inv.El.=82.250
79.50	0.00	(N/A)	0.00	HW & TW below Inv.El.=82.250
79.75	0.00	(N/A)	0.00	HW & TW below Inv.El.=82.250
80.25	0.00	(N/A)	0.00	HW & TW below Inv.El.=82.250
80.75	0.00	(N/A)	0.00	HW & TW below Inv.El.=82.250
81.25	0.00	(N/A)	0.00	HW & TW below Inv.El.=82.250
81.75	0.00	(N/A)	0.00	HW & TW below Inv.El.=82.250
82.25	0.00	(N/A)	0.00	H=.00; Htw=.00; Qfree=.00;
82.50	1.60	(N/A)	0.00	H=.25; Htw=.00; Qfree=1.60;

Subsection: Composite Rating Curve
Label: West Outlet
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)	Contributing Structures
77.75	0.00	(N/A)	0.00	None Contributing
78.25	0.14	(N/A)	0.00	Orifice - 1
78.75	0.22	(N/A)	0.00	Orifice - 1
79.25	0.28	(N/A)	0.00	Orifice - 1
79.50	0.30	(N/A)	0.00	Orifice - 1
79.75	0.51	(N/A)	0.00	Orifice - 1 + Orifice - 2
80.25	1.74	(N/A)	0.00	Orifice - 1 + Orifice - 2
80.75	2.80	(N/A)	0.00	Orifice - 1 + Orifice - 2
81.25	3.47	(N/A)	0.00	Orifice - 1 + Orifice - 2
81.75	4.02	(N/A)	0.00	Orifice - 1 + Orifice - 2
82.25	4.50	(N/A)	0.00	Orifice - 1 + Orifice - 2 + Weir - 2
82.50	6.33	(N/A)	0.00	Orifice - 1 + Orifice - 2 + Weir - 2

Subsection: Elevation-Volume-Flow Table (Pond)
Label: West Pervious Pavement
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	77.75 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 min

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
77.75	0.00	0.000	0.000	0.00	0.00	0.00
78.25	0.14	4,020.750	0.000	0.00	0.14	2,680.64
78.75	0.22	9,394.630	0.000	0.00	0.22	6,263.31
79.25	0.28	14,585.040	0.000	0.00	0.28	9,723.64
79.50	0.30	17,089.910	0.000	0.00	0.30	11,393.57
79.75	0.51	19,519.200	0.000	0.00	0.51	13,013.31
80.25	1.74	24,077.500	0.000	0.00	1.74	16,053.41
80.75	2.80	27,982.310	0.000	0.00	2.80	18,657.67
81.25	3.47	30,723.740	0.000	0.00	3.47	20,485.96
81.75	4.02	33,290.450	0.000	0.00	4.02	22,197.65
82.25	4.50	36,127.170	0.000	0.00	4.50	24,089.28
82.50	6.33	37,140.530	0.000	0.00	6.33	24,766.68

Subsection: Level Pool Pond Routing Summary
Label: West Pervious Pavement (IN)
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: NOAA-D (3.35 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	77.75 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	6.62 ft³/s	Time to Peak (Flow, In)	726.900 min
Flow (Peak Outlet)	0.30 ft³/s	Time to Peak (Flow, Outlet)	893.000 min

Elevation (Water Surface, Peak)	79.44 ft
Volume (Peak)	16,512.173 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	28,318.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	14,214.000 ft³
Volume (Retained)	14,109.000 ft³
Volume (Unrouted)	4.000 ft³
Error (Mass Balance)	0.015 %

Subsection: Level Pool Pond Routing Summary
Label: West Pervious Pavement (IN)
Scenario: Post-Development 10 year

Return Event: 10 years
Storm Event: NOAA-D (5.12 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	77.75 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	10.52 ft³/s	Time to Peak (Flow, In)	726.900 min
Flow (Peak Outlet)	1.47 ft³/s	Time to Peak (Flow, Outlet)	775.800 min

Elevation (Water Surface, Peak)	80.14 ft
Volume (Peak)	23,085.918 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	46,099.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	28,518.000 ft³
Volume (Retained)	17,580.000 ft³
Volume (Unrouted)	-1.000 ft³
Error (Mass Balance)	0.002 %

Subsection: Level Pool Pond Routing Summary
Label: West Pervious Pavement (IN)
Scenario: Post-Development 25 year

Return Event: 25 years
Storm Event: NOAA-D (6.36 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	77.75 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	13.30 ft³/s	Time to Peak (Flow, In)	726.900 min
Flow (Peak Outlet)	2.64 ft³/s	Time to Peak (Flow, Outlet)	758.300 min

Elevation (Water Surface, Peak)	80.67 ft
Volume (Peak)	27,420.415 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	58,887.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	40,343.000 ft³
Volume (Retained)	18,543.000 ft³
Volume (Unrouted)	-1.000 ft³
Error (Mass Balance)	0.002 %

Subsection: Level Pool Pond Routing Summary
Label: West Pervious Pavement (IN)
Scenario: Post-Development 100 year

Return Event: 100 years
Storm Event: NOAA-D (8.63 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	77.75 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	18.45 ft³/s	Time to Peak (Flow, In)	726.900 min
Flow (Peak Outlet)	4.50 ft³/s	Time to Peak (Flow, Outlet)	752.750 min

Elevation (Water Surface, Peak)	82.24 ft
Volume (Peak)	36,078.488 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	82,697.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	62,938.000 ft³
Volume (Retained)	19,763.000 ft³
Volume (Unrouted)	4.000 ft³
Error (Mass Balance)	0.005 %

Index

M

Master Network Summary...2, 3

W

West Impervious (Unit Hydrograph Summary, 10 years (Post-Development 10 year))...5

West Impervious (Unit Hydrograph Summary, 100 years (Post-Development 100 year))...7

West Impervious (Unit Hydrograph Summary, 2 years (Post-Development 2 year))...4

West Impervious (Unit Hydrograph Summary, 25 years (Post-Development 25 year))...6

West Outlet (Composite Rating Curve, 100 years (Post-Development 100 year))...17

West Outlet (Individual Outlet Curves, 100 years (Post-Development 100 year))...14, 15, 16

West Outlet (Outlet Input Data, 100 years (Post-Development 100 year))...12, 13

West Pervious (Unit Hydrograph Summary, 10 years (Post-Development 10 year))...9

West Pervious (Unit Hydrograph Summary, 100 years (Post-Development 100 year))...11

West Pervious (Unit Hydrograph Summary, 2 years (Post-Development 2 year))...8

West Pervious (Unit Hydrograph Summary, 25 years (Post-Development 25 year))...10

West Pervious Pavement (Elevation-Volume-Flow Table (Pond), 100 years (Post-Development 100 year))...18

West Pervious Pavement (IN) (Level Pool Pond Routing Summary, 10 years (Post-Development 10 year))...20

West Pervious Pavement (IN) (Level Pool Pond Routing Summary, 100 years (Post-Development 100 year))...22

West Pervious Pavement (IN) (Level Pool Pond Routing Summary, 2 years (Post-Development 2 year))...19

West Pervious Pavement (IN) (Level Pool Pond Routing Summary, 25 years (Post-Development 25 year))...21

STORM SEWER DESIGN WORK SHEET

LOCATION		RUNOFF DATA									SEWER DESIGN DATA						
STRUCTURE NUMBER		INCREMENTAL AREA				TIME OF CONCENTRATION					PIPE MATERIAL : HDPE MANNINGS `n' = 0.012						
UPSTREAM	DOWNSTREAM	AREA	WEIGHTED RUNOFF COEFFICIENT	SUBAREA Ac x C	TOTAL AREA	OVERLAND THROUGH AREA, Ta	THROUGH PIPE, Tp	TOTAL Tc OR LONGEST ACCUMULATED Tc	RAINFALL INTENSITY,	RUNOFF PEAK, Q	DIAMETER	LENGTH	SLOPE	CAPACITY AT FULL FLOW, Qf	VELOCITY AT FULL FLOW, Vf	VELOCITY ACTUAL, Va	FLOW TIME THROUGH PIPE
		Ac	C		Ac X C	MIN.	MIN.	MIN.	IN/HR	CFS	INCHES	FEET	%	CFS	FPS	FPS	MIN.
W 1	W 4	0.49	0.74	0.36	0.36	5.0		5.0	7.20	2.6	15	95	1.00	6.5	5.3	5.2	0.3
W 4	W. BASIN	0.30	0.87	0.26	0.62		0.3	5.3	7.20	4.5	15	4	1.16	7.0	5.7	6.3	0.0
W 3	W 6	0.30	0.77	0.23	0.23	5.0		5.0	7.20	1.7	15	89	1.00	6.5	5.3	4.7	0.3
W 6	W. BASIN	0.22	0.91	0.20	0.43		0.3	5.3	7.20	3.1	15	4	1.01	6.5	5.3	5.4	0.0
W 9	W 8	0.44	0.91	0.40	0.40	5.0		5.0	7.20	2.9	15	200	1.00	6.5	5.3	5.4	0.6
W 8	W 7	0.44	0.91	0.40	0.80		0.6	5.6	7.20	5.8	15	32	1.00	6.5	5.3	6.4	0.1
W 7	W. BASIN	0.30	0.92	0.28	1.08		0.1	5.7	7.20	7.8	18	24	1.00	10.5	5.9	6.9	0.1
W 10	W. BASIN	0.31	0.88	0.27	0.27	5.0		5.0	7.20	2.0	15	24	1.00	6.5	5.3	4.9	0.1
W. BASIN	W 12	---	---	---	---	---	---	---	---	2.6	15	112	0.50	4.6	3.7	4.0	0.5
W 12	W 13	---	---	---	---	---	---	---	---	2.6	15	280	0.50	4.6	3.7	4.0	1.2
W 13	EX MH 1	1.57	0.73	1.14	1.14	5.0	--	5.0	7.20	10.8	24	11	0.50	16.0	5.1	5.9	0.0
W 14	EX MH 2	0.86	0.98	0.84	0.84	5.0	--	5.0	7.20	6.1	18	10	0.50	7.4	4.2	5.0	0.0

1. SEE CONSTRUCTION PLANS FOR PROFILE INFORMATION
2. ACTUAL DIMENSION FOR PEAK RUNOFF,Q IS Ac-IN/HR, HOWEVER Ac-fT/Hr, HOWEVER 1.008 Ac-ft/hr IS APPROXIMATELY EQUAL TO 1.0 CFS
3. SEE PLANS FOR PIPE PROFILE AND INLET INFORMATION

PROJECT NAME : PUNIA PARKING LOT

PROJECT NO. : 06C028T.003

STORM FREQUENCY 25 YEAR

COMPUTED BY : S.P. DATE : 04-13-2023

CHECKED BY : DATE :

REVISED BY : KN DATE : 7/19/23

FRENCH & PARRELLO ASSOCIATES

STORM SEWER DESIGN WORK SHEET

LOCATION		RUNOFF DATA									SEWER DESIGN DATA						
STRUCTURE NUMBER		INCREMENTAL AREA				TIME OF CONCENTRATION					PIPE MATERIAL : HDPE MANNINGS `n' = 0.012						
UPSTREAM	DOWNSTREAM	AREA	WEIGHTED RUNOFF COEFFICIENT	SUBAREA Ac x C	TOTAL AREA	OVERLAND THROUGH AREA, Ta	THROUGH PIPE, Tp	TOTAL Tc OR LONGEST ACCUMULATED Tc	RAINFALL INTENSITY,	RUNOFF PEAK, Q	DIAMETER	LENGTH	SLOPE	CAPACITY AT FULL FLOW, Qf	VELOCITY AT FULL FLOW, Vf	VELOCITY ACTUAL, Va	FLOW TIME THROUGH PIPE
		Ac	C		Ac X C	MIN.	MIN.	MIN.	IN/HR	CFS	INCHES	FEET	%	CFS	FPS	FPS	MIN.
W 1	W 4	0.49	0.74	0.36	0.36	5.0		5.0	8.39	3.0	15	95	1.00	7.0	5.7	5.4	0.3
W 4	W. BASIN	0.30	0.87	0.26	0.62		0.3	5.3	8.39	5.2	15	4	1.16	7.5	6.1	6.6	0.0
W 3	W 6	0.30	0.77	0.23	0.23	5.0		5.0	8.39	1.9	15	89	1.00	7.0	5.7	4.8	0.3
W 6	W. BASIN	0.22	0.91	0.20	0.43		0.3	5.3	8.39	3.6	15	4	1.01	7.0	5.7	5.7	0.0
W 9	W 8	0.44	0.91	0.40	0.40	5.0		5.0	8.39	3.4	15	200	1.00	7.0	5.7	5.6	0.6
W 8	W 7	0.44	0.91	0.40	0.80		0.6	5.6	8.39	6.7	15	32	1.00	7.0	5.7	6.5	0.1
W 7	W. BASIN	0.30	0.92	0.28	1.08		0.1	5.7	8.39	9.0	18	24	1.00	11.4	6.4	7.1	0.1
W 10	W. BASIN	0.31	0.88	0.27	0.27	5.0		5.0	8.39	2.3	15	24	1.00	7.0	5.7	5.0	0.1
W. BASIN	W 12	---	---	---	---	---	---	---	---	4.5	15	112	0.50	4.9	4.0	4.5	0.4
W 12	W 13	---	---	---	---	---	---	---	---	4.5	15	280	0.50	4.9	4.0	4.5	1.0
W 13	EX MH 1	1.57	0.73	1.14	1.14	5.0	--	5.0	8.39	14.0	24	11	0.50	17.3	5.5	6.1	0.0
W 14	EX MH 2	0.86	0.98	0.84	0.84	5.0	--	5.0	8.39	7.1	18	10	0.50	8.0	4.6	5.1	0.0

1. SEE CONSTRUCTION PLANS FOR PROFILE INFORMATION
2. ACTUAL DIMENSION FOR PEAK RUNOFF,Q IS Ac-IN/HR, HOWEVER Ac-fT/Hr, HOWEVER 1.008 Ac-ft/hr IS APPROXIMATELY EQUAL TO 1.0 CFS
3. SEE PLANS FOR PIPE PROFILE AND INLET INFORMATION

PROJECT NAME : PUNIA PARKING LOT

PROJECT NO. : 06C028T.003

STORM FREQUENCY 100 YEAR

COMPUTED BY : S.P. DATE : 04-13-2023

CHECKED BY : DATE :

REVISED BY : KN DATE : 7/19/23

FRENCH & PARRELLO ASSOCIATES

Appendix E
Delaware and Raritan Canal Commission

NJDEP Nonstructural Strategies Points System (NSPS)

Version: January 31, 2006

Note: Input Values in Yellow Cells Only

Project:	Temporary Parking Lot
Date:	June 14, 2022
User:	FPA
Notes:	

Step 1 - Provide Basic Major Development Site Information

A. Specify Total Area in Acres of Development Site Described in Steps 2 and 3 = 6.6 **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				Use/Cover Subtotals	Points
		HSG A	HSG B	HSG C	HSG D		
1	Wetlands and Undisturbed Stream Buffers					0.0	0
2	Lawn and Open Space		0.8	1.1		1.9	79
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		1.8	0.8		2.6	106
7	Woods - Indigenous					0.0	0
8	Woods - Planted		0.4			0.4	26
9	Woods and Grass Combination		1.1	0.6		1.7	91
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					0.0	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	4.1	2.5	0.0	**Total Area:**	6.6
	HSG Subtotals (%):	0.0%	62.1%	37.9%	0.0%	**Total % Area:**	100.0%

Points Subtotal: **302**

Total Existing Site Points: **302**

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				Use/Cover Subtotals	Points
		HSG A	HSG B	HSG C	HSG D		
1	Wetlands and Undisturbed Stream Buffers					0.0	0
2	Lawn and Open Space		2.6	1.8		4.4	193
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		0.1			0.1	7
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		1.4	0.7		2.1	95
13	Directly Connected Impervious					0.0	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	4.1	2.5	0.0	**Total Area:**	6.6
	HSG Subtotals (%):	0.0%	62.1%	37.9%	0.0%	**Total % Area:**	100.0%
						Points Subtotal:	**294**

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

Total Directly Connected Impervious Coverage =	0%	% 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 =	0%	% of Site
Effective Site Impervious Coverage =	0%	% 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 =		Feet
Length of Vegetated Runoff Conveyance System =		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: 294

Ratio of Proposed to Existing Site Points: 97%

Required Site Points Ratio: 90%

Nonstructural Point System Results: Proposed Nonstructural Measures are Adequate

Appendix F
Drainage Area Maps

BLOCK 1701
Lot 4.05

BLOCK 1701
Lot 3.01

BLOCK 1701
Lot 4.04

BLOCK 1701
Lot 6

BLOCK 1701
Lot 4.02

PUNIA BOULEVARD
(Private R.O.W.)

BOULEVARD & ACCESS EASEMENT

EXISTING PRIVATE R.O.W. EASEMENT

Boulevard & Access Easement Line per (DB5539-PG.172)

TIME OF CONCENTRATION PATHWAY

NkrA

NknB

EXISTING DRAINAGE AREA

OPEN SPACE, TYPE B = 0.104 AC.
OPEN SPACE, TYPE C = 0.315 AC.
WOODS-GRASS, TYPE B = 1.566 AC.
WOODS-GRASS, TYPE C = 0.782 AC.
WOODS, TYPE B = 0.064 AC.
TOTAL = 2.831 AC.

S44° 28' 20"W 1,776.67'

20' WIDE PSE&G UTILITY EASEMENT PER MAP REF. #4

25' WIDE WATER EASEMENT (EASEMENT #1 - DB6160-PG.522)

15.0' WIDE NEW JERSEY AMERICAN WATER EXCLUSIVE EASEMENT (MAP REF. #1)

15.0' WIDE NEW JERSEY AMERICAN WATER NON-EXCLUSIVE EASEMENT (MAP REF. #1)

STORM WATER BASIN EASEMENT LINE PER MAP REF. #4

25.0' WIDE SOUTH BRUNSWICK UTILITY EASEMENT (MAP REF. #4)

10.0' WIDE UTILITY EASEMENT (MAP REF. #4

15.0' WIDE UTILITY EASEMENT (MAP REF. #4

24.40'

26.0'

28.17'

20.0'

25.0'

Rip Rap

SOLAR PANEL

No.	Date	Revision	Revised By	Checked By

30 0 30 60
SCALE IN FEET

FPA
FRENCH & PARRELLO ASSOCIATES
New Jersey ▲ New York ▲ Pennsylvania ▲ Georgia

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Wall, New Jersey 07719
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FPAengineers.com

EXISTING DRAINAGE AREAS

FOR

PENN MEDICINE PRINCETON HEALTH

PUNIA BOULEVARD PARKING

BLOCK 1701, LOTS 3.01 & 4.04

TOWNSHIP OF PLAINSBORO
MIDDLESEX COUNTY NEW JERSEY

DATE:	DESIGNED BY:	SCALE:	PROJECT NUMBER:
12-16-2022		1" = 30'	06028T.003
DRAWN BY:	CHECKED BY:	FIELD BOOK	SHEET:
SP	JBB		1 of 2

O:\CE\2006\06028t – Cancer Center\06028T.003 – Penn Medical Cancer Center\CADD\DWG\06028T – Temporary Parking Lot\06028T.003 – DA-TPL.dwg EXIST

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PROPOSED DRAINAGE AREA - WEST

MOTOR VEHICLE SURFACE = 2.138 AC.
IMPERVIOUS SURFACE (NON-MVS) = 0.028 AC.
OPEN SPACE, TYPE B = 0.292 AC.
OPEN SPACE, TYPE C = 0.373 AC.
TOTAL = 2.831 AC.

TIME OF CONCENTRATION, WEST PERVIOUS

TIME OF CONCENTRATION, WEST IMPERVIOUS

BLOCK 1701
Lot 4.05

BLOCK 1701
Lot 3.01

BLOCK 1701
Lot 4.02

BLOCK 1701
Lot 6

PUNIA BOULEVARD
(Private R.O.W.)

EXISTING PRIVATE R.O.W. EASEMENT

BOULEVARD & ACCESS EASEMENT

Boulevard & Access Easement Line per (B8539-PG.172)

EXISTING PRIVATE R.O.W. EASEMENT PER MAP REF. #4

25' WIDE PSE&G UTILITY EASEMENT (EASEMENT #1 - DB8160-PG.522)

S44° 28' 20"W 1,776.67'

N44° 28' 20"E 480.62'

S45° 31' 39"E 805.20'

N45° 31' 39"W 789.87'

S46° 18' 00"W 480.86'

20' WIDE UTILITY EASEMENT (TYP.)

15' WIDE NEW JERSEY AMERICAN WATER EASEMENT (TYP.)

10' WIDE NEW JERSEY AMERICAN WATER NON-EXCLUSIVE EASEMENT (TYP.)

15.0' WIDE NEW JERSEY AMERICAN WATER EXCLUSIVE EASEMENT (MAP REF. #3)

STORM WATER BASIN EASEMENT, LINE PER MAP REF. #4

10' WIDE UTILITY EASEMENT (TYP.)

25' WIDE SOUTH BRUNSWICK UTILITY EASEMENT (TYP.)

15.0' WIDE UTILITY EASEMENT (MAP REF. #4)

STORMWATER BASIN EASEMENT (TYP.)

STORM WATER BASIN EASEMENT LINE PER MAP REF. #4

NkrA

NkrB

LIMITS OF SOIL TYPE (TYP.)

ACCESS PORT (TYP.)

ACCESS PORT, WHERE POSSIBLE, INSTALL PORT ON PARKING STRIP (TYP.)

INLETS TO SERVE AS ADDITIONAL POROUS PAVEMENT INSPECTION PORTS (TYP.)

WEST PERVIOUS PAVEMENT; SEE CONSTRUCTION DETAILS FOR LAYOUT AND CROSS SECTIONS

WEST CULTEC CHAMBER LAYOUT (SEE DETAIL)

CONNECT TO CULTEC CHAMBERS

CONNECT CULTEC CHAMBERS TO OUTLET PIPE

INLET # W-1 (B)
GR: 85.20
INV. IN: 83.92 (4")
INV. IN: 83.50 (4")
INV. IN: 83.50 (4")
INV. OUT: 79.15

INLET # W-2 (B)
GR: 85.20
INV. IN: 83.92 (4")
INV. IN: 83.50 (4")
INV. IN: 83.50 (4")
INV. OUT: 79.15

INLET # W-3 (B)
GR: 84.65
INV. OUT: 80.89

INLET # W-4 (B)
GR: 83.93
INV. IN: 80.68 (15")
INV. OUT: 79.05

INLET # W-5 (S)
GR: 84.01
INV. IN: 79.29 (15")
INV. IN: 80.48 (4")
INV. IN: 80.48 (4")
INV. OUT: 78.05

INLET # W-6 (B)
INV. OUT: 78.05

INLET # W-7 (B)
GR: 82.79
INV. IN: 78.25 (15")
INV. OUT: 78.24

INLET # W-8 (B)
GR: 82.65
INV. OUT: 78.57

INLET # W-9 (B)
GR: 82.65
INV. OUT: 79.82

INLET # W-10 (B)
GR: 82.79
INV. IN: 79.50 (15")
INV. OUT: 78.24

INLET # W-13 (DOUBLE S)
GR: 80.54
INV. IN: 74.00 (15")
INV. OUT: 74.00

INLET # W-14 (S)
GR: 79.56
INV. OUT: 72.87

MANHOLE #W-12
GR: 84.00
INV. IN: 75.39 (15")
INV. OUT: 75.39

WEST OUTLET CONTROL STRUCTURE
GR: 84.27
INV. IN: 78.00 (24")
INV. OUT: 75.95

EX STORM MH (1)
RIM: 79.26
INV IN: 73.94(15")
INV OUT: 73.36(EX)

EX STORM MH (2)
RIM: 80.49
INV IN: 72.82(24")
INV OUT: 72.82(EX)

EMERGENCY OVERFLOW
CANT. BERM

309 LF 15" HDPE @ 0.50%

11 LF 15" HDPE @ 0.50%

10 LF 24" ADS @ 0.50%

95 LF 15" HDPE @ 1.00%

4 LF 15" HDPE @ 1.16%

4 LF 15" HDPE @ 1.00%

4 LF 15" HDPE @ 1.01%

32 LF 15" HDPE @ 1.00%

32 LF 15" HDPE @ 1.00%

24 LF 15" HDPE @ 1.00%

10 LF 24" HDPE @ 1.00%

Rip Rap

SOLAR PANEL

No.	Date	Revision	Revised By	Checked By

30 0 30 60
SCALE IN FEET

FPA FRENCH & PARRELLO ASSOCIATES
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FPAengineers.com
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PROPOSED DRAINAGE AREAS
FOR
PENN MEDICINE PRINCETON HEALTH
PUNIA BOULEVARD PARKING
BLOCK 1701, LOTS 3.01 & 4.04
TOWNSHIP OF PLAINSBORO
MIDDLESEX COUNTY NEW JERSEY

DATE:	DESIGNED BY:	SCALE:	PROJECT NUMBER:
12-16-2022		1" = 30'	06C028T.003
DRAWN BY:	CHECKED BY:	FIELD BOOK	SHEET:
SP	JBB		2 of 2

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INLET W-3 AREA
0.088 AC PERVIOUS
0.211 AC IMPERVIOUS

INLET W-1 AREA
0.259 AC PERVIOUS
0.229 AC IMPERVIOUS

INLET W-4 AREA
0.077 AC PERVIOUS
0.220 AC IMPERVIOUS

INLET W-7 AREA
0.039 AC PERVIOUS
0.256 AC IMPERVIOUS

INLET W-8 AREA
0.047 AC PERVIOUS
0.393 AC IMPERVIOUS

INLET W-9 AREA
0.047 AC PERVIOUS
0.393 AC IMPERVIOUS

INLET W-10 AREA
0.044 AC PERVIOUS
0.264 AC IMPERVIOUS

INLET W-6 AREA
0.026 AC PERVIOUS
0.198 AC IMPERVIOUS

INLET W-13 AREA
0.513 AC PERVIOUS
1.057 AC IMPERVIOUS

INLET W-14 AREA
0.063 AC PERVIOUS
0.800 AC IMPERVIOUS

BLOCK 1701
Lot 4.05

BLOCK 1701
Lot 3.01

BLOCK 1701
Lot 4.02
383,377.96 SF OR
8.80 AC

BLOCK 1701
Lot 6

PUNIA BOULEVARD
(Private R.O.W.)

S45° 31' 39"E 805.20'

N45° 31' 39"W 789.87'

N44° 28' 20"E 480.62'

S44° 28' 20"W 1,176.67'

S46° 18' 00"W 480.86'

NkrA

NkrB

STRUCTURE # (46)
RIM: 85.17
INV. OUT: 80.73

INLET # W-2 (B)
RIM: 85.20
INV. IN: 83.92
INV. IN: 83.50
INV. IN: 83.50
INV. OUT: 79.71

INLET # W-3 (B)
RIM: 84.65
INV. OUT: 80.89

INLET # W-4 (B)
RIM: 83.93
INV. IN: 80.60
INV. OUT: 79.05

INLET # W-5 (E)
RIM: 84.31
INV. IN: 78.29 (15")
INV. IN: 80.48
INV. IN: 80.48
INV. OUT: 78.06

INLET # W-7 (B)
RIM: 82.79
INV. IN: 78.25 (15")
INV. OUT: 78.24

INLET # W-8 (B)
RIM: 82.65
INV. OUT: 78.57

INLET # W-9 (B)
RIM: 82.65
INV. OUT: 79.82

INLET # W-10 (B)
RIM: 82.79
INV. IN: 79.50 (15")
INV. OUT: 78.24

INLET # W-13 (DOUBLE E)
RIM: 80.20
INV. IN: 74.05 (24")
INV. OUT: 74.00

INLET # W-14 (E)
RIM: 79.29
INV. OUT: 72.87

MANHOLE #W-12
RIM: 83.59
INV. IN: 75.39 (15")
INV. OUT: 75.39

WEST OUTLET CONTROL STRUCTURE
RIM: 84.27
INV. IN: 78.00 (24")
INV. OUT: 75.95

EX STORM MH (1)
RIM: 79.97
INV. IN: 73.94(24")
INV. OUT: 73.36(EX)

EX STORM MH (2)
RIM: 78.97
INV. IN: 72.82(18")
INV. OUT: 72.82(EX)

WEST PERVIOUS PAVEMENT, SEE CONSTRUCTION DETAILS FOR LAYOUT AND CROSS SECTIONS

LIMITS OF SOIL TYPE (TYP.)

CONCRETE CURB (TYP.)

20' WIDE UTILITY EASEMENT (TYP.)

15' WIDE NEW JERSEY AMERICAN WATER EASEMENT (TYP.)

10' WIDE NEW JERSEY AMERICAN WATER NON-EXCLUSIVE EASEMENT (TYP.)

10' WIDE UTILITY EASEMENT (TYP.)

25' WIDE SOUTH BRUNSWICK UTILITY EASEMENT (TYP.)

STORMWATER BASIN EASEMENT (TYP.)

STORM WATER BASIN EASEMENT, LINE PER MAP REF: #4

10' WIDE UTILITY EASEMENT (TYP.)

10' WIDE UTILITY EASEMENT (TYP.)

EXISTING PRIVATE R.O.W. EASEMENT

BOULEVARD & ACCESS EASEMENT

Boulevard & Access Easement Line per (DB5539-PG.372)

Boulevard & Access Easement Line per (DB5539-PG.372)

25' WIDE PSE&G UTILITY EASEMENT (EASEMENT #1 - DB6160-PG.522)

25' WIDE PSE&G UTILITY EASEMENT (EASEMENT #1 - DB6160-PG.522)

PUNIA BOULEVARD
(Private R.O.W.)

Bar Rule

Bar Rule

Bar Rule

Bar Rule

SOLAR PANEL

SOLAR PANEL

SOLAR PANEL

SOLAR PANEL

No.	Date	Revision	Revised By	Checked By

30 0 30 60
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PROPOSED INLET DRAINAGE AREAS

FOR

PENN MEDICINE PRINCETON HEALTH

PUNIA BOULEVARD PARKING

BLOCK 1701, LOTS 3.01 & 4.04

TOWNSHIP OF PLAINSBORO
MIDDLESEX COUNTY NEW JERSEY

DATE:	DESIGNED BY:	SCALE:	PROJECT NUMBER:
12-16-2022		1" = 30'	06C0281.003
DRAWN BY:	CHECKED BY:	FIELD BOOK	SHEET:
SP	JBB		3 of 3

Q:\CE\2005\06C0281 - Cancer Center\06C0281.003 - Penn Medical Cancer Center\CADD\DWG\06C0281 - Temporary Parking Lot\06C0281.003 - DA-TPL.dwg P-INL

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DUE TO INHERENT ERRORS IN REPRODUCTION METHODS, ERRORS MAY OCCUR WHEN SCALING THIS DRAWING.

1.0 PUNIA PARKING LOT EARTHWORK CALCULATIONS

PERVIOUS PAVEMENT VOLUME CALCULATIONS		
3	IN	THICK PERMEABLE ASPHALT
1	IN	THICK CHOKE COURSE
+ 3	IN	THICK STORAGE BED
7	IN	PERVIOUS PAVEMENT CROSS SECTION THICKNESS
0.583	FT	PERVIOUS PAVEMENT CROSS SECTION THICKNESS
X 200,418	SF	PERVIOUS PAVEMENT AREA
116,911	CF	PERVIOUS PAVEMENT VOLUME

CULTEC CHAMBER STORAGE AREAS VOLUME CALCULATIONS		
15	IN	REMAINING STONE ABOVE CHAMBER
36	IN	CULTEC 360HD HEIGHT
+ 6	IN	STONE BELOW CHAMBERS
57	IN	CULTEC CHAMBER STORAGE AREAS THICKNESS
4.750	FT	CULTEC CHAMBER STORAGE AREAS THICKNESS
X 28,689	SF	CULTEC CHAMBER STORAGE AREAS
136,273	CF	CULTEC CHAMBER STORAGE AREAS VOLUME

PUNIA PARKING LOT EARTHWORK CALCULATIONS			
	CUT (CY)	**FILL (CY)**	**NET (CY)**
EXISTING SURFACE TO PROPOSED SURFACE FINISHED ELEVATIONS	111	8,609	8,499
PERVIOUS PAVEMENT VOLUME	4,330	0	-4,330
CULTEC CHAMBER STORAGE AREAS VOLUME	5,047	0	-5,047
TOTAL PUNIA PARKING LOT EARTHWORK CALCS	**9,488**	**8,609**	**-879**

2.0 PARKING GARAGE EARTHWORK CALCULATIONS

LANDSCAPE AREAS TO REGULAR PAVEMENT (CUT)		
2	IN	THICK SURFACE COURSE
3	IN	THICK BASE COURSE
+ 6	IN	THICK DENSE GRADED AGGREGATE
11	IN	REGULAR PAVEMENT CROSS SECTION THICKNESS
0.917	FT	REGULAR PAVEMENT CROSS SECTION THICKNESS
X 7,535	SF	REGULAR PAVEMENT AREA
6,907	CF	REGULAR PAVEMENT VOLUME

LANDSCAPE AREAS TO PERVIOUS PAVEMENT (CUT)		
3	IN	THICK PERMEABLE ASPHALT
1	IN	THICK CHOKE COURSE
+ 3	IN	THICK STORAGE BED
7	IN	PERVIOUS PAVEMENT CROSS SECTION THICKNESS
0.583	FT	PERVIOUS PAVEMENT CROSS SECTION THICKNESS
X 2,071	SF	PERVIOUS PAVEMENT AREA
1,208	CF	PERVIOUS PAVEMENT VOLUME

CULTEC CHAMBER STORAGE AREAS VOLUME CALCULATIONS		
2	IN	THICK SURFACE COURSE
3	IN	THICK BASE COURSE
+ 6	IN	THICK DENSE GRADED AGGREGATE
11	IN	REGULAR PAVEMENT CROSS SECTION THICKNESS
0.917	FT	PERVIOUS PAVEMENT CROSS SECTION THICKNESS
X 9,373	SF	PERVIOUS PAVEMENT AREA
8,592	CF	PERVIOUS PAVEMENT VOLUME

PUNIA PARKING LOT EARTHWORK CALCULATIONS			
	CUT (CY)	**FILL (CY)**	**NET (CY)**
EXISTING SURFACE TO PROPOSED SURFACE FINISHED ELEVATIONS	985	1,830	845
LANDSCAPE AREAS TO REGULAR PAVEMENT	256	0	-256
LANDSCAPE AREAS TO PERVIOUS PAVEMENT	45	0	-45
PAVEMENT AREAS TO LANDSCAPE	0	318	318
TOTAL PARKING GARAGE EARTHWORK CALCS	**1,286**	**2,148**	**862**

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TECHNICAL MEMORANDUM ADDENDUM
PARKING STUDY

PENN MEDICINE PRINCETON HEALTH CAMPUS
Township Of Plainsboro, Middlesex County, New Jersey

Prepared for
PENN MEDICINE PRINCETON HEALTH
Township Of Plainsboro, New Jersey

Prepared by
DTS Provident Design Engineering, LLP
One North Broadway
White Plains, New York

June 16, 2023
DTS Provident Project No. 0905

Carlito Holt
Charles (Carlito) S. Holt, P.E.
New Jersey P.E. #24GE04890500
Partner

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P23-03 Penn Med PB Submission Reports 08/09/23

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Charles 'Carlito' Holt, P.E., PTOE
Brian Dempsey, P.E., PTOE, RSP1

TECHNICAL MEMORANDUM ADDENDUM

TO:	Ms. Bonnie N. Flynn Director of Planning & Community Development	DATE:	June 16, 2023
FROM:	Carlito Holt, P.E., PTOE Partner	RE:	Parking Study Penn Medicine Princeton Health Campus, Plainsboro, NJ

Introduction

DTS Provident Design Engineering, LLP (DTS Provident) has prepared this Technical Memorandum Addendum (Addendum) to supplement our April 14, 2023 Technical Memorandum and summarize the parking operations during construction of the proposed Cancer Center and Parking Garage at the Penn Medicine Princeton Health (PMPH) Campus located along Plainsboro Road and Campus Road in Plainsboro Township, Middlesex County, New Jersey. The purpose of this Addendum is to verify that parking at the Campus will be adequately served throughout the entire Cancer Center and Parking Garage construction process.

The parking evaluation contained in this Addendum considers the parking requirements at the Health and Medical Office Complex (HMOC) component of the Campus, which consists of the Hospital, Medical Office Building and the former Health/Fitness Center, as well as considering the future additional parking demand along with parking spaces that would be added (both permanent and temporary) or displaced during the course of construction.

Based upon the information contained herein, it is the considered professional opinion of DTS Provident that the supplied parking spaces will be more than adequate to accommodate the parking needs of the HMOC during construction of the proposed Cancer Center and Parking Garage.

Existing Parking Supply & Requirements

As noted in DTS Provident's April 14, 20223 Technical Memorandum, the total parking supply provided at the HMOC is 1,539 parking spaces. Although not counted towards the parking requirements contained in the Amended Redevelopment Plan, it should be noted that the HMOC also utilizes Parking Lot P10, typically referred to as the "Crescent Lot" and located in the Hospital Auxiliary District (HAD), to allow for additional parking availability at the HMOC to accommodate atypical surges in parking demand. Parking Lot P10 provides an additional 315 parking spaces, bringing the total parking supply available to patrons/employees of the HMOC to 1,854 parking spaces.

Based on the approved "Amended Preliminary and Final Major Site Plan" prepared by French & Parrello Associates on July 22, 2010, the total number of parking spaces required by the Amended Redevelopment Plan for the existing HMOC is 1,540 parking spaces.

Construction Phasing

During the course of construction for the proposed Cancer Center and Parking Garage, certain areas of existing parking lots will be unavailable. In addition, construction of the proposed Cancer Center and Parking Garage will increase parking demand due to construction personnel parking on site. In order to accommodate the loss of parking spaces and increase in parking demand, the Applicant proposes to build a series of both permanent and temporary parking areas. The temporary parking areas are further broken down by either long-term temporary parking or short-term temporary parking. For purposes of this Addendum, a long-term temporary parking area is one that services parked vehicles for longer than 6 months while a short-term temporary parking area is one that services parked vehicles no more than 6 months.

The Applicant's construction contractor has provided information as it relates to the timeline of construction as well as the anticipated number of parking spaces that would be displaced and the estimated number of construction vehicles that would need to be accommodated during each phase of construction. DTS Provident broke down this information into seven distinct construction phases, with each phase representing a significant change in parking demand and/or supply.

The following is a brief summary of the parking impacts of each construction phase:

Phase 1 (approximately June 2023 to August 2023)
During Phase 1, construction of the approved expansion to Parking Lot P10 will displace a total of 24 parking spaces. In addition, construction of the Co-Location (COLO) space within the vacant Fitness Center will displace a total of 20 parking spaces. Given the limited number of displaced parking spaces (total of 44 displaced parking spaces) during this Phase, combined with the existing excess parking space capacity, no additional parking relief is required during this construction Phase. Any construction personnel and displaced parkers (HMOC staff/visitors) will be accommodated throughout the site via the excess parking space capacity. During this Phase, the excess parking capacity will be 270 parking spaces. Table No. 1 below summarizes the total parking supply, parking displaced and parking demand during Phase 1. Figure No. 1 below graphically illustrates the parking areas impacted during Phase 1.

TABLE NO. 1
CONSTRUCTION PARKING OPERATIONS
PHASE 1 (~ JUNE 2023 TO AUGUST 2023)
PENN MEDICINE PRINCETON HEALTH, PLAINSBORO, NEW JERSEY

Parking Supply/Displaced/Demand	Number of Parking Spaces
Existing Parking Supply (excluding Lot P10)	+1,539
Existing Parking Supply (Lot P10)	+315
Additional Supply (Lot P10 Expansion)	0
Additional Supply (Proposed Temporary Punia Lot - Long Term)	0
Additional Supply (Proposed Temporary Punia Lot - Short Term)	0
Additional Supply (Proposed Parking Garage)	0
Total Parking Supply	*1,854*
Displaced Parking Supply (due to Lot P10 expansion)	-24
Displaced Parking Supply (due to COLO construction)	-20
Displaced Parking Supply (due to Utility relocation)	0
Displaced Parking Supply (due to Parking Garage construction)	0
Displaced Parking Supply (due to Cancer Center construction)	0
Total Parking Displaced	*-44*
Required HMOC Parking (1)	-1,540
Construction Worker Parking Demand (2)	0
Required Fitness Center Reoccupation Parking (3)	0
Required Cancer Center Expansion Parking (4)	0
Total Parking Demand	*-1,540*
EXCESS PARKING CAPACITY	*+270*

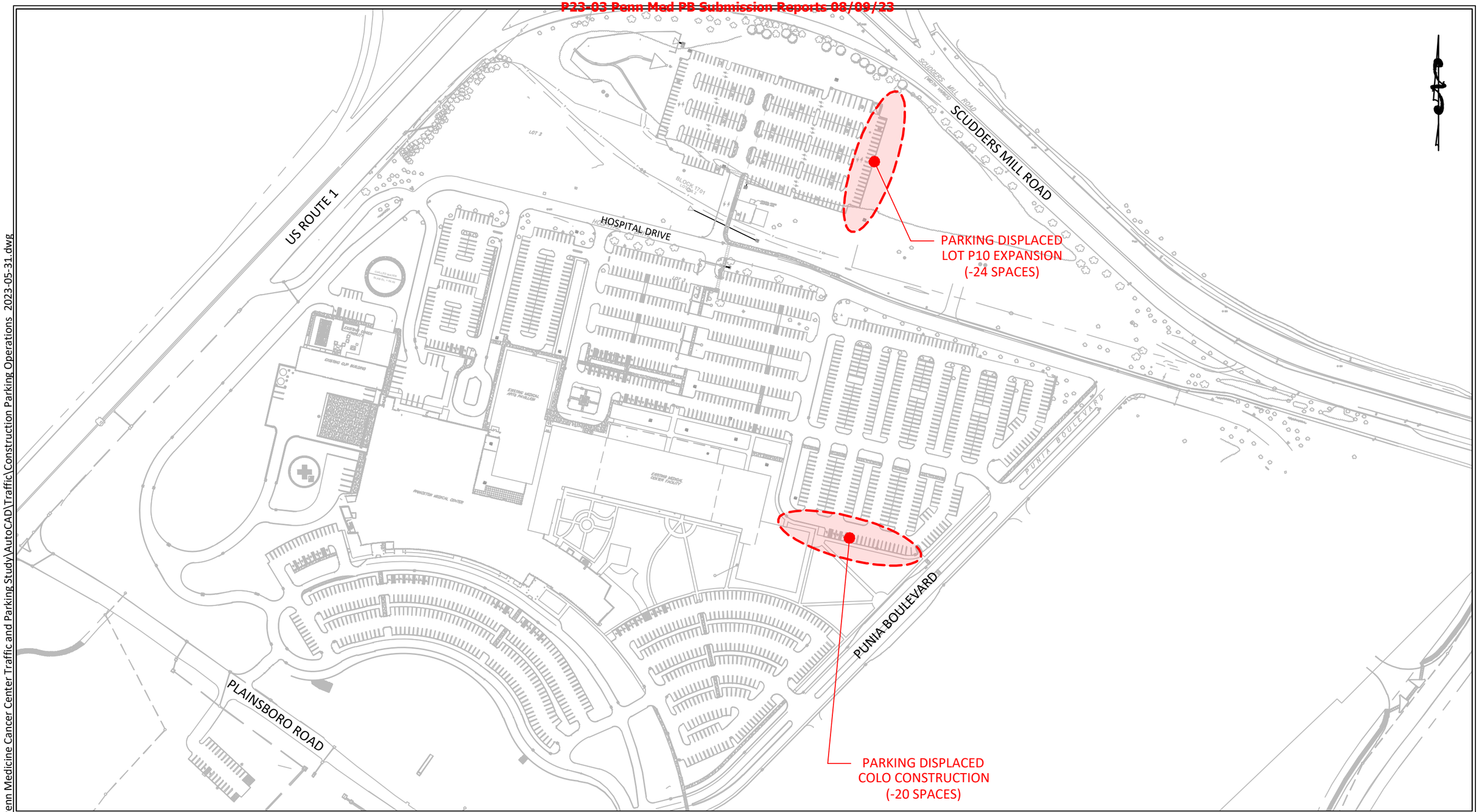
NOTES

(1) Required HMOC parking was obtained from the "Amended Preliminary and Final Major Site Plan", prepared by French & Parrello and dated 7/22/2010.

(2) Maximum construction worker parking demand during this phase, provided by the construction contractor.

(3) Reoccupied Fitness Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.

(4) Proposed Cancer Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.



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Construction Parking Operations
Phase 1 (~ June 2023 to August 2023)
Penn Medicine Princeton Health - Proposed Cancer Center & Parking Garage
Plainsboro Township, Middlesex County, New Jersey

Project No. 0905
Scale: 1" = 200'
June 2023

Figure No. 01

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Phase 2 (approximately September 2023 to December 2023)

By the start of construction Phase 2, the approved expansion to Parking Lot P10 is anticipated to be complete and will add an additional 128 parking spaces to the existing HMOC supply bringing the total supply to 1,982 parking spaces. In addition, construction of the construction offices in the COLO space is anticipated to be complete and the space occupied, adding an additional 10 parked vehicles for construction personnel to the existing peak parking demand at the HMOC. Finally, relocating utilities for the proposed Parking Garage construction will displace a total of 45 parking spaces in Parking Lot P5. Given the limited number of displaced parking spaces during this Phase, combined with the existing excess parking space capacity and the additional 128 parking space capacity added as part of the Parking Lot P10 expansion, no additional parking relief is required during this construction Phase. Construction personnel will utilize parking spaces in Parking Lot P10 and displaced parkers (HMOC staff/visitors) will be accommodated throughout the site via the excess parking space capacity. During this Phase, the excess parking capacity will be 387 parking spaces. Table No. 2 below summarizes the total parking supply, parking displaced and parking demand during Phase 2. Figure No. 2 below graphically illustrates the parking areas impacted during Phase 2.

TABLE NO. 2
CONSTRUCTION PARKING OPERATIONS
PHASE 2 (~ SEPTEMBER 2023 TO DECEMBER 2023)
PENN MEDICINE PRINCETON HEALTH, PLAINSBORO, NEW JERSEY

Parking Supply/Displaced/Demand	Number of Parking Spaces
Existing Parking Supply (excluding Lot P10)	+1,539
Existing Parking Supply (Lot P10)	+315
Additional Supply (Lot P10 Expansion)	+128
Additional Supply (Proposed Temporary Punia Lot - Long Term)	0
Additional Supply (Proposed Temporary Punia Lot - Short Term)	0
Additional Supply (Proposed Parking Garage)	0
Total Parking Supply	*1,982*
Displaced Parking Supply (due to Lot P10 expansion)	0
Displaced Parking Supply (due to COLO construction)	0
Displaced Parking Supply (due to Utility relocation)	-45
Displaced Parking Supply (due to Parking Garage construction)	0
Displaced Parking Supply (due to Cancer Center construction)	0
Total Parking Displaced	*-45*
Required HMOC Parking (1)	-1,540
Construction Worker Parking Demand (2)	-10
Required Fitness Center Reoccupation Parking (3)	0
Required Cancer Center Expansion Parking (4)	0
Total Parking Demand	*-1,550*
EXCESS PARKING CAPACITY	*+387*

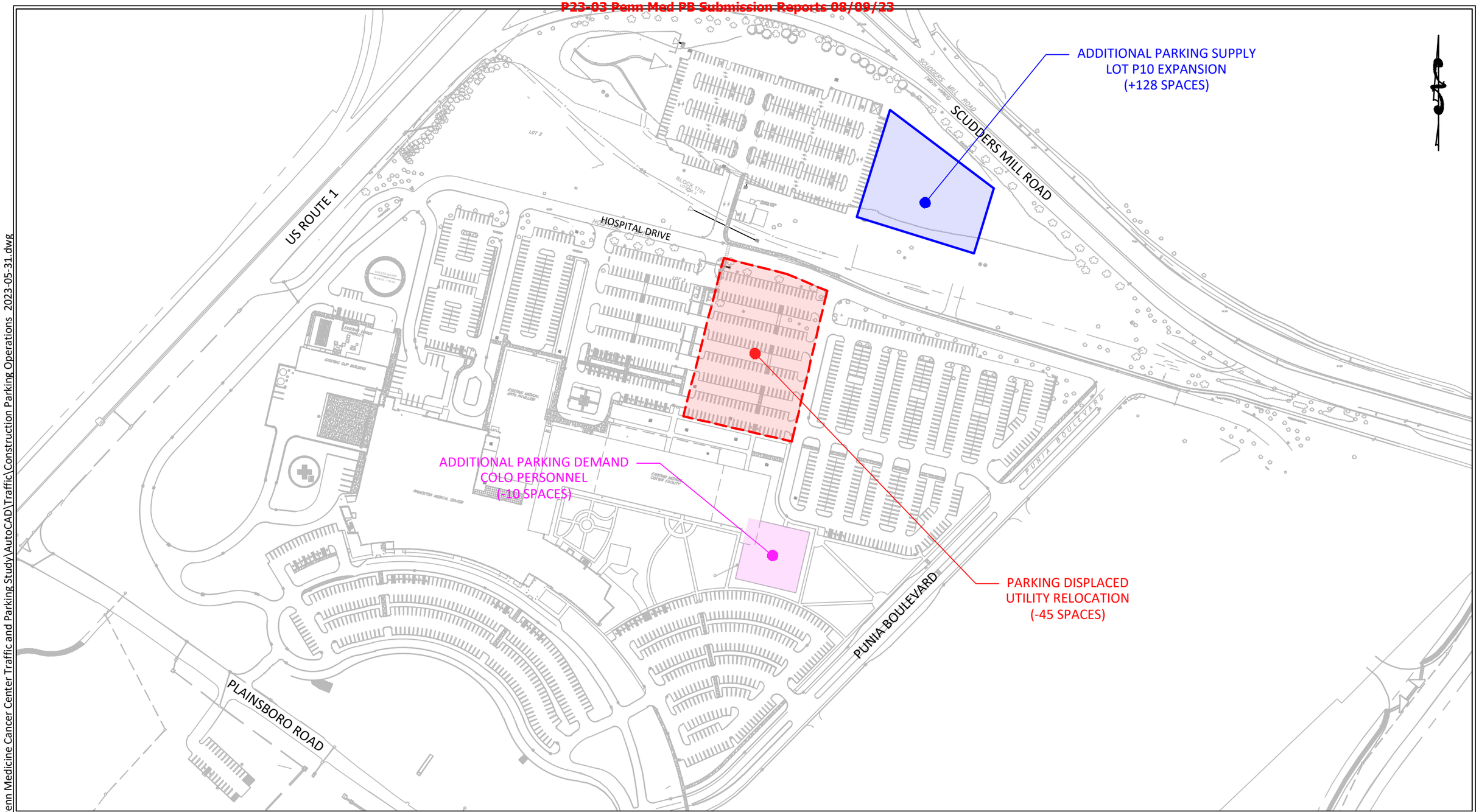
NOTES

(1) Required HMOC parking was obtained from the "Amended Preliminary and Final Major Site Plan", prepared by French & Parrello and dated 7/22/2010.

(2) Maximum construction worker parking demand during this phase, provided by the construction contractor.

(3) Reoccupied Fitness Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.

(4) Proposed Cancer Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.



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Construction Parking Operations
Phase 2 (~ September 2023 to December 2023)
Penn Medicine Princeton Health - Proposed Cancer Center & Parking Garage
Plainsboro Township, Middlesex County, New Jersey

Project No. 0905
Scale: 1" = 200'
June 2023

Figure No. 02

Phase 3 (approximately January 2024 to September 2024)

During Phase 3, construction of the proposed Parking Garage is anticipated to commence, which will result in a displacement of 246 parking spaces in Parking Lots P5 and P6. Towards the latter end of this Phase, construction on the proposed Cancer Center is anticipated to begin and will initially displace a total of 75 parking spaces in Parking Lot P2. Construction of these two proposed facilities will result in an additional demand of 45 parked vehicles for construction personnel (20 vehicles for the proposed Parking Garage construction and 25 vehicles for the proposed Cancer Center construction). As a result of the displaced parking spaces and additional parking demand during this Phase, the Applicant proposes to construct a long-term (longer than 6 months) temporary parking lot along Punia Boulevard to adequately accommodate the parking demand during this Phase. This temporary long-term parking lot would provide a total of 304 parking spaces, resulting in an excess parking capacity of 370 parking spaces during this Phase. Construction personnel will utilize parking spaces in either Parking Lot P10 or the temporary long-term parking area along Punia Boulevard. In addition, HMOC staff will utilize the temporary long-term parking area to free up existing parking spaces for visitor parking spaces that were displaced as part of the Cancer Center and Parking Garage construction. Table No. 3 below summarizes the total parking supply, parking displaced and parking demand during Phase 3. Figure No. 3 below graphically illustrates the parking areas impacted during Phase 3.

TABLE NO. 3
CONSTRUCTION PARKING OPERATIONS
PHASE 3 (~ JANUARY 2024 TO SEPTEMBER 2024)
PENN MEDICINE PRINCETON HEALTH, PLAINSBORO, NEW JERSEY

Parking Supply/Displaced/Demand	Number of Parking Spaces
Existing Parking Supply (excluding Lot P10)	+1,539
Existing Parking Supply (Lot P10)	+315
Additional Supply (Lot P10 Expansion)	+128
Additional Supply (Proposed Temporary Punia Lot - Long Term)	+304
Additional Supply (Proposed Temporary Punia Lot - Short Term)	0
Additional Supply (Proposed Parking Garage)	0
Total Parking Supply	*2,286*
Displaced Parking Supply (due to Lot P10 expansion)	0
Displaced Parking Supply (due to COLO construction)	0
Displaced Parking Supply (due to Utility relocation)	0
Displaced Parking Supply (due to Parking Garage construction)	-246
Displaced Parking Supply (due to Cancer Center construction)	-75
Total Parking Displaced	*-321*
Required HMOC Parking (1)	-1,540
Construction Worker Parking Demand (2)	-55
Required Fitness Center Reoccupation Parking (3)	0
Required Cancer Center Expansion Parking (4)	0
Total Parking Demand	*-1,595*
EXCESS PARKING CAPACITY	*+370*

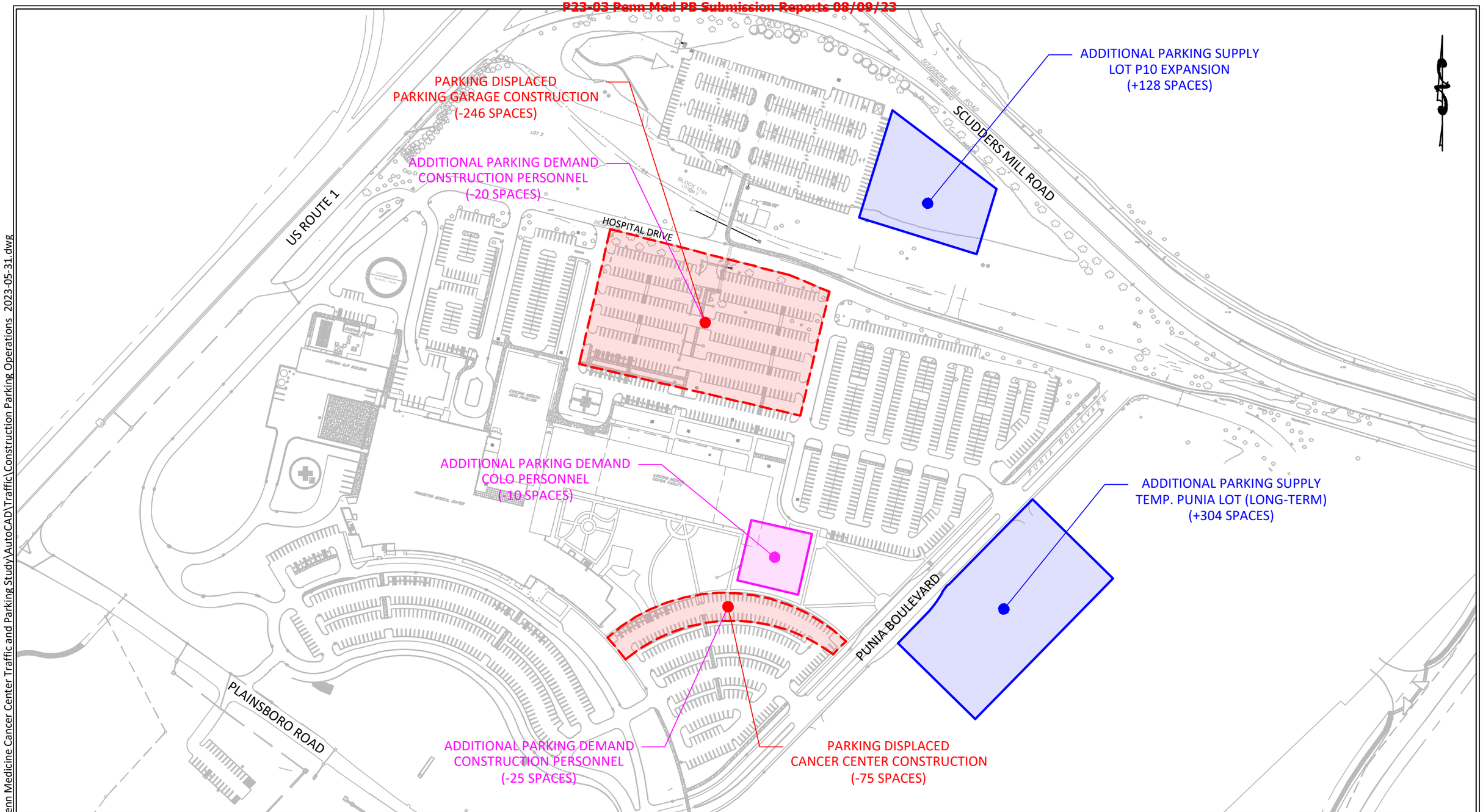
NOTES

(1) Required HMOC parking was obtained from the "Amended Preliminary and Final Major Site Plan", prepared by French & Parrello and dated 7/22/2010.

(2) Maximum construction worker parking demand during this phase, provided by the construction contractor.

(3) Reoccupied Fitness Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.

(4) Proposed Cancer Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.



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Construction Parking Operations
Phase 3 (~ January 2024 to September 2024)
Penn Medicine Princeton Health - Proposed Cancer Center & Parking Garage
Plainsboro Township, Middlesex County, New Jersey

Project No. 0905
Scale: 1" = 200'
June 2023

Figure No. 03

Phase 4 (approximately October 2024)

During Phase 4, which is anticipated to last for approximately one month, construction on the proposed Cancer Center is expected to ramp up. The number of displaced parking spaces in Parking Lot P2 is expected to increase from 75 parking spaces in Phase 3 to 200 parking spaces in this Phase, and the parking demand for construction personnel is expected to increase from 25 vehicles in Phase 3 to 50 vehicles in this Phase. Given the additional parking spaces constructed for the temporary parking area in Phase 3, no additional parking relief is required during this construction Phase to accommodate the increase in displaced parking spaces and construction personnel. Construction personnel will continue to utilize parking spaces in either Parking Lot P10 or the temporary long-term parking area along Punia Boulevard, and HMOC staff will continue to utilize the temporary long-term parking area to free up existing parking spaces for visitor parking spaces that were displaced as part of the Cancer Center and Parking Garage construction. During this Phase, the excess parking capacity will be 220 parking spaces, which is expected to be the lowest parking capacity available throughout the entire construction process. Table No. 4 below summarizes the total parking supply, parking displaced and parking demand during Phase 4. Figure No. 4 below graphically illustrates the parking areas impacted during Phase 4.

TABLE NO. 4
CONSTRUCTION PARKING OPERATIONS
PHASE 4 (~ OCTOBER 2024)
PENN MEDICINE PRINCETON HEALTH, PLAINSBORO, NEW JERSEY

Parking Supply/Displaced/Demand	Number of Parking Spaces
Existing Parking Supply (excluding Lot P10)	+1,539
Existing Parking Supply (Lot P10)	+315
Additional Supply (Lot P10 Expansion)	+128
Additional Supply (Proposed Temporary Punia Lot - Long Term)	+304
Additional Supply (Proposed Temporary Punia Lot - Short Term)	0
Additional Supply (Proposed Parking Garage)	0
Total Parking Supply	*2,286*
Displaced Parking Supply (due to Lot P10 expansion)	0
Displaced Parking Supply (due to COLO construction)	0
Displaced Parking Supply (due to Utility relocation)	0
Displaced Parking Supply (due to Parking Garage construction)	-246
Displaced Parking Supply (due to Cancer Center construction)	-200
Total Parking Displaced	*-446*
Required HMOC Parking [(1)]	-1,540
Construction Worker Parking Demand [(2)]	-80
Required Fitness Center Reoccupation Parking [(3)]	0
Required Cancer Center Expansion Parking [(4)]	0
Total Parking Demand	*-1,620*
EXCESS PARKING CAPACITY	*+220*

NOTES

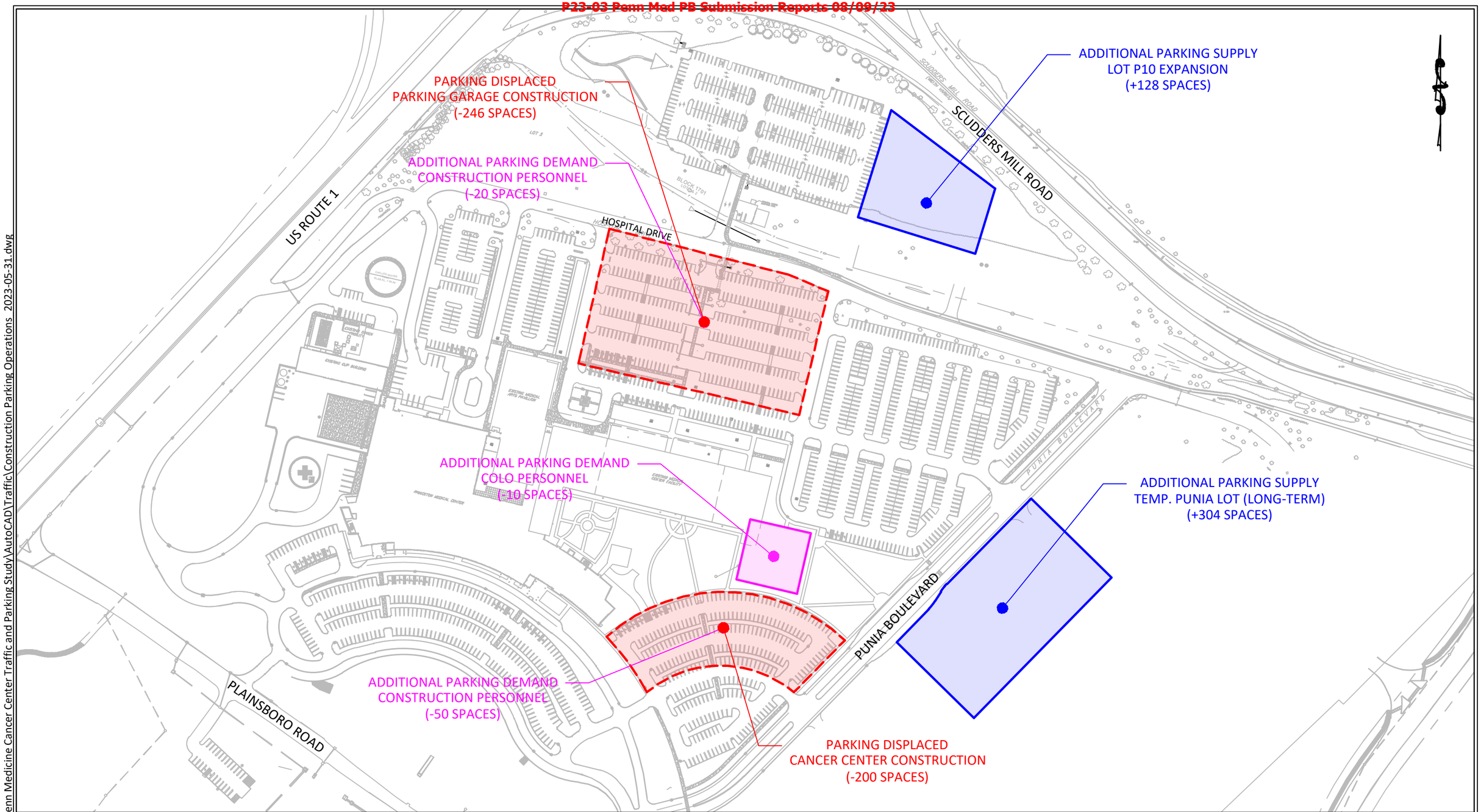
(1) Required HMOC parking was obtained from the "Amended Preliminary and Final Major Site Plan", prepared by French & Parrello and dated 7/22/2010.

(2) Maximum construction worker parking demand during this phase, provided by the construction contractor.

(3) Reoccupied Fitness Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.

(4) Proposed Cancer Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.

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Construction Parking Operations
Phase 4 (~ October 2024)
Penn Medicine Princeton Health - Proposed Cancer Center & Parking Garage
Plainsboro Township, Middlesex County, New Jersey

Project No. 0905
Scale: 1" = 200'
June 2023

Figure No. 04

Phase 5 (approximately November 2024 to December 2024)

During Phase 5, as a result of the proposed Cancer Center construction, the number of displaced parking spaces in Parking Lot P2 is expected to increase from 200 parking spaces in Phase 4 to 272 parking spaces in this Phase, and the parking demand for construction personnel is expected to increase from 50 vehicles in Phase 4 to 75 vehicles in this Phase. As a result of the displaced parking spaces and additional parking demand during this Phase, the Applicant proposes to construct a short-term (shorter than 6 months) temporary parking lot along Punia Boulevard, behind the long-term temporary parking lot constructed as part of Phase 3, to adequately accommodate the parking demand during this Phase. This temporary short-term parking lot would provide a total of 324 parking spaces, resulting in an excess parking capacity of 447 parking spaces during this Phase, and would be removed upon completion of Phase 6. Construction personnel will utilize parking spaces in the temporary short-term parking area along Punia Boulevard. In addition, HMOC staff will utilize the temporary long-term parking area to free up existing parking spaces for visitor parking spaces that were displaced as part of the Cancer Center and Parking Garage construction. Table No. 5 below summarizes the total parking supply, parking displaced and parking demand during Phase 5. Figure No. 5 below graphically illustrates the parking areas impacted during Phase 5.

TABLE NO. 5
CONSTRUCTION PARKING OPERATIONS
PHASE 5 (~ NOVEMBER 2024 TO DECEMBER 2024)
PENN MEDICINE PRINCETON HEALTH, PLAINSBORO, NEW JERSEY

Parking Supply/Displaced/Demand	Number of Parking Spaces
Existing Parking Supply (excluding Lot P10)	+1,539
Existing Parking Supply (Lot P10)	+315
Additional Supply (Lot P10 Expansion)	+128
Additional Supply (Proposed Temporary Punia Lot - Long Term)	+304
Additional Supply (Proposed Temporary Punia Lot - Short Term)	+324
Additional Supply (Proposed Parking Garage)	0
Total Parking Supply	*2,610*
Displaced Parking Supply (due to Lot P10 expansion)	0
Displaced Parking Supply (due to COLO construction)	0
Displaced Parking Supply (due to Utility relocation)	0
Displaced Parking Supply (due to Parking Garage construction)	-246
Displaced Parking Supply (due to Cancer Center construction)	-272
Total Parking Displaced	*-518*
Required HMOC Parking [(1)]	-1,540
Construction Worker Parking Demand [(2)]	-105
Required Fitness Center Reoccupation Parking [(3)]	0
Required Cancer Center Expansion Parking [(4)]	0
Total Parking Demand	*-1,645*
EXCESS PARKING CAPACITY	*+447*

NOTES

(1) Required HMOC parking was obtained from the "Amended Preliminary and Final Major Site Plan", prepared by French & Parrello and dated 7/22/2010.

(2) Maximum construction worker parking demand during this phase, provided by the construction contractor.

(3) Reoccupied Fitness Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.

(4) Proposed Cancer Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.

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PARKING DISPLACED
PARKING GARAGE CONSTRUCTION
(-246 SPACES)

ADDITIONAL PARKING DEMAND
CONSTRUCTION PERSONNEL
(-20 SPACES)

ADDITIONAL PARKING SUPPLY
LOT P10 EXPANSION
(+128 SPACES)

US ROUTE 1

SCUDDERS MILL ROAD

HOSPITAL DRIVE

ADDITIONAL PARKING DEMAND
COLO PERSONNEL
(-10 SPACES)

ADDITIONAL PARKING SUPPLY
TEMP. PUNIA LOT (LONG-TERM)
(+304 SPACES)

ADDITIONAL PARKING SUPPLY
TEMP. PUNIA LOT (SHORT-TERM)
(+324 SPACES)

PUNIA BOULEVARD

PLAINSBORO ROAD

ADDITIONAL PARKING DEMAND
CONSTRUCTION PERSONNEL
(-75 SPACES)

PARKING DISPLACED (FULL)
CANCER CENTER CONSTRUCTION
(-272 SPACES)

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Construction Parking Operations
Phase 5 (~ November 2024 to December 2024)
Penn Medicine Princeton Health - Proposed Cancer Center & Parking Garage
Plainsboro Township, Middlesex County, New Jersey

Project No. 0905
Scale: 1" = 200'
June 2023

Figure No. 05

Phase 6 (approximately January 2025 to March 2025)

During Phase 6, as a result of the proposed Cancer Center construction, the parking demand for construction personnel is expected to increase from 75 vehicles in Phase 5 to 125 vehicles in this Phase. In addition, construction of the proposed Parking Garage is expected to be winding down and as a result, the parking demand for construction personnel is expected to decrease from 20 vehicles in Phases 3, 4 and 5 to 10 vehicles in this Phase. Finally, the vacant Fitness Center space is anticipated to be reoccupied, resulting in an additional parking demand of 177 vehicles. Given the additional parking spaces constructed for the two temporary parking areas in Phases 3 and 5, with the short-term temporary parking lot scheduled to be taken out of service at the conclusion of this Phase, no additional parking relief is required during this construction Phase to accommodate the increase in parking demand. Construction personnel will continue to utilize parking spaces in the temporary short-term parking area along Punia Boulevard, and HMOC staff will continue to utilize the temporary long-term parking area to free up existing parking spaces for visitor parking spaces that were displaced as part of the Cancer Center and Parking Garage construction. During this Phase, the excess parking capacity will be 240 parking spaces. Table No. 6 below summarizes the total parking supply, parking displaced and parking demand during Phase 6. Figure No. 6 below graphically illustrates the parking areas impacted during Phase 6.

TABLE NO. 6
CONSTRUCTION PARKING OPERATIONS
PHASE 6 (~ JANUARY 2025 TO MARCH 2025)
PENN MEDICINE PRINCETON HEALTH, PLAINSBORO, NEW JERSEY

Parking Supply/Displaced/Demand	Number of Parking Spaces
Existing Parking Supply (excluding Lot P10)	+1,539
Existing Parking Supply (Lot P10)	+315
Additional Supply (Lot P10 Expansion)	+128
Additional Supply (Proposed Temporary Punia Lot - Long Term)	+304
Additional Supply (Proposed Temporary Punia Lot - Short Term)	+324
Additional Supply (Proposed Parking Garage)	0
Total Parking Supply	*2,610*
Displaced Parking Supply (due to Lot P10 expansion)	0
Displaced Parking Supply (due to COLO construction)	0
Displaced Parking Supply (due to Utility relocation)	0
Displaced Parking Supply (due to Parking Garage construction)	-246
Displaced Parking Supply (due to Cancer Center construction)	-272
Total Parking Displaced	*-518*
Required HMOC Parking [(1)]	-1,540
Construction Worker Parking Demand [(2)]	-135
Required Fitness Center Reoccupation Parking [(3)]	-177
Required Cancer Center Expansion Parking [(4)]	0
Total Parking Demand	*-1,852*
EXCESS PARKING CAPACITY	*+240*

NOTES

(1) Required HMOC parking was obtained from the "Amended Preliminary and Final Major Site Plan", prepared by French & Parrello and dated 7/22/2010.

(2) Maximum construction worker parking demand during this phase, provided by the construction contractor.

(3) Reoccupied Fitness Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.

(4) Proposed Cancer Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.

PARKING DISPLACED
PARKING GARAGE CONSTRUCTION
(-246 SPACES)

ADDITIONAL PARKING DEMAND
CONSTRUCTION PERSONNEL
(-10 SPACES)

ADDITIONAL PARKING SUPPLY
LOT P10 EXPANSION
(+128 SPACES)

US ROUTE 1

SCUDDERS MILL ROAD

HOSPITAL DRIVE

ADDITIONAL PARKING DEMAND
REOCCUPIED FITNESS CENTER
(-177 SPACES)

ADDITIONAL PARKING SUPPLY
TEMP. PUNIA LOT (LONG-TERM)
(+304 SPACES)

ADDITIONAL PARKING SUPPLY
TEMP. PUNIA LOT (SHORT-TERM)
(+324 SPACES)

PUNIA BOULEVARD

PLAINSBORO ROAD

ADDITIONAL PARKING DEMAND
CONSTRUCTION PERSONNEL
(-125 SPACES)

PARKING DISPLACED (FULL)
CANCER CENTER CONSTRUCTION
(-272 SPACES)

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Construction Parking Operations
Phase 6 (~ January 2025 to March 2025)
Penn Medicine Princeton Health - Proposed Cancer Center & Parking Garage
Plainsboro Township, Middlesex County, New Jersey

Project No. 0905
Scale: 1" = 200'
June 2023

Figure No. 06

Phase 7 (approximately last 3 quarters of 2025 + all of 2026 + first quarter of 2027)

By the start of construction Phase 7, the proposed Parking Garage is anticipated to be complete, which will add an additional 1,161 parking spaces to the existing HMOC supply, while the 324-space temporary short-term parking lot would along Punia Boulevard would be taken offline. Eliminating the parking supply of the short-term temporary parking lot along with the opening of the proposed Parking Garage, while also accounting for the parking spaces displaced by the proposed Parking Garage and Cancer Center, would bring the total HMOC/HAD parking supply to 3,447 parking spaces. In addition, as a result of the proposed Cancer Center construction, the parking demand for construction personnel is expected to increase from 125 vehicles in Phase 6 to a peak of 200 vehicles in this Phase. Construction personnel will utilize parking spaces in the long-term temporary parking lot along Punia Boulevard while HMOC staff will return to utilizing existing parking spaces located throughout the site. During this Phase, the excess parking capacity will be a minimum of 1,076 parking spaces. Table No. 7 below summarizes the total parking supply, parking displaced and parking demand during Phase 7. Figure No. 7 below graphically illustrates the parking areas impacted during Phase 7.

TABLE NO. 7
CONSTRUCTION PARKING OPERATIONS
PHASE 7 (~ LAST 3 QUARTERS OF 2025 + ALL OF 2026 + FIRST QUARTER OF 2027)
PENN MEDICINE PRINCETON HEALTH, PLAINSBORO, NEW JERSEY

Parking Supply/Displaced/Demand	Number of Parking Spaces
Existing Parking Supply (excluding Lot P10)	+1,539
Existing Parking Supply (Lot P10)	+315
Additional Supply (Lot P10 Expansion)	+128
Additional Supply (Proposed Temporary Punia Lot - Long Term)	+304
Additional Supply (Proposed Temporary Punia Lot - Short Term)	0
Additional Supply (Proposed Parking Garage)	+1,161
Total Parking Supply	*3,447*
Displaced Parking Supply (due to Lot P10 expansion)	0
Displaced Parking Supply (due to COLO construction)	0
Displaced Parking Supply (due to Utility relocation)	0
Displaced Parking Supply (due to Parking Garage construction)	-182
Displaced Parking Supply (due to Cancer Center construction)	-272
Total Parking Displaced	*-454*
Required HMOC Parking [(1)]	-1,540
Construction Worker Parking Demand [(2)]	-200
Required Fitness Center Reoccupation Parking [(3)]	-177
Required Cancer Center Expansion Parking [(4)]	0
Total Parking Demand	*-1,917*
EXCESS PARKING CAPACITY	*+1,076*

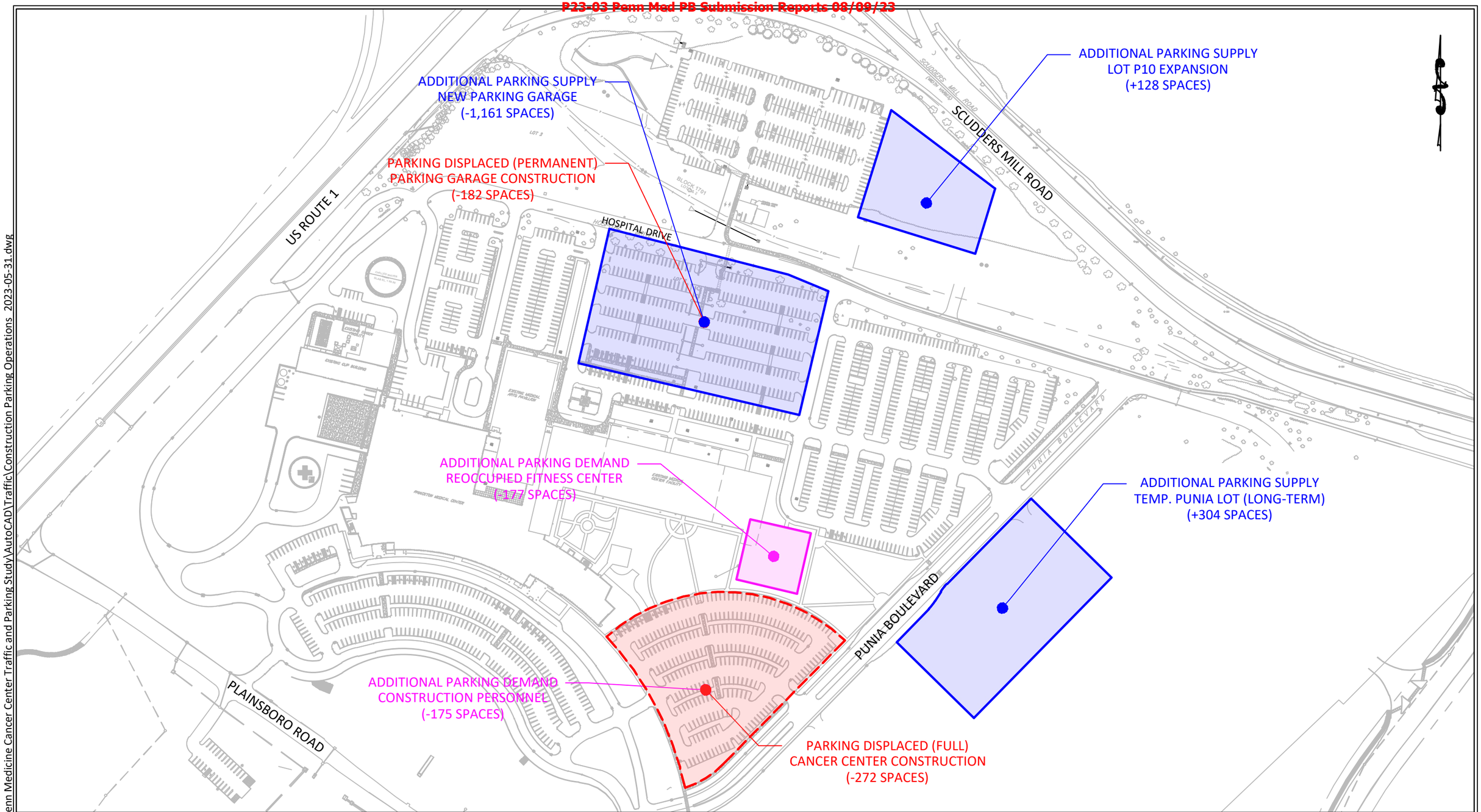
NOTES

(1) Required HMOC parking was obtained from the "Amended Preliminary and Final Major Site Plan", prepared by French & Parrello and dated 7/22/2010.

(2) Maximum construction worker parking demand during this phase, provided by the construction contractor.

(3) Reoccupied Fitness Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.

(4) Proposed Cancer Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.



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Construction Parking Operations
Phase 7 (~ Last 3 Quarters of 2025 + All of 2026 + First Quarter of 2027)
Penn Medicine Princeton Health - Proposed Cancer Center & Parking Garage
Plainsboro Township, Middlesex County, New Jersey

Project No. 0905
Scale: 1" = 200'
June 2023

Figure No. 07

Upon conclusion of Phase 7, the proposed Cancer Center is anticipated to be complete and is estimated to increase the parking demand at the HMOC by an additional 606 parked vehicles. As a result of the completed Cancer Center and Parking Garage footprint, a total of 349 parking spaces will be permanently displaced (182 parking spaces displaced for the Parking Garage footprint and 167 parking spaces displaced for the Cancer Center footprint), bringing the final HMOC/HAD supply total to 2,794 parking spaces. Upon completion of this Phase, the long-term temporary parking lot would taken out of service and the final excess parking capacity at the HMOC will be 471 parking spaces. Table No. 8 below summarizes the total parking supply, parking displaced and parking at the conclusion of Phase 7. Figure No. 8 below graphically illustrates the final parking areas after Phase 7 is completed.

TABLE NO. 8
CONSTRUCTION PARKING OPERATIONS
COMPLETION OF PHASE 7
PENN MEDICINE PRINCETON HEALTH, PLAINSBORO, NEW JERSEY

Parking Supply/Displaced/Demand	Number of Parking Spaces
Existing Parking Supply (excluding Lot P10)	+1,539
Existing Parking Supply (Lot P10)	+315
Additional Supply (Lot P10 Expansion)	+128
Additional Supply (Proposed Temporary Punia Lot - Long Term)	0
Additional Supply (Proposed Temporary Punia Lot - Short Term)	0
Additional Supply (Proposed Parking Garage)	+1,161
Total Parking Supply	*3,143*
Displaced Parking Supply (due to Lot P10 expansion)	0
Displaced Parking Supply (due to COLO construction)	0
Displaced Parking Supply (due to Utility relocation)	0
Displaced Parking Supply (due to Parking Garage construction)	-182
Displaced Parking Supply (due to Cancer Center construction)	-167
Total Parking Displaced	*-349*
Required HMOC Parking [(1)]	-1,540
Construction Worker Parking Demand [(2)]	0
Required Fitness Center Reoccupation Parking [(3)]	-177
Required Cancer Center Expansion Parking [(4)]	-606
Total Parking Demand	*-2,323*
EXCESS PARKING CAPACITY	*+471*

NOTES

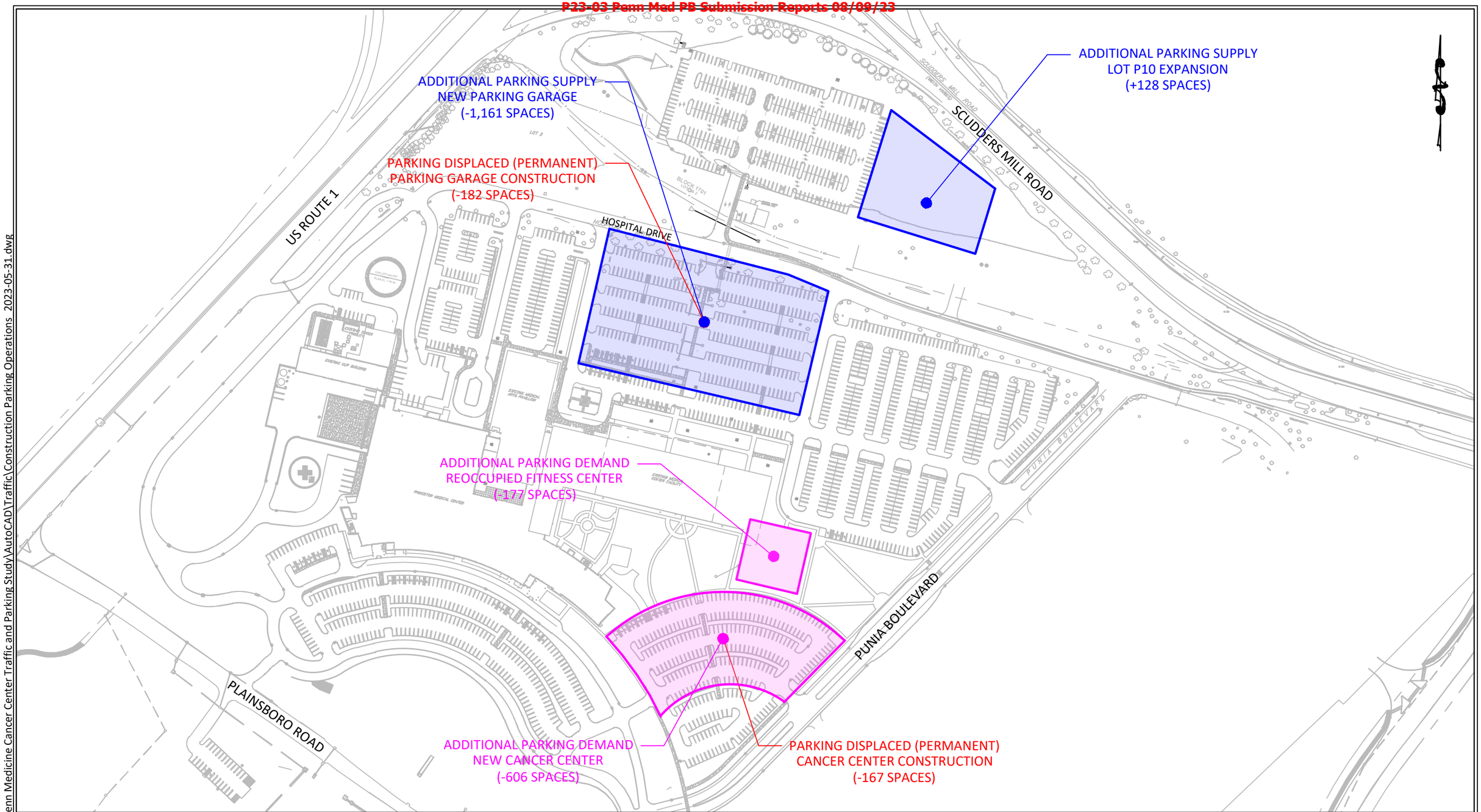
(1) Required HMOC parking was obtained from the "Amended Preliminary and Final Major Site Plan", prepared by French & Parrello and dated 7/22/2010.

(2) Maximum construction worker parking demand during this phase, provided by the construction contractor.

(3) Reoccupied Fitness Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.

(4) Proposed Cancer Center demand utilizes "Amended Redevelopment Plan" requirement of 4 parking spaces per 1,000 square feet.

~~P23-03 Penn Med PB Submission Reports 08/09/23~~



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Construction Parking Operations
Completion of Phase 7
Penn Medicine Princeton Health - Proposed Cancer Center & Parking Garage
Plainsboro Township, Middlesex County, New Jersey

Project No. 0905
Scale: 1" = 200'
June 2023

Figure No. 08

Conclusions

Based on the foregoing, it is the considered professional opinion of DTS Provident that the supplied parking spaces will be more than adequate to accommodate the parking needs of the HMOC during construction of the proposed Cancer Center and Parking Garage. This analysis takes into consideration both the parking spaces that are displaced due to the construction of the various facilities outlined herein and additional demand created by temporary construction personnel, while also accounting for temporary parking areas that will be constructed during certain phases to accommodate the decreased parking space supply and increased parking demand.

cc: Jim Watson, P.E.
Lou Ploskonka, P.E.
Trishka Cecil
Ron Yake
PMPH Team
Tom Letizia

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FRENCH & PARRELLO ASSOCIATES

ENGINEERING AND CONSULTING **SINCE 1974**

OPERATIONS AND MAINTENANCE MANUAL

For

Penn Medicine Princeton Health
Cancer Center Parking Garage
Block 1701, Lot 3.01
Township of Plainsboro
Middlesex County, New Jersey





Prepared For:

Princeton HealthCare System
A New Jersey Nonprofit Corporation
d/b/a Penn Medicine Princeton Health
1 Plainsboro Road
Plainsboro, NJ 08536

July 2023 | FPA No. 06C028T.003
1800 Route 34, Suite 101, Wall Township, NJ 07719

Stormwater Management Measures
Maintenance Plan & Field Manuals

Development Name: Cancer Center Parking Garage

Address: 1 Plainsboro Road

Block(s) / Lot(s): Block 1701, Lot 3.01

Township, County: Township of Plainsboro, Middlesex County, NJ

Party Responsible for Maintenance:

Princeton Healthcare System – Penn Medicine Princeton Health

Address: 1 Plainsboro Road, Plainsboro, NJ 08536

Contact Person(s): Larry Bell Phone: 215-301-6702

Prepared by: French & Parrello Associates, P.A. Date: 07/24/2023

This plan is recorded in

Deed Book # _____ Page # ____ with _____ County Clerk on Date _____

Last Revised on ____/____/_____

Table of Contents

Part I- Maintenance

List of Stormwater Management Measures 2
Location Map 3
Description of Stormwater Management Measures 4
Preventative and Corrective Maintenance Action Plan 5
Maintenance Personnel, Equipment, Tools, and Supplies 9
Disposal Plan 10
Cost Estimate 11
Safety Measures and Procedures 12
Training Plan and Records 13
Annual Evaluation of the Effectiveness of the Plan 16
Documents 17

Part II- Field Manuals and Maintenance Records

Field Manual for Pervious Pavement

Maintenance Logs and Inspection Records

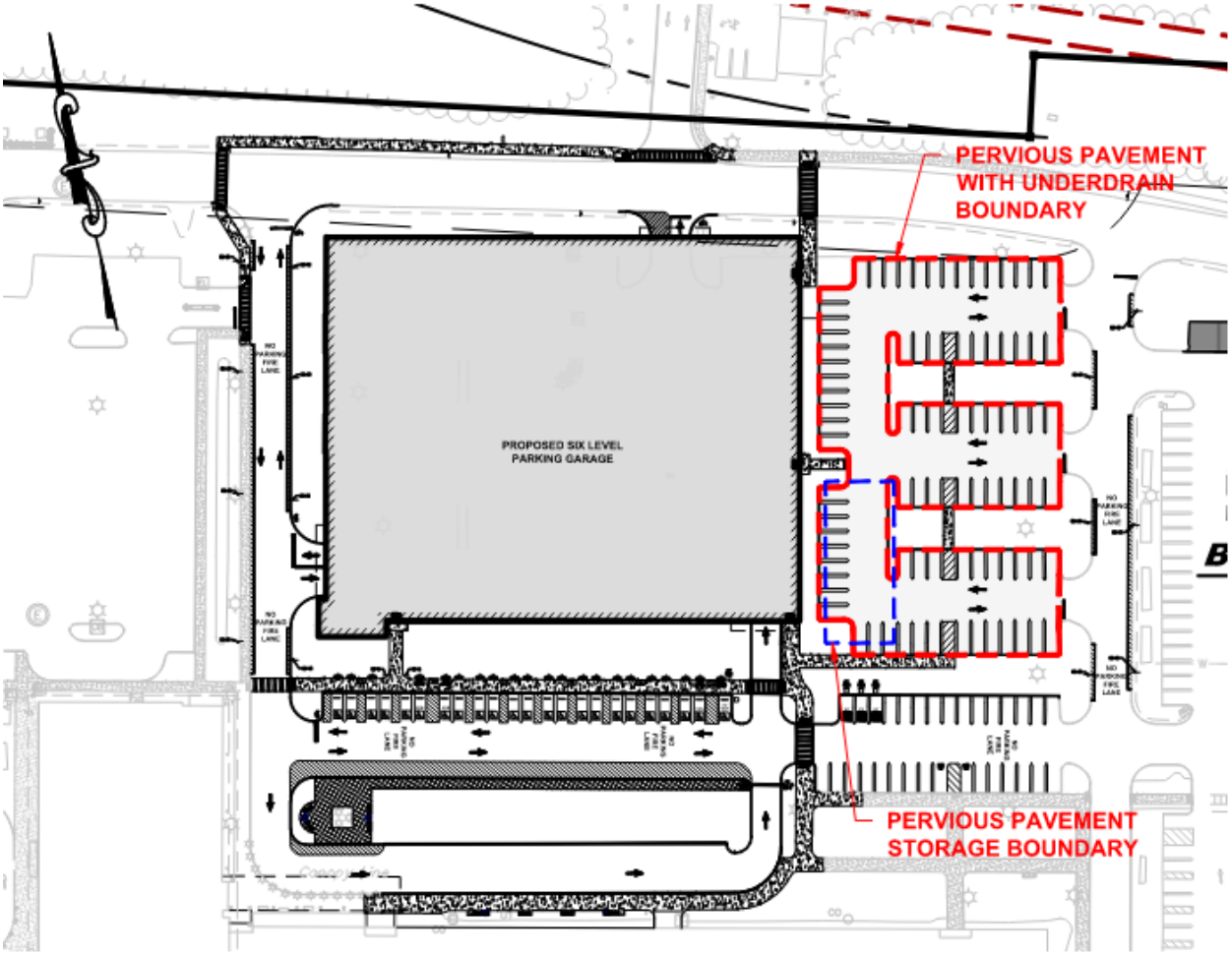
Part I- Maintenance Plan

List of Stormwater Management Measures

The stormwater management measures incorporated into this development are listed below. The corresponding Field Manuals for the stormwater management measures are located in Part II of the Maintenance Plan.

Type of Stormwater Management Measure	BMP No.	Location Description	State Plane Coordinates / Lat., Long.
Pervious Pavement with Underdrain and Storage	Pervious Pavement	East of Proposed Garage	E(X): 458,151 N(Y): 549,149

Location Map



Description of Stormwater Management Measures

Name of the stormwater management measure: Pervious Pavement
Design storm: 100-Yr Storm

- Design Purposes:
  - Water Quality; Detention
- Water Quality Portion Dimensions: _243'_ (Length) x _148'_ (Width) x _7"_ (Depth)
- Storage Portion (Cultec) Dimensions: _99'_ (Length) x _42'_ (Width) x _64"_ (Depth)

Preventative and Corrective Maintenance Action Plan

As per N.J.A.C. 7:8-5.8(b) & (e), preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including, but not limited to, repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of non-vegetated linings.

As per NJDEP BMP Manual Ch. 8 Feb. 2004), maintenance plans should include specific preventative and corrective maintenance tasks such as removal of sediment, trash, and debris; mowing, pruning, and restoration of vegetation; restoration of eroded areas; elimination of mosquito breeding habitats; control of aquatic vegetation; and repair or replacement of damaged or deteriorated components.

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), maintenance plans should include recommended corrective responses to various emergency conditions that may be encountered at the stormwater management measure. It should be noted that if the stormwater management measure includes a Class I or II dam as defined in the NJDEP Dam Safety Standards at N.J.A.C. 7:20, an emergency action plan for the dam is also required. See N.J.A.C. 7:20-1.7(f) for more information.

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), the maintenance plan should address the maintenance of access points to the stormwater management measures in accordance with the following:

- all components of the stormwater management measures must be readily accessible for inspection and maintenance;
- trees, shrubs, and underbrush must be pruned or trimmed as necessary to maintain access to the stormwater management measure;
- the exact limits of inspection and maintenance easements and rights-of-way should be specified on stormwater management measure plans and included in the maintenance plan.

Preventative Maintenance Actions

Frequency	Preventative Maintenance Actions	Stormwater Measures/ No.
Quarterly	Sediment removal	Pervious Pavement
Semiannual	Sediment removal	Pervious Pavement
Annual	Basin Structural Inspection Check inlets and outlets for clogging and remove any debris, as required.	Pervious Pavement
Unscheduled	Quick inspection after every 1" rain	Pervious Pavement
Other	When establishing or restoring vegetation, inspections should be performed biweekly	Pervious Pavement
Two Years after Commissioning	Inspect the interior of the Cultec stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique.	Pervious Pavement
Nine Years after Commissioning (and every 9 years following)	Clean stormwater management chambers and feed connectors of any debris Inspect the interior of the Cultec stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique.	Pervious Pavement

Corrective Maintenance Actions

Potential Corrective Maintenance Actions	Stormwater Management Measures/No.
- Repair/replacement of outlet pipes or orifices	Pervious Pavement
- Sediment Removal	Pervious Pavement

Inspection and Logs of All Preventative and Corrective Maintenance

As per N.J.A.C. 7:8-5.8(f), the person responsible for maintenance shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.

As per NJDEP BMP Manual Ch. 8 (Feb, 2004), a maintenance plan shall include a schedule of regular inspections and tasks, and detailed logs of all preventative and corrective maintenance performed on the stormwater management measure, including all maintenance-related work orders. The person with maintenance responsibility must retain and, upon request, make available the maintenance plan and associated logs and other records for review by a public entity with administrative, health, environmental, or safety authority over the site.

Inspection Checklists in the Field Manual for the stormwater management measures on this site include:

- Pervious Pavement

The logs of all inspections, and both preventative and corrective maintenance performed should be attached in the "**Maintenance Logs and Inspection Records**" section. See Part II of the Maintenance Plan

Maintenance Personnel, Equipment, Tools, and Supplies

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), maintenance plans should include equipment, tools, and supplies necessary to perform the various preventative and corrective maintenance tasks specified in the plan. Sources of specialized, proprietary, and nonstandard equipment, tools, and supplies should also be provided.

This section applies to both maintenance tasks that are performed by in-house personnel or are outsourced.

Maintenance Personnel/Equipment/Tools/Supplies

Personnel/Equipment/Tools Name	Quantity
General Maintenance Crew	1
Shovel, rake, pick, wheel barrow, gloves, sediment probe, flashlight, camera, hard hat, broom, power washer, hose	As needed
Trucks, lightweight backhoe, vacuum truck, sump pump	As needed

Disposal Plan

Disposal/Recycling Procedures

Dewatering procedures and requirements

Sediment removal shall take place when all runoff has drained from basins, pervious pavers and storm sewer system and all are dry.

Unloading procedures and requirements

Disposal of the debris, trash, sediment and all other waste material should be done at an approved disposal/recycling site and in accordance with all applicable local, state and federal regulation

Disposal Field – Offsite

Cost Estimate

As per N.J.A.C.7:8-5.8(b), cost estimates of maintenance tasks, including, but not limited to, sediment, trash and debris removal must be included in the maintenance plan. Below is an illustration of a cost breakdown and estimation for maintenance of stormwater management measures. The actual costs may vary with factors such as local requirements, equipment, personnel, weather, and maintenance methods.

COST ESTIMATES

Cost Overview

The design engineer should list the maintenance tasks and break down the costs for each maintenance task.

Cost Type	Cost	Details
Annual Contract to perform all routine and unscheduled maintenance	$2,000 per basin	
Annual contract to perform corrective measures	$5,000 per basin	

Safety Measures and Procedures

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), maintenance plans should include procedures and equipment required to protect the safety of inspection and maintenance personnel.

Safety Regulations and Requirements

Attach all local ordinance(s) and state and federal regulations regarding occupational safety after this section

Safety Tools, Equipment and Garments

Safety Tools and Equipment	Location	Responsible Person/Contact #

Emergency Procedures

In case of emergency, Call 911

Training Plan and Records

As per NJDEP BMP Manual Ch. 8 (February 2004), maintenance training begins with a basic description of the purpose and function of the overall stormwater management measure and its major components. Such understanding will enable maintenance personnel to provide more effective component maintenance and more readily detect maintenance-related problems. Depending on the size, character, location, and components of each stormwater management measure, maintenance personnel may also require training in specialized inspection and maintenance tasks and/or the operation and care of specialized maintenance equipment. Training should also be provided in the need for and use of all required safety equipment and procedures.

I. Training Plan

Types of Training

- Mandatory Stormwater Management Basic Training and Field Manual Usage Training for new maintenance crews
- Occupational Safety Training
- Subcontractor training, if applicable

Content of Training

- **Stormwater Management Basic Training**
  - Purposes and Functions of BMPs

    Example Training Material
    - NJDEP Stormwater BMP Manual, Chapter Nine: Structural Stormwater Management Measures
      - Chapter 9.5 Infiltration Basins

More training information is available at NJ Stormwater.org (http://www.nj.gov/dep/stormwater/training.htm)

  - Vegetation Care

    Example Training Material
    - NJDEP Stormwater BMP Manual, Chapter Seven: Landscaping

  - Field Manual Usage Training

    - Field Manuals attached to this Maintenance Plan

  - Equipment and Tools Operation Training

    - Equipment or tool manufacturer's Operation & Maintenance Manual

- Occupational Safety Training
    - OSHA Training
    - Equipment or tool manufacturer's Operation & Maintenance Manual

II. Training Records

Training attendance sheets should be attached by the responsible party after each training.

Attach training attendance sheets from each training

Annual Evaluation of the Effectiveness of the Plan

As per N.J.A.C. 7:8-5.8(g), the person responsible for maintenance shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed.

The responsible party should evaluate the effectiveness of the maintenance plan by comparing the maintenance plan with the actual performance of the maintenance. The items to evaluate may include, but not limited to,

- Whether the inspections have been performed as scheduled;
- Whether the preventive maintenance has been performed as scheduled;
- Whether the frequency of preventative maintenance needs to increase or decrease;
- Whether the planned resources were enough to perform the maintenance;
- Whether the repairs were completed on time;
- Whether the actual cost was consistent with the estimated cost;
- Whether the inspection, maintenance, and repair records have been kept.

If actual performance of those items has been deviated from the maintenance plan, the responsible party should find the causes and implement solutions in a revised maintenance plan.

Annual Evaluation Records

Evaluator(s)	Date of Evaluation	Decision
		__Maintain current version OR __Revise current version Revision date _____ (also update the last revision date on the cover page) __Requires a new deed recording (also update the last recording information on the cover page)
		__Maintain current version OR __Revise current version Revision date _____ (also update the last revision date on the cover page) __Requires a new deed recording (also update the last recording information on the cover page)
		__Maintain current version OR __Revise current version Revision date _____ (also update the last revision date on the cover page) __Requires a new deed recording (also update the last recording information on the cover page)

Documents

Please attach the following:

Transfer Agreement

As per N.J.A.C. 7:8-5.8(b), if the maintenance plan identifies a person other than the developer as having the responsibility for maintenance, the plan shall include documentation of such person's agreement to assume this responsibility, or the developer's obligation to dedicate a stormwater management facility to such person under an applicable ordinance or regulation.

Deed

As per N.J.A.C. 7:8-5.8(d), if the person responsible for maintenance is not a public agency, the maintenance plan and any future revisions shall be recorded upon the deed of record for each property on which the maintenance described in the maintenance plan must be undertaken.

As-Built Drawings with Drainage Plans

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), as-built construction plans of the stormwater management measure and copies of pertinent construction documents, such as laboratory test results, permits, and completion certificates should be included in this Maintenance Plan.

Landscaping Plan for the Stormwater Management Measures

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), if there is a Landscaping Plan for the stormwater management measures, it should be included in this Maintenance Plan.

Permeability Test/Infiltration Test Report

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), if a permeability test or infiltration test is required and available, the reports for pre-construction and post-construction testing should be included in this Maintenance Plan.

Groundwater Mounding Analysis

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), if a groundwater mounding analysis is required and the groundwater mounding analysis was performed, a copy of the analysis should be included in this Maintenance Plan.

Soil Boring Logs

As per NJDEP BMP Manual Ch.8 (Feb., 2004), if any soil borings were taken prior to construction, a copy of the soil boring logs should be included in this Maintenance Plan.

Local, State, Federal Permits

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), local, state, or federal permits related to the stormwater management measures for this development should be included in this Maintenance Plan. See Cost Estimate Section of This Maintenance Plan for more information. The requirement to obtain State permits depends on specific circumstances, such as, but not limited to, the specific design of the stormwater management measures, the maintenance

actions, the access and disturbance, the disposal methods, the location of disposal, the method to empty a basin, the method to dredge the basin, the pollutants in the basin, the damages to the basin, and the method to repair the basin.

Check Maintenance Guidance in NJDEP Stormwater Management Website for details and links to the relevant permits and program areas (http://www.njstormwater.org).

Safety Regulations and Requirements

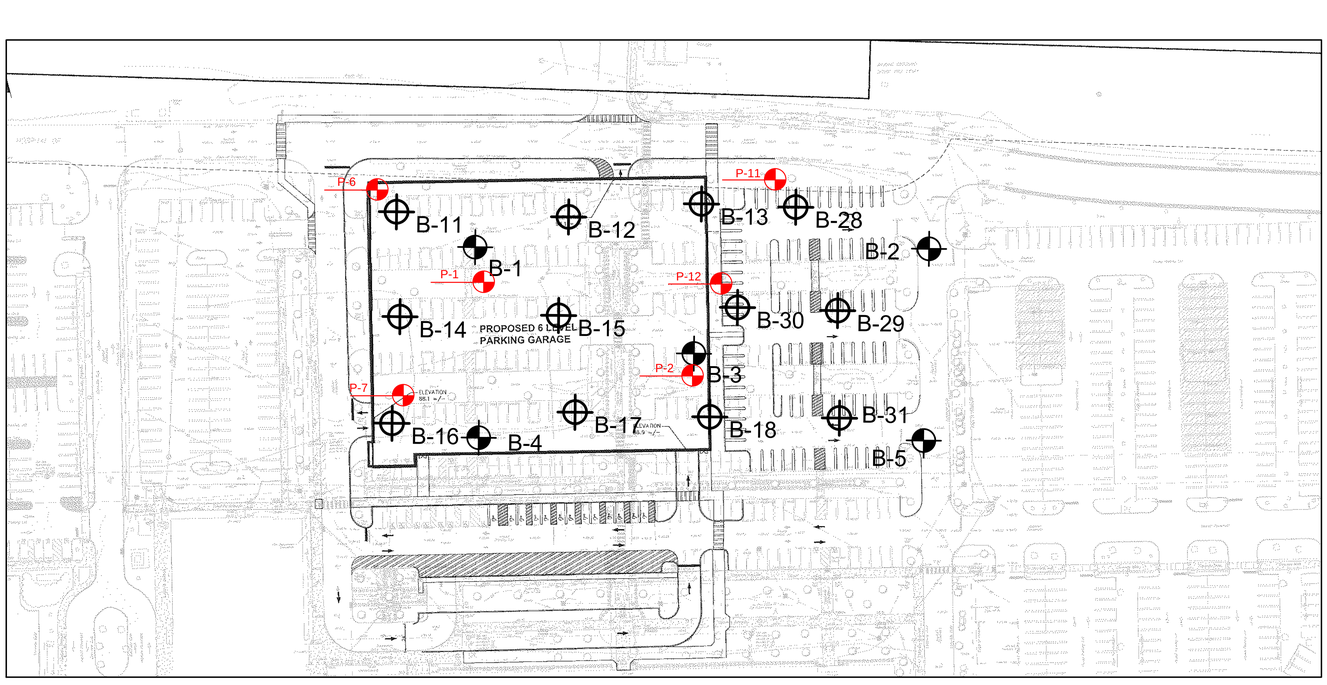
As per NJDEP BMP Manual Ch. 8 (Feb., 2004), all local ordinances and state and federal regulations regarding occupational safety should be included in this Maintenance Plan.

Devices/Tools/Equipment Operation and Maintenance Manual and Warranties

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), maintenance, repair, and replacement instructions for specialized, proprietary, and nonstandard equipment, tools, supplies, manufacturers' product instructions, and user manuals should be included in this Maintenance Plan.

Attach Documents Here

PARKING GARAGE AREA



LEGEND:

- 2021 TEST BORING LOCATION
- 2022 TEST BORING LOCATION

No.	Date	Revision	Revised By	Checked By

60 0 60 120
SCALE IN FEET

FRENCH & PARRELLO ASSOCIATES
Corporate Office:
1800 Route 34, Suite 101
Wall, New Jersey 07719
732.312.9800
FPAengineers.com
New Jersey ▲ New York ▲ Pennsylvania ▲ Georgia

TEST BORING LOCATION PLAN

FOR

PENN MEDICINE

CANCER CENTER

BLOCK 1701, LOTS 1, 2 & 3

TAX MAP SHEET NO. 17

TOWNSHIP OF PLAINSBORO
MIDDLESEX COUNTY, NEW JERSEY

DATE:	DESIGNED BY:	SCALE:	PROJECT NUMBER:
8/19/22	MC	1" = 60'	06C028T.003
DRAWN BY:	CHECKED BY:	FIELD BOOK	DRAWING NO.
RDK	ALF		2

O:\CE\2006\06C028T - CANCER CENTER\06C028T.002 - PENN MED. CANCER - CONSULTANT\CADD\DWG\GEOTECHNICAL\06C028T.002 - TEST BORING LOCATION PLAN 2022.DWG (OVERALL)

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COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-1 (B-1)** Date Tested **7/20/2023**

2. Depth **8" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation dropped 1/8" after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

7. I hereby certify that the information furnished on Form 3d of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____
Mark Kalusz, PE

Date _____

Signature of Professional Engineer _____
Mark Kalusz, PE

License No. 24GE05937000

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-2 (B-3)** Date Tested **7/20/2023**

2. Depth **6" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____Four Hour Pre-soak completed - Indicate result:
   _____Test Hole Drained within 15 to 24 hours after Pre-soak
   __X__Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation dropped 1/16" after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

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COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-6 (B-11)** Date Tested **7/20/2023**

2. Depth **6" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____Four Hour Pre-soak completed - Indicate result:
   _____Test Hole Drained within 15 to 24 hours after Pre-soak
   __X__Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation dropped 1/8" after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

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COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-7 (B-16)** Date Tested **7/20/2023**

2. Depth **6" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____Four Hour Pre-soak completed - Indicate result:
   _____Test Hole Drained within 15 to 24 hours after Pre-soak
   __X__Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation did not drop after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
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COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-11 (B-28)** Date Tested **7/20/2023**

2. Depth **6" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____Four Hour Pre-soak completed - Indicate result:
   _____Test Hole Drained within 15 to 24 hours after Pre-soak
   __X__Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation dropped 1/8" after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

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7"		
7"		
7"		

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COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-12 (B-30)** Date Tested **7/20/2023**

2. Depth **6" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____Four Hour Pre-soak completed - Indicate result:
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   Pre-Soak water elevation dropped 1/8" after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

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Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

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Part II- Field Manuals

Attachment of Field Manuals
for Stormwater Management Measures on this Site

As per N.J.A.C. 7:8-5.8(b)&(e), preventative and corrective maintenance shall be performed to maintain the function of stormwater management measures, including repair or replacement of the structure; removal of sediment, debris or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; repair or replacement of non-vegetated linings, and removal of rodent/wildlife and repair/restoration to damaged affected areas caused by them.

Each Field Manual attached to this Maintenance Plan is a separate document pertaining to one specific stormwater management measure, and should be used by inspections and maintenance crews in order to carry out the maintenance work required by N.J.A.C. 7:8-5.8(e).

Field Manual for Pervious Pavement

Pervious Pavement with Underdrain and Storage on the Location Map

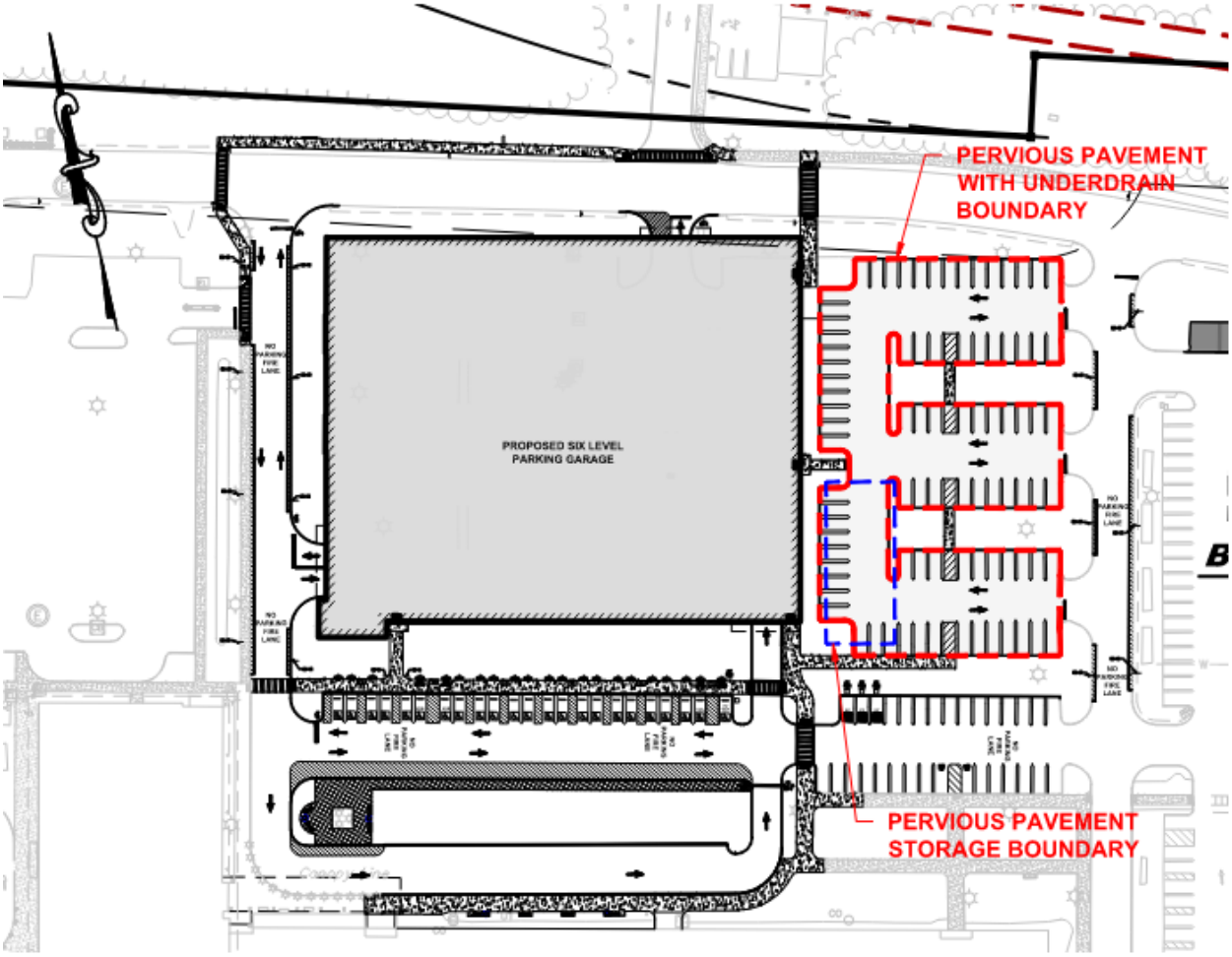
Development Name: Cancer Center Parking Garage

Township, County: Township of Plainsboro, Middlesex County, NJ

Location of System: E(X): 458,151; N(Y): 549,149

Location Description: East of Proposed Garage

Location Map



NOTE

This Field Manual is intended to be editable and adjustable in accordance with the design of stormwater management measures, the site conditions, and the special needs of responsible party. The Engineer should supplement information and best management practice to assist the responsible party to perform maintenance.

Table of Contents

Pervious Pavement System Overview 4
Basic Design Information 5
Reference Documents 6
Inspection Checklist / Maintenance Actions 8
Preventative Maintenance Record 11
Corrective Maintenance Record 12

Pervious Pavement System Overview

Functionality

Pervious paving systems are paved areas that produce less stormwater runoff than areas paved with conventional paving. This reduction is achieved primarily through the infiltration of a greater portion of the rain falling on the area than would occur with conventional paving. This increased infiltration occurs either through the paving material itself or through void spaces between individual paving blocks known as pavers.

Pervious paving systems are divided into two general types. Each type depends primarily upon the nature of the pervious paving surface course and the presence or absence of a runoff storage bed beneath the surface course. Porous paving and permeable paver with storage bed systems treat the stormwater quality design storm runoff through storage and infiltration. Therefore, these systems have adopted TSS removal rates similar to infiltration structures. The adopted TSS removal rate for each type of pervious paving system is from 80%.

Pervious paving systems are used to reduce runoff rates and volumes from paved, on-grade surfaces such as patios, walkways, driveways, fire lanes, and parking spaces. Pervious paving systems with runoff storage beds achieve these reductions through storage of runoff and eventual infiltration into the subgrade soils. Through this infiltration process, these types of pervious paving systems also achieve stormwater quality requirements.

Proper care and attention in the long-term maintenance of the stormwater management measure is critically important to the safety and health of the public.

Type of BMP – Dry Stormwater Management Measure

The pervious pavement system shall fully drain within 72 hours of the most recent rainfall. Standing water in excess of 72 hours is a sign of the porous pavement failure. It may also contribute to mosquito breeding and other health and safety issues. At no time shall there be ponding on the surface of the pavement.

Basic Design Information

Hydrology Design Targets

1. The system is porous pavement with storage bed.
2. This system has an underdrain.
3. The design drain time is <72 hours.
4. The elevation of the seasonal high water table of this pavement area was observed on 11 / 16 / 2022 and it was 5.4 feet below the pavement bottom surface, at EL. 72.10 feet.
5. The TSS removal rate is 80%.

Hydraulic Design Targets

1. This system is designed to treat the runoff from the Water Quality Design Storm which generates 0.00 cubic feet of runoff. The peak flow entering the system is 1.97 cubic feet per second.
2. The invert elevation of the overflow outlet is at EL. 84.90 feet.

System Configuration Targets

1. The system has no pretreatment.
2. The depth of uniformly graded coarse aggregate in the storage bed ranges from 3 inches in the Water Quality section to 60 inches in the Water Quantity section.
3. The 3-inch Water Quality section spans the entire area of the parking lot.
4. The 60-inch Water Quantity section spans a smaller, 99-foot by 42-foot wide section with 36" Cultec Chambers.

Critical Maintenance Features

1. Avoid sand or silt onto the porous pavement area.
2. Sweep and vacuum the porous pavement area often to prevent clog.
3. Do not apply sealant to cracks or entire surface.

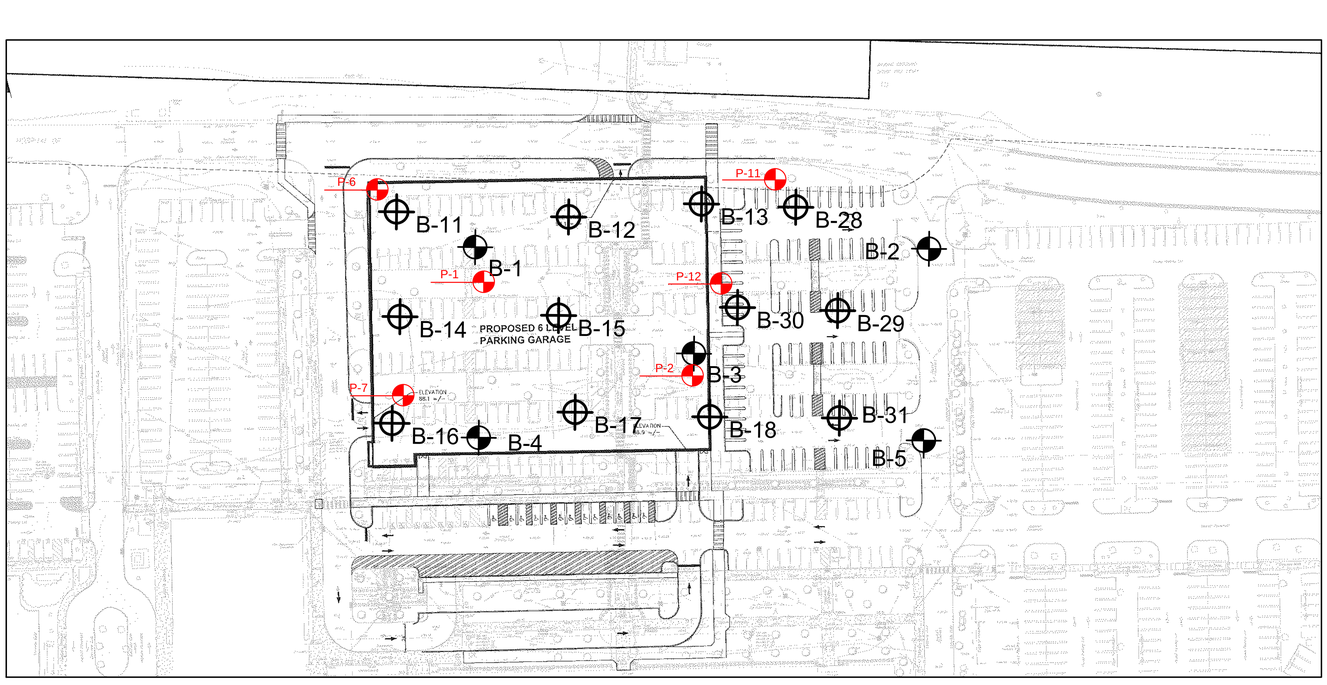
Reference Documents

Documents to be placed in this field manual should include the following:

- As-built Drawings with Drainage Plans
- Manufacturer's Operation and Maintenance Manual
- Soil Boring Logs
- Permeability Test

Attach Reference Documents Here

PARKING GARAGE AREA



LEGEND:

- 2021 TEST BORING LOCATION
- 2022 TEST BORING LOCATION

No.	Date	Revision	Revised By	Checked By

60 0 60 120
SCALE IN FEET

FRENCH & PARRELLO ASSOCIATES
Corporate Office:
1800 Route 34, Suite 101
Wall, New Jersey 07719
732.312.9800
FPAengineers.com
New Jersey ▲ New York ▲ Pennsylvania ▲ Georgia

TEST BORING LOCATION PLAN

FOR

PENN MEDICINE

CANCER CENTER

BLOCK 1701, LOTS 1, 2 & 3

TAX MAP SHEET NO. 17

TOWNSHIP OF PLAINSBORO
MIDDLESEX COUNTY, NEW JERSEY

DATE:	DESIGNED BY:	SCALE:	PROJECT NUMBER:
8/19/22	MC	1" = 60'	06C028T.003
DRAWN BY:	CHECKED BY:	FIELD BOOK	DRAWING NO.
RDK	ALF		2

O:\CE\2006\06C028T - CANCER CENTER\06C028T.002 - PENN MED. CANCER - CONSULTANT\CADD\DWG\GEOTECHNICAL\06C028T.002 - TEST BORING LOCATION PLAN 2022.DWG (OVERALL)

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COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-1 (B-1)** Date Tested **7/20/2023**

2. Depth **8" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation dropped 1/8" after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
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6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

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Date _____

Signature of Professional Engineer _____
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License No. 24GE05937000

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-2 (B-3)** Date Tested **7/20/2023**

2. Depth **6" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____Four Hour Pre-soak completed - Indicate result:
   _____Test Hole Drained within 15 to 24 hours after Pre-soak
   __X__Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation dropped 1/16" after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

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7"		
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COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-6 (B-11)** Date Tested **7/20/2023**

2. Depth **6" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____Four Hour Pre-soak completed - Indicate result:
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7"		
7"		
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COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-7 (B-16)** Date Tested **7/20/2023**

2. Depth **6" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
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COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-11 (B-28)** Date Tested **7/20/2023**

2. Depth **6" below grade**

3. Pre-soak:
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5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

7. I hereby certify that the information furnished on Form 3d of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____
Mark Kalusz, PE

Date _____

Signature of Professional Engineer _____
Mark Kalusz, PE

License No. 24GE05937000

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **3.01**

1. Test Number **P-12 (B-30)** Date Tested **7/20/2023**

2. Depth **6" below grade**

3. Pre-soak:
   _____Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____Four Hour Pre-soak completed - Indicate result:
   _____Test Hole Drained within 15 to 24 hours after Pre-soak
   __X__Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation dropped 1/8" after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

7. I hereby certify that the information furnished on Form 3d of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____
Mark Kalusz, PE

Date _____

Signature of Professional Engineer _____
Mark Kalusz, PE

License No. 24GE05937000

Maintenance Logs and Inspection Records

As per N.J.A.C. 7:8-5.8(e), preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure(s), including repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of non-vegetated linings.

As per N.J.A.C. 7:8-5.8(f), the person responsible for maintenance shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.

The responsible party shall maintain a record of all maintenance actions performed, including:

- Inspection checklists from each performed inspection
- Preventative maintenance logs
- Corrective maintenance logs, including work orders
- Other maintenance records

Inspection Checklist / Maintenance Actions
Pervious Pavement System

Checklist (circle one)**:** Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. _____ **Inspection Date:** _____

Date of most recent rain event: _____

Rain Condition (circle one):
Drizzle / Shower / Downpour / Other _____

Ground Condition (circle one):
Dry / Moist / Ponding / Submerged / Snow accumulation

The inspection items and preventative/corrective maintenance actions listed below represent general requirements. The design engineer and/or responsible party shall adjust the items and actions to better meet the conditions of the site, the specific design targets, and the requirements of regulatory authorities.

	For Inspector			For Maintenance Crew
Component No. Component Name	Inspection Item and Inspection Item No.		Result	Preventative / Corrective Maintenance Actions
A Pavement Surface (Porous Pavement)	1	Standing water is present after the design drain time The observed drain time is approximately _____ hours. Excessive sediment or mud accumulation on top of the pavement	Y__ N__	Recheck to determine if there is standing water after 72 hours If standing water is present longer than 5 days, report to mosquito commission. If excessive sediment is present, the system may be clogged - Sweep the surface - Power wash (at 45 degree angle to the top) - Vacuum the surface - Excavate to inspect the storage bed for clogging, replace the storage bed material if it is severely clogged - Check the permeability rate of the subsoil Work Order # _____
A Pavement Surface (Porous Pavement)	2	Cracking, subsidence, spalling, or other damage to the pavement	Y__ N__	Repair according to the manufacturer's procedures and material. See Reference Documents section. Work Order # _____
	3	Weeds or other vegetation on the porous pavement	Y__ N__	Remove the vegetation
Note:				

	For Inspector			For Maintenance Crew
Component No. Component Name	Inspection Item and Inspection Item No.		Result	Preventative / Corrective Maintenance Actions
B Outlet	1	Clogged overflow outlet	Y__ N__	Clear and remove sediment
	2	Discharge pipe apron is eroded or scoured	Y__ N__	Restabilize the discharge riprap apron Work Order #_____
Note:				

Follow Up Items (Component No. / Inspection Item No.):

_____

Associated Work Orders: # _____, # _____, # _____, # _____, # _____

_____	_____	_____
Inspector Name	**Signature**	**Date**

Report issues to the local authority and mosquito commission as required by local ordinances and regulatory authorities.

File this checklist in the Maintenance Log after performing maintenance.

Preventative Maintenance Record

Corresponding Checklist No. _____
Component No._____, Inspection Item No._____

Work Logs

Activities	Components	Date Completed
Sediment/debris removal	A – Pavement Surface (Porous Pavement)	
	B – Outlet	

Debris, sediment, and trash are handled by _____ to disposal site _____.
(See Part I: Maintenance Plan – Disposal Plan Section)

Crew member:_____/_____ **Date:** _____
(name/ signature)

Supervisor:_____/_____ **Date:** _____
(name/ signature)

File this Preventative Maintenance Record in the Maintenance Log after performing maintenance.

Corrective Maintenance Record

1. **Work Order #** _____ **Date Issued** _____

2. **Issue to be resolved:**

3. The issue was from **Corresponding Checklist No.** _____, **Component No.**__, **Inspection Item No.** _____.

4. **Required Actions**

Actions	Planned Date	Date Completed

5. **Responsible person(s):**
   _____

6. **Special requirements**
   - Time of the season or weather condition:_____
   - Tools/equipment:_____
   - Subcontractor (name or specific type):_____

Approved by _____/_____ **Date** _____
(name/signature)

Verification of completion by _____/_____ **Date** _____
(name/signature)

File this Corrective Maintenance Record in the Maintenance Log after performing maintenance.

P23-03 Penn Med PB Submission Reports 08/09/23

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Operation and Maintenance Guidelines
for CULTEC Stormwater Management Systems

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Contact Information:
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For technical support, please call (203)775-4416 ext. 203 or e-mail tech@cultec.com.

Visit www.cultec.com/downloads.html for Product Downloads and CAD details.

Doc ID: CULG008 05-17
May 2017

These instructions are for single-layer traffic applications only. For multi-layer applications, contact CULTEC.
All illustrations and photos shown herein are examples of typical situations. Be sure to follow the engineer's drawings.
Actual designs may vary.

This manual contains guidelines recommended by CULTEC, Inc. and may be used in conjunction with, but not to supersede, local regulations or regulatory authorities. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Introduction

The CULTEC Subsurface Stormwater Management System is a high-density polyethylene (HDPE) chamber system arranged in parallel rows surrounded by washed stone. The CULTEC chambers create arch-shaped voids within the washed stone to provide stormwater detention, retention, infiltration, and reclamation. Filter fabric is placed between the native soil and stone interface to prevent the intrusion of fines into the system. In order to minimize the amount of sediment which may enter the CULTEC system, a sediment collection device (stormwater pretreatment device) is recommended upstream from the CULTEC chamber system. Examples of pretreatment devices include, but are not limited to, an appropriately sized catch basin with sump, pretreatment catchment device, oil grit separator, or baffled distribution box. Manufactured pretreatment devices may also be used in accordance with CULTEC chambers. Installation, operation, and maintenance of these devices shall be in accordance with manufacturer's recommendations. Almost all of the sediment entering the stormwater management system will be collected within the pretreatment device.

Best Management Practices allow for the maintenance of the preliminary collection systems prior to feeding the CULTEC chambers. The pretreatment structures shall be inspected for any debris that will restrict inlet flow rates. Outfall structures, if any, such as outlet control must also be inspected for any obstructions that would restrict outlet flow rates. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Operation and Maintenance Requirements

I. Operation

CULTEC stormwater management systems shall be operated to receive only stormwater run-off in accordance with applicable local regulations. CULTEC subsurface stormwater management chambers operate at peak performance when installed in series with pretreatment. Pretreatment of suspended solids is superior to treatment of solids once they have been introduced into the system. The use of pretreatment is adequate as long as the structure is maintained and the site remains stable with finished impervious surfaces such as parking lots, walkways, and pervious areas are properly maintained. If there is to be an unstable condition, such as improvements to buildings or parking areas, all proper silt control measures shall be implemented according to local regulations.

II. Inspection and Maintenance Options

A. The CULTEC system may be equipped with an inspection port located on the inlet row. The inspection port is a circular cast box placed in a rectangular concrete collar. When the lid is removed, a 6-inch (150 mm) pipe with a screw-in plug will be exposed. Remove the plug. This will provide access to the CULTEC Chamber row below. From the surface, through this access, the sediment may be measured at this location. A stadia rod may be used to measure the depth of sediment if any in this row. If the depth of sediment is in excess of 3 inches (76 mm), then this row should be cleaned with high pressure water through a culvert cleaning nozzle. This would be carried out through an upstream manhole or through the CULTEC StormFilter Unit (or other pretreatment device). CCTV inspection of this row can be deployed through this access port to deter mine if any sediment has accumulated in the inlet row.

B. If the CULTEC bed is not equipped with an inspection port, then access to the inlet row will be through an upstream manhole or the CULTEC StormFilter.

1. Manhole Access
This inspection should only be carried out by persons trained in confined space entry and sewer inspection services. After the manhole cover has been removed a gas detector must be lowered into the manhole to ensure that there are not high concentrations of toxic gases present. The inspector should be lowered into the manhole with the proper safety equipment as per OSHA requirements. The inspector may be able to observe sediment from this location. If this is not possible, the inspector will need to deploy a CCTV robot to permit viewing of the sediment.

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2. StormFilter Access
Remove the manhole cover to allow access to the unit. Typically a 30-inch (750 mm) pipe is used as a riser from the StormFilter to the surface. As in the case with manhole access, this access point requires a technician trained in confined space entry with proper gas detection equipment. This individual must be equipped with the proper safety equipment for entry into the StormFilter. The technician will be lowered onto the StormFilter unit. The hatch on the unit must be removed. Inside the unit are two filters which may be removed according to StormFilter maintenance guidelines. Once these filters are removed the inspector can enter the StormFilter unit to launch the CCTV camera robot.

C. The inlet row of the CULTEC system is placed on a polyethylene liner to prevent scouring of the washed stone beneath this row. This also facilitates the flushing of this row with high pressure water through a culvert cleaning nozzle. The nozzle is deployed through a manhole or the StormFilter and extended to the end of the row. The water is turned on and the inlet row is back-flushed into the manhole or StormFilter. This water is to be removed from the manhole or StormFilter using a vacuum truck.

III. Maintenance Guidelines

The following guidelines shall be adhered to for the operation and maintenance of the CULTEC stormwater management system:

A. The owner shall keep a maintenance log which shall include details of any events which would have an effect on the system's operational capacity.

B. The operation and maintenance procedure shall be reviewed periodically and changed to meet site conditions.

C. Maintenance of the stormwater management system shall be performed by qualified workers and shall follow applicable occupational health and safety requirements.

D. Debris removed from the stormwater management system shall be disposed of in accordance with applicable laws and regulations.

IV. Suggested Maintenance Schedules

A. Minor Maintenance
The following suggested schedule shall be followed for routine maintenance during the regular operation of the stormwater system:

Frequency	Action
Monthly in first year	Check inlets and outlets for clogging and remove any debris, as required.
Spring and Fall	Check inlets and outlets for clogging and remove any debris, as required.
One year after commissioning and every third year following	Check inlets and outlets for clogging and remove any debris, as required.

B. Major Maintenance
The following suggested maintenance schedule shall be followed to maintain the performance of the CULTEC stormwater management chambers. Additional work may be necessary due to insufficient performance and other issues that might be found during the inspection of the stormwater management chambers. (See table on next page)

For more information, contact CULTEC at (203) 775-4416 or visit www.cultec.com.

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	Frequency	Action
Inlets and Outlets	Every 3 years	• Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
	Spring and Fall	• Check inlet and outlets for clogging and remove any debris as required.
CULTEC Stormwater Chambers	2 years after commissioning	• Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
	9 years after commissioning every 9 years following	• Clean stormwater management chambers and feed connectors of any debris. • Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
	45 years after commissioning	• Clean stormwater management chambers and feed connectors of any debris. • Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. • Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. • Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. • Attain the appropriate approvals as required. • Establish a new operation and maintenance schedule.
Surrounding Site	Monthly in 1st year	• Check for depressions in areas over and surrounding the stormwater management system.
	Spring and Fall	• Check for depressions in areas over and surrounding the stormwater management system.
	Yearly	• Confirm that no unauthorized modifications have been performed to the site.

For additional information concerning the maintenance of CULTEC Subsurface Stormwater Management Chambers, please contact CULTEC, Inc. at 1-800-428-5832.

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WQMP
Operation & Maintenance (O&M) Plan

Project Name:_____

Prepared for:

Project Name: _____

Address:_____

City, State Zip:_____

Prepared on:

Date:_____

For more information, contact CULTEC at (203) 775-4416 or visit www.cultec.com.

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This O&M Plan describes the designated responsible party for implementation of this WQMP, including: operation and maintenance of all the structural BMP(s), conducting the training/educational program and duties, and any other necessary activities. The O&M Plan includes detailed inspection and maintenance requirements for all structural BMPs, including copies of any maintenance contract agreements, manufacturer's maintenance requirements, permits, etc.

8.1.1 Project Information

Project name	
Address	
City, State Zip	
Site size	
List of structural BMPs, number of each	
Other notes	

8.1.2 Responsible Party

The responsible party for implementation of this WQMP is:

Name of Person or HOA Property Manager	
Address	
City, State Zip	
Phone number	
24-Hour Emergency Contact number	
Email	

8.1.3 Record Keeping

Parties responsible for the O&M plan shall retain records for at least 5 years.

All training and educational activities and BMP operation and maintenance shall be documented to verify compliance with this O&M Plan. A sample Training Log and Inspection and Maintenance Log are included in this document.

8.1.4 Electronic Data Submittal

This document along with the Site Plan and Attachments shall be provided in PDF format. AutoCAD files and/or GIS coordinates of BMPs shall also be submitted to the City.

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Appendix ____

BMP SITE PLAN

Site plan is preferred on minimum 11” by 17” colored sheets, as long as legible.

For more information, contact CULTEC at (203) 775-4416 or visit www.cultec.com.

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BMP OPERATION & MAINTENANCE LOG

Project Name: _____

Today's Date:_____

Name of Person Performing Activity (Printed):_____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

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Minor Maintenance

Frequency		Action
Monthly in first year		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Month 1	Date:	
□ Month 2	Date:	
□ Month 3	Date:	
□ Month 4	Date	
□ Month 5	Date:	
□ Month 6	Date:	
□ Month 7	Date:	
□ Month 8	Date:	
□ Month 9	Date:	
□ Month 10	Date:	
□ Month 11	Date:	
□ Month 12	Date:	
Spring and Fall		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
One year after commissioning and every third year following		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Year 1	Date:	
□ Year 4	Date:	
□ Year 7	Date:	
□ Year 10	Date:	
□ Year 13	Date:	
□ Year 16	Date:	
□ Year 19	Date:	
□ Year 22	Date:	

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Major Maintenance

	Frequency		Action
Inlets and Outlets	**Every 3 years**		Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
			Notes
	□ Year 1	Date:	
	□ Year 4	Date:	
	□ Year 7	Date:	
	□ Year 10	Date:	
	□ Year 13	Date:	
	□ Year 16	Date:	
	□ Year 19	Date:	
	□ Year 22	Date:	
	Spring and Fall		Check inlet and outlets for clogging and remove any debris, as required.
			Notes
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
CULTEC Stormwater Chambers	**2 years after commissioning**		□ Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. □ Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
			Notes
	□ Year 2	Date:	

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Major Maintenance

	Frequency		Action
CULTEC Stormwater Chambers	**9 years after commissioning every 9 years following**		□ Clean stormwater management chambers and feed connectors of any debris. □ Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. □ Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
			Notes
	□ Year 9	Date:	
	□ Year 18	Date:	
	□ Year 27	Date:	
	□ Year 36	Date:	
	45 years after commissioning		□ Clean stormwater management chambers and feed connectors of any debris. □ Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. □ Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. □ Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. □ Attain the appropriate approvals as required. □ Establish a new operation and maintenance schedule.
			Notes
	□ Year 45	Date:	

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Major Maintenance

	Frequency		Action
Surrounding Site	**Monthly in 1st year**		□ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	□ Month 1	Date:	
	□ Month 2	Date:	
	□ Month 3	Date:	
	□ Month 4	Date:	
	□ Month 5	Date:	
	□ Month 6	Date:	
	□ Month 7	Date:	
	□ Month 8	Date:	
	□ Month 9	Date:	
	□ Month 10	Date:	
	□ Month 11	Date:	
	□ Month 12	Date:	
	Spring and Fall		□ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	Yearly		□ Confirm that no unauthorized modifications have been performed to the site.
			Notes
	□ Year 1	Date:	
	□ Year 2	Date:	
	□ Year 3	Date:	
	□ Year 4	Date:	
	□ Year 5	Date:	
	□ Year 6	Date:	
	□ Year 7	Date:	

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CULG008 05-17

FRENCH & PARRELLO ASSOCIATES

ENGINEERING AND CONSULTING **SINCE 1974**

OPERATIONS AND MAINTENANCE MANUAL

For

Punia Boulevard Parking Lot
Block 1701, Lot 4.04
Township of Plainsboro
Middlesex County, New Jersey





Prepared For:

Princeton HealthCare System
A New Jersey Nonprofit Corporation
d/b/a Penn Medicine Princeton Health
1 Plainsboro Road
Plainsboro, NJ 08536

July 2023 | FPA No. 06C028T.003
1800 Route 34, Suite 101, Wall Township, NJ 07719

Stormwater Management Measures
Maintenance Plan & Field Manuals

Development Name: Punia Boulevard Parking Lot

Address: Punia Boulevard

Block(s) / Lot(s): Block 1701, Lot 4.04

Township, County: Township of Plainsboro, Middlesex County, NJ

Party Responsible for Maintenance:

Princeton Healthcare System – Penn Medicine Princeton Health

Address: 1 Plainsboro Road, Plainsboro, NJ 08536

Contact Person(s): Larry Bell Phone: 215-301-6702

Prepared by: French & Parrello Associates, P.A. Date: 07/24/2023

This plan is recorded in

Deed Book # _____ Page # ____ with _____ County Clerk on Date _____

Last Revised on ____/____/_____

Table of Contents

Part I- Maintenance

List of Stormwater Management Measures 2
Location Map 3
Description of Stormwater Management Measures 4
Preventative and Corrective Maintenance Action Plan 5
Maintenance Personnel, Equipment, Tools, and Supplies 9
Disposal Plan 10
Cost Estimate 11
Safety Measures and Procedures 12
Training Plan and Records 13
Annual Evaluation of the Effectiveness of the Plan 16
Documents 17

Part II- Field Manuals and Maintenance Records

Field Manual for Pervious Pavement

Maintenance Logs and Inspection Records

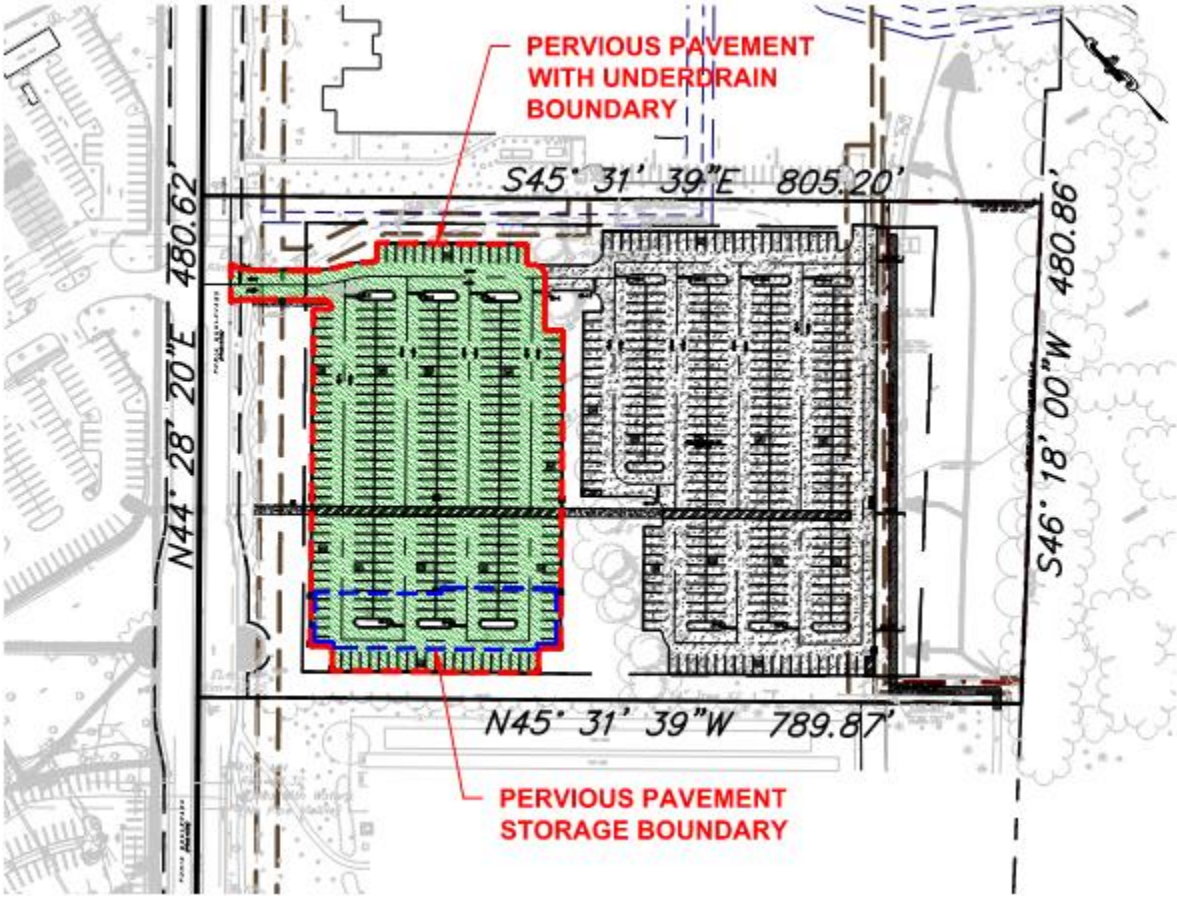
Part I- Maintenance Plan

List of Stormwater Management Measures

The stormwater management measures incorporated into this development are listed below. The corresponding Field Manuals for the stormwater management measures are located in Part II of the Maintenance Plan.

Type of Stormwater Management Measure	BMP No.	Location Description	State Plane Coordinates / Lat., Long.
Pervious Pavement with Underdrain and Storage	West Pervious Pavement	Underneath proposed parking lot	E(X): 458,712 N(Y): 548,527

Location Map



Description of Stormwater Management Measures

Name of the stormwater management measure: West Pervious Pavement
Design storm: 100-Yr Storm

- Design Purposes:
  - Water Quality; Detention
- Dimensions: 411' (Length) x 240' (Width) x 7" (WQ) to 64" (Cultec) (Depth)

Preventative and Corrective Maintenance Action Plan

As per N.J.A.C. 7:8-5.8(b) & (e), preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including, but not limited to, repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of non-vegetated linings.

As per NJDEP BMP Manual Ch. 8 Feb. 2004), maintenance plans should include specific preventative and corrective maintenance tasks such as removal of sediment, trash, and debris; mowing, pruning, and restoration of vegetation; restoration of eroded areas; elimination of mosquito breeding habitats; control of aquatic vegetation; and repair or replacement of damaged or deteriorated components.

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), maintenance plans should include recommended corrective responses to various emergency conditions that may be encountered at the stormwater management measure. It should be noted that if the stormwater management measure includes a Class I or II dam as defined in the NJDEP Dam Safety Standards at N.J.A.C. 7:20, an emergency action plan for the dam is also required. See N.J.A.C. 7:20-1.7(f) for more information.

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), the maintenance plan should address the maintenance of access points to the stormwater management measures in accordance with the following:

- all components of the stormwater management measures must be readily accessible for inspection and maintenance;
- trees, shrubs, and underbrush must be pruned or trimmed as necessary to maintain access to the stormwater management measure;
- the exact limits of inspection and maintenance easements and rights-of-way should be specified on stormwater management measure plans and included in the maintenance plan.

Preventative Maintenance Actions

Frequency	Preventative Maintenance Actions	Stormwater Measures/ No.
Quarterly	Sediment removal	West Pervious Pavement
Semiannual	Sediment removal	West Pervious Pavement
Annual	Basin Structural Inspection Check inlets and outlets for clogging and remove any debris, as required.	West Pervious Pavement
Unscheduled	Quick inspection after every 1" rain	West Pervious Pavement
Other	When establishing or restoring vegetation, inspections should be performed biweekly	West Pervious Pavement
Two Years after Commissioning	Inspect the interior of the Cultec stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique.	West Pervious Pavement
Nine Years after Commissioning (and every 9 years following)	Clean stormwater management chambers and feed connectors of any debris Inspect the interior of the Cultec stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique.	West Pervious Pavement

Corrective Maintenance Actions

Potential Corrective Maintenance Actions	Stormwater Management Measures/No.
- Repair/replacement of outlet pipes or orifices	West Pervious Pavement
- Sediment Removal	West Pervious Pavement

Inspection and Logs of All Preventative and Corrective Maintenance

As per N.J.A.C. 7:8-5.8(f), the person responsible for maintenance shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.

As per NJDEP BMP Manual Ch. 8 (Feb, 2004), a maintenance plan shall include a schedule of regular inspections and tasks, and detailed logs of all preventative and corrective maintenance performed on the stormwater management measure, including all maintenance-related work orders. The person with maintenance responsibility must retain and, upon request, make available the maintenance plan and associated logs and other records for review by a public entity with administrative, health, environmental, or safety authority over the site.

Inspection Checklists in the Field Manual for the stormwater management measures on this site include:

- West Pervious Pavement

The logs of all inspections, and both preventative and corrective maintenance performed should be attached in the "**Maintenance Logs and Inspection Records**" section. See Part II of the Maintenance Plan

Maintenance Personnel, Equipment, Tools, and Supplies

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), maintenance plans should include equipment, tools, and supplies necessary to perform the various preventative and corrective maintenance tasks specified in the plan. Sources of specialized, proprietary, and nonstandard equipment, tools, and supplies should also be provided.

This section applies to both maintenance tasks that are performed by in-house personnel or are outsourced.

Maintenance Personnel/Equipment/Tools/Supplies

Personnel/Equipment/Tools Name	Quantity
General Maintenance Crew	1
Shovel, rake, pick, wheel barrow, gloves, sediment probe, flashlight, camera, hard hat, broom, power washer, hose	As needed
Trucks, lightweight backhoe, vacuum truck, sump pump	As needed

Disposal Plan

Disposal/Recycling Procedures

Dewatering procedures and requirements

Sediment removal shall take place when all runoff has drained from basins, pervious pavers and storm sewer system and all are dry.

Unloading procedures and requirements

Disposal of the debris, trash, sediment and all other waste material should be done at an approved disposal/recycling site and in accordance with all applicable local, state and federal regulation

Disposal Field – Offsite

Cost Estimate

As per N.J.A.C.7:8-5.8(b), cost estimates of maintenance tasks, including, but not limited to, sediment, trash and debris removal must be included in the maintenance plan. Below is an illustration of a cost breakdown and estimation for maintenance of stormwater management measures. The actual costs may vary with factors such as local requirements, equipment, personnel, weather, and maintenance methods.

COST ESTIMATES

Cost Overview

The design engineer should list the maintenance tasks and break down the costs for each maintenance task.

Cost Type	Cost	Details
Annual Contract to perform all routine and unscheduled maintenance	$2,000 per basin	
Annual contract to perform corrective measures	$5,000 per basin	

Safety Measures and Procedures

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), maintenance plans should include procedures and equipment required to protect the safety of inspection and maintenance personnel.

Safety Regulations and Requirements

Attach all local ordinance(s) and state and federal regulations regarding occupational safety after this section

Safety Tools, Equipment and Garments

Safety Tools and Equipment	Location	Responsible Person/Contact #

Emergency Procedures

In case of emergency, Call 911

Training Plan and Records

As per NJDEP BMP Manual Ch. 8 (February 2004), maintenance training begins with a basic description of the purpose and function of the overall stormwater management measure and its major components. Such understanding will enable maintenance personnel to provide more effective component maintenance and more readily detect maintenance-related problems. Depending on the size, character, location, and components of each stormwater management measure, maintenance personnel may also require training in specialized inspection and maintenance tasks and/or the operation and care of specialized maintenance equipment. Training should also be provided in the need for and use of all required safety equipment and procedures.

I. Training Plan

Types of Training

- Mandatory Stormwater Management Basic Training and Field Manual Usage Training for new maintenance crews
- Occupational Safety Training
- Subcontractor training, if applicable

Content of Training

- **Stormwater Management Basic Training**
  - Purposes and Functions of BMPs

    Example Training Material
    - NJDEP Stormwater BMP Manual, Chapter Nine: Structural Stormwater Management Measures
      - Chapter 9.5 Infiltration Basins

More training information is available at NJ Stormwater.org (http://www.nj.gov/dep/stormwater/training.htm)

  - Vegetation Care

    Example Training Material
    - NJDEP Stormwater BMP Manual, Chapter Seven: Landscaping

  - Field Manual Usage Training

    - Field Manuals attached to this Maintenance Plan

  - Equipment and Tools Operation Training

    - Equipment or tool manufacturer's Operation & Maintenance Manual

- Occupational Safety Training
    - OSHA Training
    - Equipment or tool manufacturer's Operation & Maintenance Manual

II. Training Records

Training attendance sheets should be attached by the responsible party after each training.

Attach training attendance sheets from each training

Annual Evaluation of the Effectiveness of the Plan

As per N.J.A.C. 7:8-5.8(g), the person responsible for maintenance shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed.

The responsible party should evaluate the effectiveness of the maintenance plan by comparing the maintenance plan with the actual performance of the maintenance. The items to evaluate may include, but not limited to,

- Whether the inspections have been performed as scheduled;
- Whether the preventive maintenance has been performed as scheduled;
- Whether the frequency of preventative maintenance needs to increase or decrease;
- Whether the planned resources were enough to perform the maintenance;
- Whether the repairs were completed on time;
- Whether the actual cost was consistent with the estimated cost;
- Whether the inspection, maintenance, and repair records have been kept.

If actual performance of those items has been deviated from the maintenance plan, the responsible party should find the causes and implement solutions in a revised maintenance plan.

Annual Evaluation Records

Evaluator(s)	Date of Evaluation	Decision
		__Maintain current version OR __Revise current version Revision date _____ (also update the last revision date on the cover page) __Requires a new deed recording (also update the last recording information on the cover page)
		__Maintain current version OR __Revise current version Revision date _____ (also update the last revision date on the cover page) __Requires a new deed recording (also update the last recording information on the cover page)
		__Maintain current version OR __Revise current version Revision date _____ (also update the last revision date on the cover page) __Requires a new deed recording (also update the last recording information on the cover page)

Documents

Please attach the following:

Transfer Agreement

As per N.J.A.C. 7:8-5.8(b), if the maintenance plan identifies a person other than the developer as having the responsibility for maintenance, the plan shall include documentation of such person's agreement to assume this responsibility, or the developer's obligation to dedicate a stormwater management facility to such person under an applicable ordinance or regulation.

Deed

As per N.J.A.C. 7:8-5.8(d), if the person responsible for maintenance is not a public agency, the maintenance plan and any future revisions shall be recorded upon the deed of record for each property on which the maintenance described in the maintenance plan must be undertaken.

As-Built Drawings with Drainage Plans

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), as-built construction plans of the stormwater management measure and copies of pertinent construction documents, such as laboratory test results, permits, and completion certificates should be included in this Maintenance Plan.

Landscaping Plan for the Stormwater Management Measures

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), if there is a Landscaping Plan for the stormwater management measures, it should be included in this Maintenance Plan.

Permeability Test/Infiltration Test Report

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), if a permeability test or infiltration test is required and available, the reports for pre-construction and post-construction testing should be included in this Maintenance Plan.

Groundwater Mounding Analysis

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), if a groundwater mounding analysis is required and the groundwater mounding analysis was performed, a copy of the analysis should be included in this Maintenance Plan.

Soil Boring Logs

As per NJDEP BMP Manual Ch.8 (Feb., 2004), if any soil borings were taken prior to construction, a copy of the soil boring logs should be included in this Maintenance Plan.

Local, State, Federal Permits

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), local, state, or federal permits related to the stormwater management measures for this development should be included in this Maintenance Plan. See Cost Estimate Section of This Maintenance Plan for more information. The requirement to obtain State permits depends on specific circumstances, such as, but not limited to, the specific design of the stormwater management measures, the maintenance

actions, the access and disturbance, the disposal methods, the location of disposal, the method to empty a basin, the method to dredge the basin, the pollutants in the basin, the damages to the basin, and the method to repair the basin.

Check Maintenance Guidance in NJDEP Stormwater Management Website for details and links to the relevant permits and program areas (http://www.njstormwater.org).

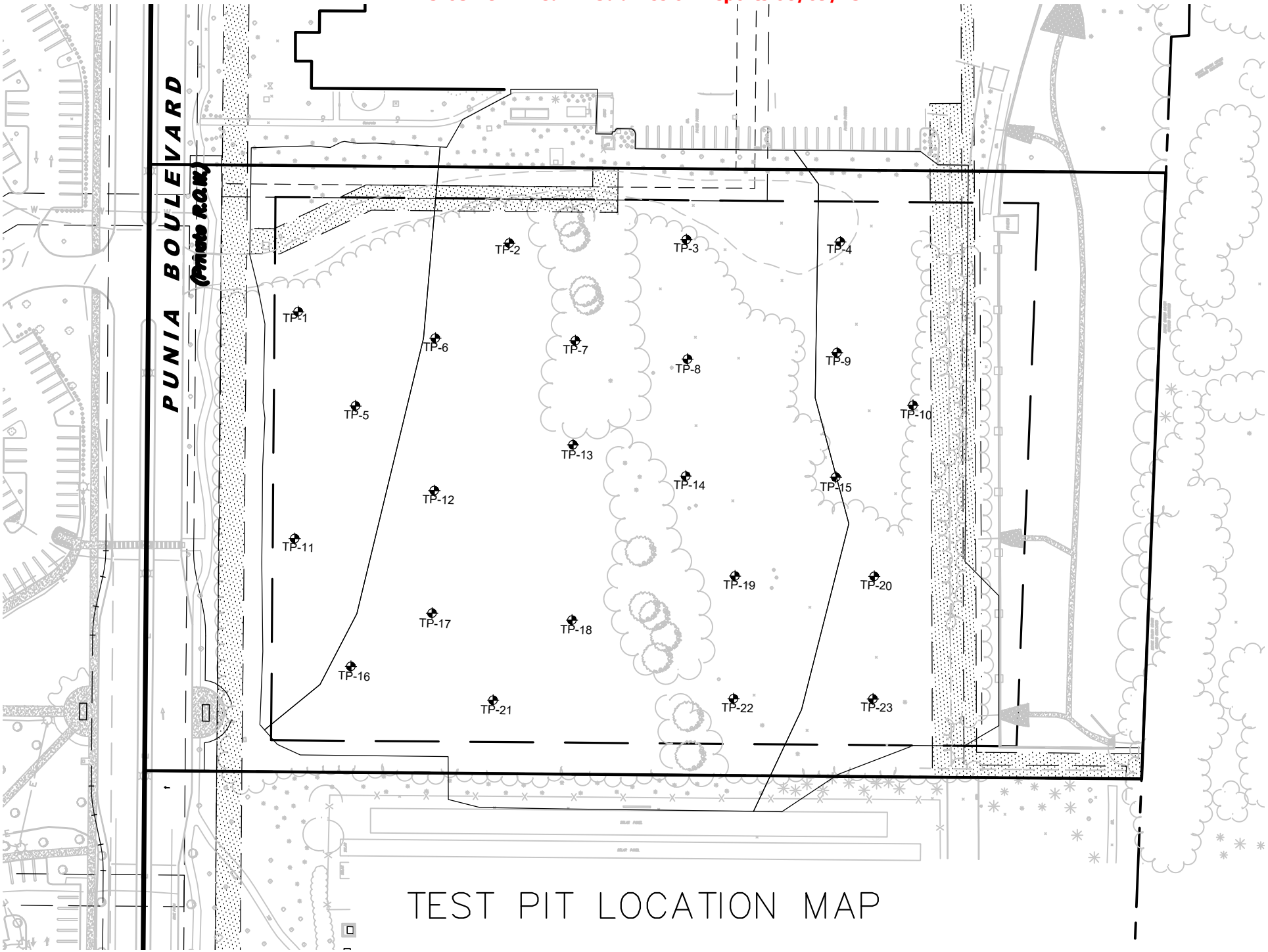
Safety Regulations and Requirements

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), all local ordinances and state and federal regulations regarding occupational safety should be included in this Maintenance Plan.

Devices/Tools/Equipment Operation and Maintenance Manual and Warranties

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), maintenance, repair, and replacement instructions for specialized, proprietary, and nonstandard equipment, tools, supplies, manufacturers' product instructions, and user manuals should be included in this Maintenance Plan.

Attach Documents Here



TEST PIT LOCATION MAP

FRENCH & PARRELLO ASSOCIATES, P.A.
P23-03 Penn Med PB Submission Reports 08/09/23
1800 State Highway 34, Suite 101
Wall, New Jersey 07719

SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-16

SHEET NO.: 1 OF 1

DATE: 11/16/2022

GROUND ELEVATION: 82.8
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 12”	Topsoil/Organic Material
12”- 58”	Dark Yellowish Brown *(10YR 3/6)* **silty clay loam**; subangular blocky, firm
58”-128”	Light Yellowish Brown *(10YR 6/4)* **sandy clay loam**; subangular blocky, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

FRENCH & PARRELLO ASSOCIATES, P.A.
P23-03 Penn Med PB Submission Reports 08/09/23
1800 State Highway 34, Suite 101
Wall, New Jersey 07719

SOIL LOG

TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-21

SHEET NO.: 1 OF 1

DATE: 11/16/2022

GROUND ELEVATION: 82.8
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
0” - 13”	Topsoil/Organic Material
13”- 67”	Dark Yellowish Brown *(10YR 3/6)* **silty clay loam**; subangular blocky, firm
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END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **16 (TP-16)** Date Tested **11/15**

2. Depth **12" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
   _____ Four Hour Pre-soak completed - Indicate result:
   _____ Test Hole Drained within 15 to 24 hours after Pre-soak
   X Test Hole did not Drain within 24 hours after Pre-soak

   Pre-Soak water elevation did not drop after 1 hour. Due to insignificant fall in water elevation, Percolation Test has failed, and soil is determined to be unsuitable for water infiltration.

4. Rate of Fall Data:
   a. Time Interval Selected, Minutes
   b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
7"		
7"		
7"		

5. Percolation Rate:
   a. Time, minutes, Required for a Six-inch Drop in the Water level
   b. Percolation Rate = a/6 = / 6=

6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)

   K = a/pm (in/hr) where a = 20 for a bottom width of 6 inches
   K = 20/ min/in. = in/ hr /2 = **in/hr** Therefore, Use

7. I hereby certify that the information furnished on Form 3d of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____
Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____
Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **21 (TP-21)** Date Tested **11/15**

2. Depth **13" below grade**

3. Pre-soak:
   _____ Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes
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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

Part II- Field Manuals

Attachment of Field Manuals
for Stormwater Management Measures on this Site

As per N.J.A.C. 7:8-5.8(b)&(e), preventative and corrective maintenance shall be performed to maintain the function of stormwater management measures, including repair or replacement of the structure; removal of sediment, debris or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; repair or replacement of non-vegetated linings, and removal of rodent/wildlife and repair/restoration to damaged affected areas caused by them.

Each Field Manual attached to this Maintenance Plan is a separate document pertaining to one specific stormwater management measure, and should be used by inspections and maintenance crews in order to carry out the maintenance work required by N.J.A.C. 7:8-5.8(e).

Field Manual for Pervious Pavement

Pervious Pavement with Underdrain and Storage on the Location Map

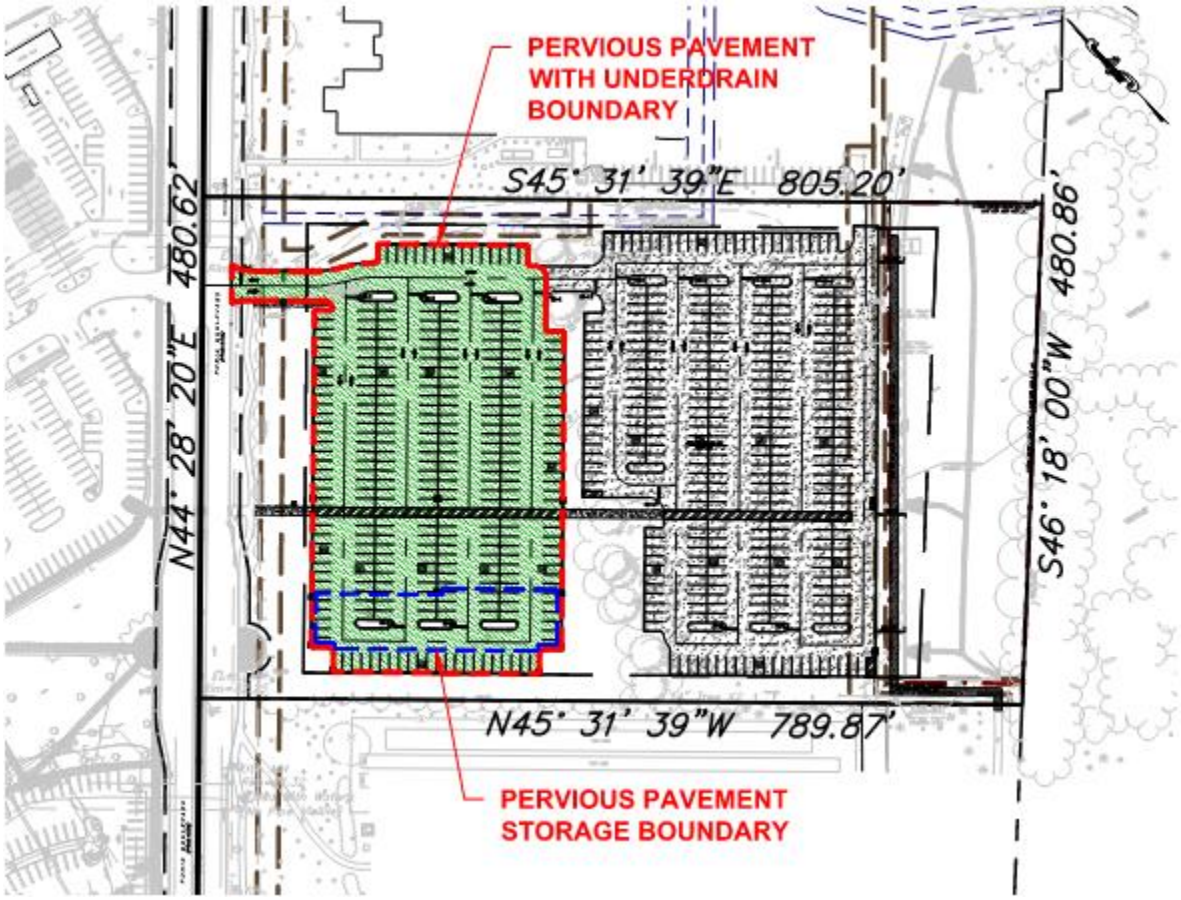
Development Name: Punia Boulevard Parking Lot

Township, County: Township of Plainsboro, Middlesex County, NJ

Location of System: E(X): 458,712; N(Y): 548.527

Location Description: Underneath Proposed Parking Lot

Location Map



NOTE

This Field Manual is intended to be editable and adjustable in accordance with the design of stormwater management measures, the site conditions, and the special needs of responsible party. The Engineer should supplement information and best management practice to assist the responsible party to perform maintenance.

Table of Contents

Pervious Pavement System Overview 4
Basic Design Information 5
Reference Documents 6
Inspection Checklist / Maintenance Actions 8
Preventative Maintenance Record 11
Corrective Maintenance Record 12

Pervious Pavement System Overview

Functionality

Pervious paving systems are paved areas that produce less stormwater runoff than areas paved with conventional paving. This reduction is achieved primarily through the infiltration of a greater portion of the rain falling on the area than would occur with conventional paving. This increased infiltration occurs either through the paving material itself or through void spaces between individual paving blocks known as pavers.

Pervious paving systems are divided into two general types. Each type depends primarily upon the nature of the pervious paving surface course and the presence or absence of a runoff storage bed beneath the surface course. Porous paving and permeable paver with storage bed systems treat the stormwater quality design storm runoff through storage and infiltration. Therefore, these systems have adopted TSS removal rates similar to infiltration structures. The adopted TSS removal rate for each type of pervious paving system is from 80%.

Pervious paving systems are used to reduce runoff rates and volumes from paved, on-grade surfaces such as patios, walkways, driveways, fire lanes, and parking spaces. Pervious paving systems with runoff storage beds achieve these reductions through storage of runoff and eventual infiltration into the subgrade soils. Through this infiltration process, these types of pervious paving systems also achieve stormwater quality requirements.

Proper care and attention in the long-term maintenance of the stormwater management measure is critically important to the safety and health of the public.

Type of BMP – Dry Stormwater Management Measure

The pervious pavement system shall fully drain within 72 hours of the most recent rainfall. Standing water in excess of 72 hours is a sign of the porous pavement failure. It may also contribute to mosquito breeding and other health and safety issues. At no time shall there be ponding on the surface of the pavement.

Basic Design Information

Hydrology Design Targets

1. The system is porous pavement with storage bed.
2. This system has an underdrain.
3. The design drain time is <72 hours.
4. The elevation of the seasonal high water table of this pavement area was observed on 11 / 16 / 2022 and it was 5.4 feet below the pavement bottom surface, at EL. 72.10 feet.
5. The TSS removal rate is 80%.

Hydraulic Design Targets

1. This system is designed to treat the runoff from the Water Quality Design Storm which generates 0.00 cubic feet of runoff. The peak flow entering the system is 5.52 cubic feet per second.
2. The invert elevation of the overflow outlet is at EL. 82.25 feet.

System Configuration Targets

1. The system has no pretreatment.
2. The depth of uniformly graded coarse aggregate in the storage bed ranges from 3 inches in the Water Quality section to 60 inches in the Water Quantity section.
3. The 3-inch Water Quality section spans the entire area of the parking lot.
4. The 60-inch Water Quantity section spans a smaller, 232-foot by 53-foot wide section with 36" Cultec Chambers.

Critical Maintenance Features

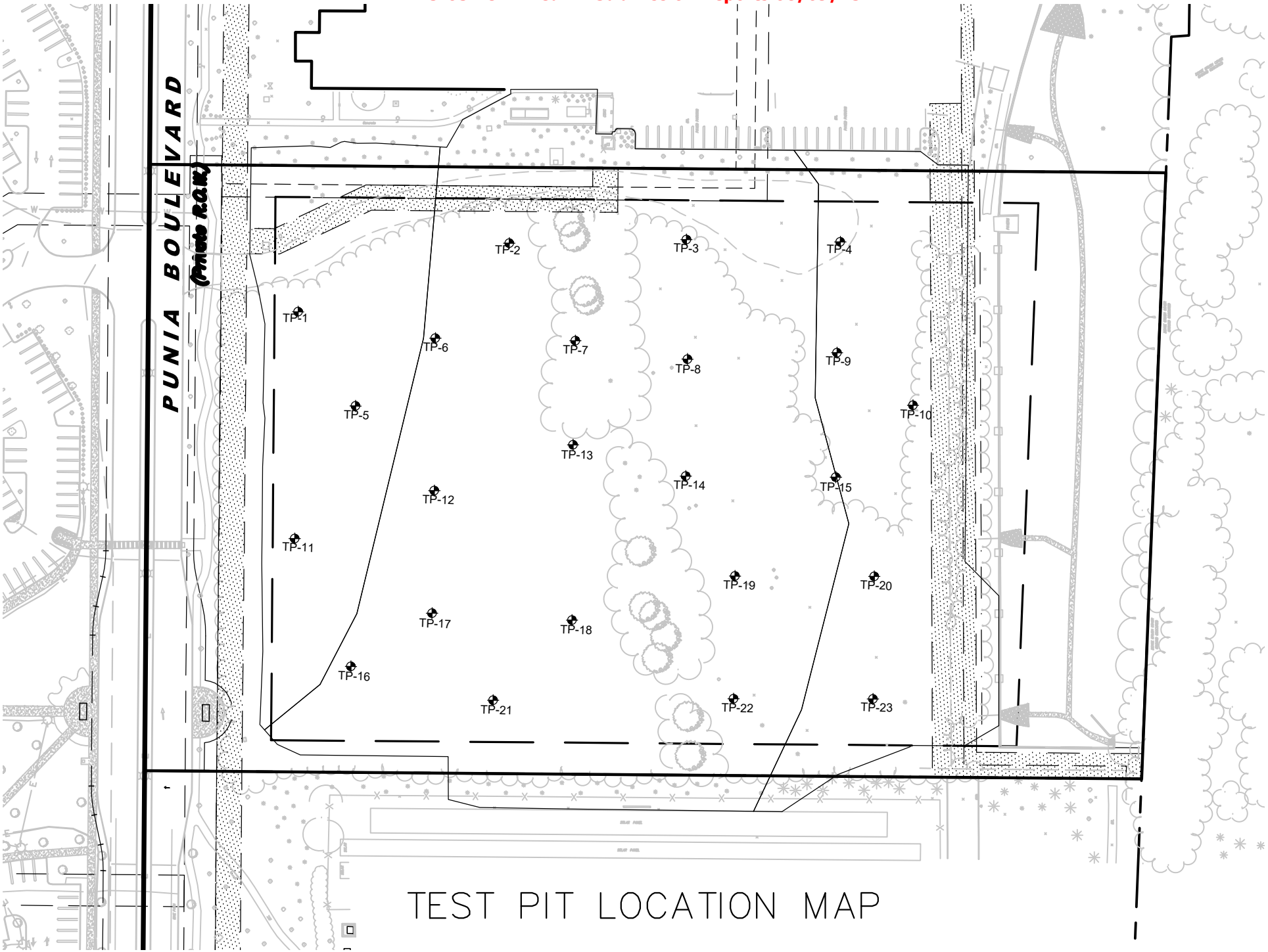
1. Avoid sand or silt onto the porous pavement area.
2. Sweep and vacuum the porous pavement area often to prevent clog.
3. Do not apply sealant to cracks or entire surface.

Reference Documents

Documents to be placed in this field manual should include the following:

- As-built Drawings with Drainage Plans
- Manufacturer's Operation and Maintenance Manual
- Soil Boring Logs
- Permeability Test

Attach Reference Documents Here



TEST PIT LOCATION MAP

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TEMPORARY PARKING LOT
BLOCK 1701, LOT 4.04
Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

SOIL LOG NO.: TP-16

SHEET NO.: 1 OF 1

DATE: 11/16/2022

GROUND ELEVATION: 82.8
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E

DEPTH	DESCRIPTION
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12”- 58”	Dark Yellowish Brown *(10YR 3/6)* **silty clay loam**; subangular blocky, firm
58”-128”	Light Yellowish Brown *(10YR 6/4)* **sandy clay loam**; subangular blocky, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: __/__/____
Mark Kalusz, EIT

Signature of Professional Engineer: _____
Andrew French, P.E. Date: __/__/____
N.J.P.E. License No. 42894

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SOIL LOG

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Township of Plainsboro, Middlesex County NJ
(FPA NO. 06C028T.003)

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SHEET NO.: 1 OF 1

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N.J.P.E. License No. 42894

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

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Signature of Site Evaluator _____
Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____
Andrew L. French, PE

License No. _____

COUNTY/MUNICIPALITY PLAINSBORO / TOWNSHIP OF PLAINSBORO

Percolation Test Data:

Block **1701** Lot **4.04**

1. Test Number **21 (TP-21)** Date Tested **11/15**

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Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Andrew L. French, PE

License No. _____

Maintenance Logs and Inspection Records

As per N.J.A.C. 7:8-5.8(e), preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure(s), including repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of non-vegetated linings.

As per N.J.A.C. 7:8-5.8(f), the person responsible for maintenance shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.

The responsible party shall maintain a record of all maintenance actions performed, including:

- Inspection checklists from each performed inspection
- Preventative maintenance logs
- Corrective maintenance logs, including work orders
- Other maintenance records

Inspection Checklist / Maintenance Actions
Pervious Pavement System

Checklist (circle one)**:** Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. _____ **Inspection Date:** _____

Date of most recent rain event: _____

Rain Condition (circle one):
Drizzle / Shower / Downpour / Other _____

Ground Condition (circle one):
Dry / Moist / Ponding / Submerged / Snow accumulation

The inspection items and preventative/corrective maintenance actions listed below represent general requirements. The design engineer and/or responsible party shall adjust the items and actions to better meet the conditions of the site, the specific design targets, and the requirements of regulatory authorities.

	For Inspector			For Maintenance Crew
Component No. Component Name	Inspection Item and Inspection Item No.		Result	Preventative / Corrective Maintenance Actions
A Pavement Surface (Porous Pavement)	1	Standing water is present after the design drain time The observed drain time is approximately _____ hours. Excessive sediment or mud accumulation on top of the pavement	Y__ N__	Recheck to determine if there is standing water after 72 hours If standing water is present longer than 5 days, report to mosquito commission. If excessive sediment is present, the system may be clogged - Sweep the surface - Power wash (at 45 degree angle to the top) - Vacuum the surface - Excavate to inspect the storage bed for clogging, replace the storage bed material if it is severely clogged - Check the permeability rate of the subsoil Work Order # _____
A Pavement Surface (Porous Pavement)	2	Cracking, subsidence, spalling, or other damage to the pavement	Y__ N__	Repair according to the manufacturer's procedures and material. See Reference Documents section. Work Order # _____
	3	Weeds or other vegetation on the porous pavement	Y__ N__	Remove the vegetation
Note:				

	For Inspector			For Maintenance Crew
Component No. Component Name	Inspection Item and Inspection Item No.		Result	Preventative / Corrective Maintenance Actions
B Outlet	1	Clogged overflow outlet	Y__ N__	Clear and remove sediment
	2	Discharge pipe apron is eroded or scoured	Y__ N__	Restabilize the discharge riprap apron Work Order #_____
Note:				

Follow Up Items (Component No. / Inspection Item No.):

_____

Associated Work Orders: # _____, # _____, # _____, # _____, # _____

_____ _____ _____

Inspector Name **Signature** **Date**

Report issues to the local authority and mosquito commission as required by local ordinances and regulatory authorities.

File this checklist in the Maintenance Log after performing maintenance.

Preventative Maintenance Record

Corresponding Checklist No. _____
Component No._____, Inspection Item No._____

Work Logs

Activities	Components	Date Completed
Sediment/debris removal	A – Pavement Surface (Porous Pavement)	
	B – Outlet	

Debris, sediment, and trash are handled by _____ to disposal site _____.
(See Part I: Maintenance Plan – Disposal Plan Section)

Crew member:_____/_____ **Date:** _____
(name/ signature)

Supervisor:_____/_____ **Date:** _____
(name/ signature)

File this Preventative Maintenance Record in the Maintenance Log after performing maintenance.

Corrective Maintenance Record

1. Work Order # _____ Date Issued _____

2. Issue to be resolved:

3. The issue was from Corresponding Checklist No. _____, Component No.__, Inspection Item No. _____.

4. Required Actions

Actions	Planned Date	Date Completed

5. Responsible person(s):
   _____

6. Special requirements
   - Time of the season or weather condition:_____
   - Tools/equipment:_____
   - Subcontractor (name or specific type):_____

Approved by _____/_____ Date _____
(name/signature)

Verification of completion by _____/_____ Date _____
(name/signature)

File this Corrective Maintenance Record in the Maintenance Log after performing maintenance.

P23-03 Penn Med PB Submission Reports 08/09/23

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Stormwater Chambers



Operation and Maintenance Guidelines
for CULTEC Stormwater Management Systems

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Contact Information:
For general information on our other products and services, please contact our offices within the United States at (800)428-5832, (203)775-4416 ext. 202, or e-mail us at custservice@cultec.com.

For technical support, please call (203)775-4416 ext. 203 or e-mail tech@cultec.com.

Visit www.cultec.com/downloads.html for Product Downloads and CAD details.

Doc ID: CULG008 05-17
May 2017

These instructions are for single-layer traffic applications only. For multi-layer applications, contact CULTEC.
All illustrations and photos shown herein are examples of typical situations. Be sure to follow the engineer's drawings.
Actual designs may vary.

This manual contains guidelines recommended by CULTEC, Inc. and may be used in conjunction with, but not to supersede, local regulations or regulatory authorities. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Introduction

The CULTEC Subsurface Stormwater Management System is a high-density polyethylene (HDPE) chamber system arranged in parallel rows surrounded by washed stone. The CULTEC chambers create arch-shaped voids within the washed stone to provide stormwater detention, retention, infiltration, and reclamation. Filter fabric is placed between the native soil and stone interface to prevent the intrusion of fines into the system. In order to minimize the amount of sediment which may enter the CULTEC system, a sediment collection device (stormwater pretreatment device) is recommended upstream from the CULTEC chamber system. Examples of pretreatment devices include, but are not limited to, an appropriately sized catch basin with sump, pretreatment catchment device, oil grit separator, or baffled distribution box. Manufactured pretreatment devices may also be used in accordance with CULTEC chambers. Installation, operation, and maintenance of these devices shall be in accordance with manufacturer's recommendations. Almost all of the sediment entering the stormwater management system will be collected within the pretreatment device.

Best Management Practices allow for the maintenance of the preliminary collection systems prior to feeding the CULTEC chambers. The pretreatment structures shall be inspected for any debris that will restrict inlet flow rates. Outfall structures, if any, such as outlet control must also be inspected for any obstructions that would restrict outlet flow rates. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Operation and Maintenance Requirements

I. Operation

CULTEC stormwater management systems shall be operated to receive only stormwater run-off in accordance with applicable local regulations. CULTEC subsurface stormwater management chambers operate at peak performance when installed in series with pretreatment. Pretreatment of suspended solids is superior to treatment of solids once they have been introduced into the system. The use of pretreatment is adequate as long as the structure is maintained and the site remains stable with finished impervious surfaces such as parking lots, walkways, and pervious areas are properly maintained. If there is to be an unstable condition, such as improvements to buildings or parking areas, all proper silt control measures shall be implemented according to local regulations.

II. Inspection and Maintenance Options

A. The CULTEC system may be equipped with an inspection port located on the inlet row. The inspection port is a circular cast box placed in a rectangular concrete collar. When the lid is removed, a 6-inch (150 mm) pipe with a screw-in plug will be exposed. Remove the plug. This will provide access to the CULTEC Chamber row below. From the surface, through this access, the sediment may be measured at this location. A stadia rod may be used to measure the depth of sediment if any in this row. If the depth of sediment is in excess of 3 inches (76 mm), then this row should be cleaned with high pressure water through a culvert cleaning nozzle. This would be carried out through an upstream manhole or through the CULTEC StormFilter Unit (or other pretreatment device). CCTV inspection of this row can be deployed through this access port to deter mine if any sediment has accumulated in the inlet row.

B. If the CULTEC bed is not equipped with an inspection port, then access to the inlet row will be through an upstream manhole or the CULTEC StormFilter.

1. Manhole Access
This inspection should only be carried out by persons trained in confined space entry and sewer inspection services. After the manhole cover has been removed a gas detector must be lowered into the manhole to ensure that there are not high concentrations of toxic gases present. The inspector should be lowered into the manhole with the proper safety equipment as per OSHA requirements. The inspector may be able to observe sediment from this location. If this is not possible, the inspector will need to deploy a CCTV robot to permit viewing of the sediment.

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2. StormFilter Access
Remove the manhole cover to allow access to the unit. Typically a 30-inch (750 mm) pipe is used as a riser from the StormFilter to the surface. As in the case with manhole access, this access point requires a technician trained in confined space entry with proper gas detection equipment. This individual must be equipped with the proper safety equipment for entry into the StormFilter. The technician will be lowered onto the StormFilter unit. The hatch on the unit must be removed. Inside the unit are two filters which may be removed according to StormFilter maintenance guidelines. Once these filters are removed the inspector can enter the StormFilter unit to launch the CCTV camera robot.

C. The inlet row of the CULTEC system is placed on a polyethylene liner to prevent scouring of the washed stone beneath this row. This also facilitates the flushing of this row with high pressure water through a culvert cleaning nozzle. The nozzle is deployed through a manhole or the StormFilter and extended to the end of the row. The water is turned on and the inlet row is back-flushed into the manhole or StormFilter. This water is to be removed from the manhole or StormFilter using a vacuum truck.

III. Maintenance Guidelines

The following guidelines shall be adhered to for the operation and maintenance of the CULTEC stormwater management system:

A. The owner shall keep a maintenance log which shall include details of any events which would have an effect on the system's operational capacity.

B. The operation and maintenance procedure shall be reviewed periodically and changed to meet site conditions.

C. Maintenance of the stormwater management system shall be performed by qualified workers and shall follow applicable occupational health and safety requirements.

D. Debris removed from the stormwater management system shall be disposed of in accordance with applicable laws and regulations.

IV. Suggested Maintenance Schedules

A. Minor Maintenance
The following suggested schedule shall be followed for routine maintenance during the regular operation of the stormwater system:

Frequency	Action
Monthly in first year	Check inlets and outlets for clogging and remove any debris, as required.
Spring and Fall	Check inlets and outlets for clogging and remove any debris, as required.
One year after commissioning and every third year following	Check inlets and outlets for clogging and remove any debris, as required.

B. Major Maintenance
The following suggested maintenance schedule shall be followed to maintain the performance of the CULTEC stormwater management chambers. Additional work may be necessary due to insufficient performance and other issues that might be found during the inspection of the stormwater management chambers. (See table on next page)

For more information, contact CULTEC at (203) 775-4416 or visit www.cultec.com.

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	Frequency	Action
Inlets and Outlets	Every 3 years	• Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
	Spring and Fall	• Check inlet and outlets for clogging and remove any debris as required.
CULTEC Stormwater Chambers	2 years after commissioning	• Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
	9 years after commissioning every 9 years following	• Clean stormwater management chambers and feed connectors of any debris. • Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
	45 years after commissioning	• Clean stormwater management chambers and feed connectors of any debris. • Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. • Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. • Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. • Attain the appropriate approvals as required. • Establish a new operation and maintenance schedule.
Surrounding Site	Monthly in 1st year	• Check for depressions in areas over and surrounding the stormwater management system.
	Spring and Fall	• Check for depressions in areas over and surrounding the stormwater management system.
	Yearly	• Confirm that no unauthorized modifications have been performed to the site.

For additional information concerning the maintenance of CULTEC Subsurface Stormwater Management Chambers, please contact CULTEC, Inc. at 1-800-428-5832.

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WQMP
Operation & Maintenance (O&M) Plan

Project Name:_____

Prepared for:

Project Name: _____

Address:_____

City, State Zip:_____

Prepared on:

Date:_____

For more information, contact CULTEC at (203) 775-4416 or visit www.cultec.com.

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This O&M Plan describes the designated responsible party for implementation of this WQMP, including: operation and maintenance of all the structural BMP(s), conducting the training/educational program and duties, and any other necessary activities. The O&M Plan includes detailed inspection and maintenance requirements for all structural BMPs, including copies of any maintenance contract agreements, manufacturer's maintenance requirements, permits, etc.

8.1.1 Project Information

Project name	
Address	
City, State Zip	
Site size	
List of structural BMPs, number of each	
Other notes	

8.1.2 Responsible Party

The responsible party for implementation of this WQMP is:

Name of Person or HOA Property Manager	
Address	
City, State Zip	
Phone number	
24-Hour Emergency Contact number	
Email	

8.1.3 Record Keeping

Parties responsible for the O&M plan shall retain records for at least 5 years.

All training and educational activities and BMP operation and maintenance shall be documented to verify compliance with this O&M Plan. A sample Training Log and Inspection and Maintenance Log are included in this document.

8.1.4 Electronic Data Submittal

This document along with the Site Plan and Attachments shall be provided in PDF format. AutoCAD files and/or GIS coordinates of BMPs shall also be submitted to the City.

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Appendix ____

BMP SITE PLAN

Site plan is preferred on minimum 11” by 17” colored sheets, as long as legible.

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BMP OPERATION & MAINTENANCE LOG

Project Name: _____

Today's Date:_____

Name of Person Performing Activity (Printed):_____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

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Minor Maintenance

Frequency		Action
Monthly in first year		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
☐ Month 1	Date:	
☐ Month 2	Date:	
☐ Month 3	Date:	
☐ Month 4	Date	
☐ Month 5	Date:	
☐ Month 6	Date:	
☐ Month 7	Date:	
☐ Month 8	Date:	
☐ Month 9	Date:	
☐ Month 10	Date:	
☐ Month 11	Date:	
☐ Month 12	Date:	
Spring and Fall		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
☐ Spring	Date:	
☐ Fall	Date:	
☐ Spring	Date:	
☐ Fall	Date:	
☐ Spring	Date:	
☐ Fall	Date:	
☐ Spring	Date:	
☐ Fall	Date:	
☐ Spring	Date:	
☐ Fall	Date:	
☐ Spring	Date:	
☐ Fall	Date:	
☐ Spring	Date:	
☐ Fall	Date:	
One year after commissioning and every third year following		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
☐ Year 1	Date:	
☐ Year 4	Date:	
☐ Year 7	Date:	
☐ Year 10	Date:	
☐ Year 13	Date:	
☐ Year 16	Date:	
☐ Year 19	Date:	
☐ Year 22	Date:	

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Major Maintenance

	Frequency		Action
Inlets and Outlets	**Every 3 years**		Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
			Notes
	☐ Year 1	Date:	
	☐ Year 4	Date:	
	☐ Year 7	Date:	
	☐ Year 10	Date:	
	☐ Year 13	Date:	
	☐ Year 16	Date:	
	☐ Year 19	Date:	
	☐ Year 22	Date:	
	Spring and Fall		Check inlet and outlets for clogging and remove any debris, as required.
			Notes
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
CULTEC Stormwater Chambers	**2 years after commissioning**		☐ Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. ☐ Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
			Notes
	☐ Year 2	Date:	

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Major Maintenance

	Frequency		Action
CULTEC Stormwater Chambers	**9 years after commissioning every 9 years following**		☐ Clean stormwater management chambers and feed connectors of any debris. ☐ Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. ☐ Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
			Notes
	☐ Year 9	Date:	
	☐ Year 18	Date:	
	☐ Year 27	Date:	
	☐ Year 36	Date:	
	45 years after commissioning		☐ Clean stormwater management chambers and feed connectors of any debris. ☐ Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. ☐ Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. ☐ Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. ☐ Attain the appropriate approvals as required. ☐ Establish a new operation and maintenance schedule.
			Notes
	☐ Year 45	Date:	

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Major Maintenance

	Frequency		Action
Surrounding Site	**Monthly in 1st year**		☐ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	☐ Month 1	Date:	
	☐ Month 2	Date:	
	☐ Month 3	Date:	
	☐ Month 4	Date:	
	☐ Month 5	Date:	
	☐ Month 6	Date:	
	☐ Month 7	Date:	
	☐ Month 8	Date:	
	☐ Month 9	Date:	
	☐ Month 10	Date:	
	☐ Month 11	Date:	
	☐ Month 12	Date:	
	Spring and Fall		☐ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
	Yearly		☐ Confirm that no unauthorized modifications have been performed to the site.
			Notes
	☐ Year 1	Date:	
	☐ Year 2	Date:	
	☐ Year 3	Date:	
	☐ Year 4	Date:	
	☐ Year 5	Date:	
	☐ Year 6	Date:	
	☐ Year 7	Date:	

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CULG008 05-17

FRENCH & PARRELLO ASSOCIATES

ENGINEERING AND CONSULTING SINCE 1974

WATER REPORT

For

Penn Medicine Princeton Health Parking Garage
Block 1701, Lot 3.01
Township of Plainsboro
Middlesex County, New Jersey





Prepared For:

Princeton HealthCare System
A New Jersey Nonprofit Corporation
d/b/a Penn Medicine Princeton Health
1 Plainsboro Road
Plainsboro, NJ 08536

Andrew L. French
Professional Engineer, NJ License No # 42894

July 25, 2023 | FPA No. 06C028T.003
1800 Route 34, Suite 101, Wall Township, NJ 07719

TABLE OF CONTENTS

Page No.

Section 1.0 Project Description.....1

Section 2.0 Proposed Conditions.....1

Section 3.0 Summary.....1

Appendix

- NJAW Fire Flow Worksheet signed by Plainsboro Fire Official
- Fire Hydrant Flow Test Data

1.0 Project Description

The Penn Medicine Princeton HealthCare System Campus has been designated as an area for redevelopment in Plainsboro Township and the township has adopted the Amended Redevelopment for the Princeton HealthCare System at Plainsboro Site, dated March 13, 2013 which establishes the zoning requirements for the project. The project site is located in the Hospital Medical Office Complex (HMOC) district within the Redevelopment Plan. The project proposes the construction of a Parking Garage with six levels which shall support the parking needs of the new Cancer Center. The project site is known as Block 1701, Lot 3.01 and contains the existing hospital.

There is an existing NJAW water main easement that is 25 feet wide and is located on the southern portion of existing P6 parking lot and the easement runs east to west. The parking garage structure will be located north of the existing water main easement.

2.0 Proposed Conditions

The proposed Parking Garage shall not contain any restrooms or plumbing fixtures except hose spigots on each level and a fire suppression system. The Parking Garage will be serviced by a new 8" water service line which will split into a 8" Fire Service line and a 2" Domestic Service line. The primary use of water in the parking garage is for fire suppression and general maintenance. The 2" domestic service line will serve multiple water spigot locations, two per each level of the parking garage, which shall be used for general maintenance.

3.0 SUMMARY

The proposed Water Service System has been designed in accordance with N.J.A.C. 7-10-12.6. All water distribution system improvements shall be installed in accordance with the requirements of the water utility and the Plumbing Subcode official.

Needed Fire Flow (NFF) Calculation Worksheet

NEW JERSEY
AMERICAN WATER

For Residential Buildings, see Tab 1 - Residential Fire Flow

For Non-Residential Buildings with a fully sprinklered system, see Tab 2 - Non-Residential Sprinkler

Print and Sign Tab 3 - Sign off sheet

Preparer: Please fill in only the yellow shaded cells on worksheets

Municipal Fire Official or assigned Delegate: Please fill in only the blue shaded cells as appropriate on Sign Off Sheet

The ability of a distribution system to provide safe, adequate and reliable service to its customers is analyzed based on forecasted customer demands and the Needed Fire Flow (NFF). Hydraulic computer modeling of the distribution system is utilized as the primary tool in the analysis. The model will determine system adequacy/deficiency and evaluate the effectiveness of proposed improvements under requested fire demand conditions. Published manuals from the ISO are used as a guide in determining the NFF. The calculations and tables contained within are obtained from the ISO's *Guide For Determination of Needed Fire Flow*, Edition 06-2014.

*This worksheet is only a guide and in no way does New Jersey American Water take responsibility for the calculated Needed Fire Flow indicated within. In some cases the requested Needed Fire Flow for a site may be more or less based on other factors not accounted for in this worksheet. ISO's municipal fire protection testing may identify sites with needed fire flows greater than 3,500 gpm for a duration of three hours. In many pressure zones, particularly in residential areas, the identified maximum is less than 3,500 gpm. Where individual structures are assigned ISO Needed Flows above 3,500 gpm, fire protection needs in excess of 3,500 gpm at these sites will be satisfied through the development of individual customer-owned fire suppression systems.

References:
Guide for Determination of Needed Fire Flow. Rep. 06-2014 ed. N.p.: Insurance Services Office, 2014. Print.
Fire Suppression Rating Schedule. Rep. N.p.: Insurance Services Office, 2012. Print.

Version 1/2021

1. Residential

Needed Fire Flow (NFF) (Refer to Table and Notes below)	*Example*	GPM
	750	

For 1- and 2-family dwellings not exceeding 2 stories with an Effective Area* of 4800 Square Feet or less, use the following Needed Fire Flows:

Distance Between Buildings	Needed Fire Flow
More than 30 feet	500 gpm
21-30 feet	750 gpm
11-20 feet	1,000 gpm
0-10 feet	1,500 gpm

Residential with Automatic Fire Sprinkler System

For a 1- or 2-family dwelling protected with an automatic fire sprinkler system installed in accordance with the general criteria of NFPA 13D, *Installation of Sprinkler Systems for One-and Two-Family Dwellings and Manufactured Homes* , the Needed Fire Flow is either the **demand at the base of the automatic sprinkler riser or 500 gpm, whichever is greater.**

The NFF for residential occupancies (such as **apartment buildings, lodgings and rooming houses, board and care facilities, hotels, motels and dormitories**) protected by an automatic fire sprinkler system installed in accordance with the general criteria of NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and including Four Stories in Height* , is either the **demand at the base of the automatic sprinkler riser or 1000 gpm, whichever is greater.**

Residential with Effective Area* of greater than 4800 square feet

For a 1- or 2-family dwelling with an Effective Area* greater than 4,800 square feet, **refer to ISO's *Guide for Determination of Needed Fire Flow* , Edition 06-2014.**

** To calculate Effective Area refer to ISO's Guide for Determination of Needed Fire Flow, Edition 06-2014.*

References:

Guide for Determination of Needed Fire Flow. Rep. 06-2014 ed. N.p.: Insurance Services Office, 2014. Print.

Fire Suppression Rating Schedule. Rep. N.p.: Insurance Services Office, 2012. Print.

2. Non-Residential, Fully Sprinklered

Fill in the Demand at the Base of the Automatic Sprinkler Riser and the NFPA 13 Hose Stream Demand

For projects with multiple buildings, fill out for the highest demand building.	GPM
Demand at the Base of the Automatic Sprinkler Riser	1250
NFPA 13 Hose Stream Demand	500
Needed Fire Flow (NFF) *	1750

** Minimum NFF is 500 GPM*

If a fire pump is required, please provide the following information		
Pump Flow Rate	1250	GPM
Total Dynamic Head	127	feet

Notes

The Needed Fire Flow (NFF) for commercial occupancies protected by an automatic fire sprinkler system installed in accordance with the general criteria of NFPA 13, *Standard for Installation of Sprinkler Systems,* is **the demand at the base of the automatic sprinkler riser and inside/outside hose stream demand.**

For Non-Residential, not fully sprinklered buildings **refer to ISO's *Guide for Determination of Needed Fire Flow* , Edition 06-2014.**

References:

Guide for Determination of Needed Fire Flow. Rep. 06-2014 ed. N.p.: Insurance Services Office, 2014. Print.

Fire Suppression Rating Schedule. Rep. N.p.: Insurance Services Office, 2012. Print.

3 - Sign Off Sheet

Residential Fire Flow (GPM)	
Needed Fire Flow (per ISO)	0
Total Needed Fire Flow (if higher flow amount requested by township official)	

Non-Residential, Fully Sprinklered (GPM)	
Needed Fire Flow (per ISO)	1750
Total Needed Fire Flow (if higher flow amount requested by township official)	1250

Note: Please Provide Both Signatures

Project Name: PMPH Garage

Project Address: 1 Plainsboro Road

Plainsboro, NJ

Prepared By: Richard Kulinski, BR+A Consulting Engineers

Signature: Richard Kulinski

Title: Senior Associate

Date: 26-Apr-23

email: rkulinski@brplusa.com

Phone #: 207 620-2071

Signing this sheet is only an **acknowledgement** of the NFF.
It **does not** imply a review and approval of the NFF calculations.

Municipal Fire Official or Delegate

(Print name): Keith Thedinga

Municipality Plainsboro Township

Signature: Keith Thedinga

Title: Fire Marshal

Date: 5/1/2023

email: kthedinga@plainsboronj.com

Phone # 609-799-0909 x1208

SimplexGrinnell BE SAFE.

Task # 86859837
SR# 53277670

FIRE HYDRANT TEST REPORT

Date 10/5/2022

CUSTOMER	Penn Medicine Princeton Health	INSPECTOR NAME	Bill Leaman
BUILDING / LOCATION		SIMPLEXGRINNELL OFFICE	544
STREET	1 PLAINSBORO RD		283 Gibraltar Road
CITY / ST/PROV / ZIP/PC	PLAINSBORO , NJ 08536		Horsham PA 19044
ATTN:	Steven Morrissey	PHONE #	215-347-6500
PHONE #	267-581-3982	LICENSE #	P00423

Inspection Type

☐ Annual Flushing* ☑ 5 year Flow Test

**If this is an Annual Flushing the Pressure and GPM boxes will be left blank*

Test Hydrant Location:		**Test Hydrant Static Pressure (PSI):**	
Test Hydrant Make & Model:		**Test Hydrant Residual Pressure (PSI):**	
Test Hydrant Nozzle Size:		**Test Hydrant GPM:**	
Test Hydrant Nozzle Coefficient:			

	Flow Hydrant Location	Flow Hydrant Make & Model	Flow Hydrant Nozzle Size	Flow Hydrant Nozzle Coefficient	Flow Hydrant Pitot Pressure (PSI)	Test Hydrant Pitot Pressure (PSI)	Flow Hydrant GPM
1	Service Road-A	Mueller-5 1/2	2 1/2	0.9	74	90	1443
2	Service Road-B	Mueller-5 1/2	2 1/2	0.9	74	90	1443
3	Athenson-East	Mueller-5 1/2	2 1/2	0.9	74	90	1443
4	Athenson-West	Mueller-5 1/2	2 1/2	0.9	74	90	1443
5	North Entrance-P6	Mueller-5 1/2	2 1/2	0.9	74	90	1443
6	by ER	Mueller-5 1/2	2 1/2	0.9	74	90	1443
7							
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16							
17							
18							
19							
20							
21							

Page 1 of 2

Andrew L. French

From: Thedinga,Keith <kthedinga@plainsboronj.com>
Sent: Monday, November 21, 2022 11:48 AM
To: Lena Barone
Cc: Andrew L. French; Penn Medicine
Subject: RE: PMPHCC - Follow up from Friday's meeting

This appears to be satisfactory. Can you send all sheets in one PDF? Thank you!

Keith Thedinga, Fire Official
Division of Fire Prevention
Township of Plainsboro
641 Plainsboro Road
Plainsboro, NJ 08536
609-799-0909 ext. 1208
kthedinga@plainsboronj.com

From: Lena Barone <Lena.Barone@FPAengineers.com>
Sent: Friday, November 18, 2022 12:06 PM
To: Thedinga,Keith <kthedinga@plainsboronj.com>
Cc: Andrew L. French <Andrew.French@FPAengineers.com>; Penn Medicine <PennMedicine@fpaengineers.com>
Subject: RE: PMPHCC - Follow up from Friday's meeting

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- *Helpdesk*

Keith, attached is the updated plan per your request. Please let us know if this looks good to you. Thank you,

Lena Balorda-Barone, PE
Senior Project Manager

1800 Route 34, Suite 101, Wall, New Jersey 07719
T 732.312.9800 Dir 732.312.9751

FRENCH & PARRELLO ASSOCIATES

Web: FPAengineers.com

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From: Thedinga,Keith <kthedinga@plainsboronj.com>
Sent: Thursday, November 17, 2022 12:00 PM
To: Lena Barone <Lena.Barone@FPAengineers.com>
Cc: Andrew L. French <Andrew.French@FPAengineers.com>; Penn Medicine <PennMedicine@fpaengineers.com>
Subject: RE: PMPHCC - Follow up from Friday's meeting

Sounds good. Thank you!

Keith Thedinga, Fire Official
Division of Fire Prevention
Township of Plainsboro
641 Plainsboro Road
Plainsboro, NJ 08536
609-799-0909 ext. 1208
kthedinga@plainsboronj.com

From: Lena Barone <Lena.Barone@FPAengineers.com>
Sent: Thursday, November 17, 2022 11:16 AM
To: Thedinga,Keith <kthedinga@plainsboronj.com>
Cc: Andrew L. French <Andrew.French@FPAengineers.com>; Penn Medicine <PennMedicine@fpaengineers.com>
Subject: RE: PMPHCC - Follow up from Friday's meeting

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- Helpdesk

Got it – thank you. We will make the edits and send you the updated plans. Thanks,

Lena Balorda-Barone, PE
Senior Project Manager

1800 Route 34, Suite 101, Wall, New Jersey 07719
T 732.312.9800 Dir 732.312.9751

FPA
FRENCH & PARRELLO
ASSOCIATES

Web: FPAengineers.com

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From: Thedinga,Keith <kthedinga@plainsboronj.com>
Sent: Wednesday, November 16, 2022 2:55 PM
To: Lena Barone <Lena.Barone@FPAengineers.com>

Cc: Andrew L. French <Andrew.French@FPAengineers.com>; Penn Medicine <PennMedicine@fpaengineers.com>
Subject: RE: PMPHCC - Follow up from Friday's meeting

I just replied to a previous email that you sent.

Keith Thedinga, Fire Official
Division of Fire Prevention
Township of Plainsboro
641 Plainsboro Road
Plainsboro, NJ 08536
609-799-0909 ext. 1208
kthedinga@plainsboronj.com

From: Lena Barone <Lena.Barone@FPAengineers.com>
Sent: Wednesday, November 16, 2022 11:14 AM
To: Thedinga,Keith <kthedinga@plainsboronj.com>
Cc: Andrew L. French <Andrew.French@FPAengineers.com>; Penn Medicine <PennMedicine@fpaengineers.com>
Subject: FW: PMPHCC - Follow up from Friday's meeting

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- Helpdesk

Keith, I am just following up to see if you had a chance to review the updated plans. Thank you,

Lena Balorda-Barone, PE
Senior Project Manager

1800 Route 34, Suite 101, Wall, New Jersey 07719
T 732.312.9800 Dir 732.312.9751

FRENCH & PARRELLO ASSOCIATES

Web: FPAengineers.com

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From: Lena Barone <Lena.Barone@FPAengineers.com>
Sent: Wednesday, November 9, 2022 2:29 PM
To: Thedinga,Keith <kthedinga@plainsboronj.com>
Cc: Andrew L. French <Andrew.French@FPAengineers.com>; Penn Medicine <PennMedicine@fpaengineers.com>
Subject: RE: PMPHCC - Follow up from Friday's meeting

Keith,

We revised the plans to reflect the fire hydrant locations discussed in our meeting as well as fire lane striping. We also ran the truck turning templates for the ladder truck per the specifications provided by you. Please see attached pdfs and let us know if you see any issues with this design.

Thank you,

Lena Balorda-Barone, PE
Senior Project Manager

1800 Route 34, Suite 101, Wall, New Jersey 07719
T 732.312.9800 Dir 732.312.9751

FRENCH & PARRELLO ASSOCIATES

Web: FPAengineers.com

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From: Lena Barone
Sent: Friday, October 28, 2022 10:10 AM
To: Thedinga,Keith <kthedinga@plainsboronj.com>
Cc: Andrew L. French <Andrew.French@FPAengineers.com>; Penn Medicine <PennMedicine@fpaengineers.com>
Subject: RE: PMPHCC - Follow up from Friday's meeting

Thank you, this is very helpful.

Lena Balorda-Barone, PE
Senior Project Manager

1800 Route 34, Suite 101, Wall, New Jersey 07719
T 732.312.9800 Dir 732.312.9751

FRENCH & PARRELLO ASSOCIATES

Web: FPAengineers.com

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From: Thedinga,Keith <kthedinga@plainsboronj.com>
Sent: Thursday, October 27, 2022 4:13 PM
To: Lena Barone <Lena.Barone@FPAengineers.com>
Cc: Andrew L. French <Andrew.French@FPAengineers.com>; Penn Medicine <PennMedicine@fpaengineers.com>
Subject: RE: PMPHCC - Follow up from Friday's meeting

Sorry for the delayed response. Here are the truck dimensions:

Engine

Length 31' 10"
Width: 100"
Height: 10' 2"
Wheelbase: 183"

Squad
Length: 34' 6"
Width: 100"
Height: 11' 3"
Wheelbase: 214"

Tower
Length: 46' 10"
Width: 100"
Height: 12' 1"
Wheelbase: 262

The fire lane striping/signage information can be found in the International Fire Code – Appendix D and also the Plainsboro Ordinance section "M" found here: https://ecode360.com/9426249

Attached is the fire safety during construction document we discussed.

Thank you,

Keith Thedinga, Fire Official
Division of Fire Prevention
Township of Plainsboro
641 Plainsboro Road
Plainsboro, NJ 08536
609-799-0909 ext. 1208
kthedinga@plainsboronj.com

From: Lena Barone <Lena.Barone@FPAengineers.com>
Sent: Tuesday, October 25, 2022 1:26 PM
To: Thedinga,Keith <kthedinga@plainsboronj.com>
Cc: Andrew L. French <Andrew.French@FPAengineers.com>; Penn Medicine <PennMedicine@fpaengineers.com>
Subject: PMPHCC - Follow up from Friday's meeting

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- Helpdesk

Keith,

I just wanted to follow up on a few of the items from our meeting on Friday. I believe you were going to send us the following:

1. Confirm fire truck dimensions to run the truck turning templates with
2. Reference materials for fire lane striping
3. Sample site plan for fire lane access during construction to forward to the construction manager for submission prior to construction

Thank you again for meeting with us, that was very helpful for our team.

Lena Balorda-Barone, PE
Senior Project Manager

1800 Route 34, Suite 101, Wall, New Jersey 07719
T 732.312.9800 Dir 732.312.9751

FRENCH & PARRELLO
ASSOCIATES

Web: FPAengineers.com

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DTS • PROVIDENT
Intelligent Land Use

TECHNICAL MEMORANDUM
PARKING STUDY

PENN MEDICINE PRINCETON HEALTH CAMPUS
Township Of Plainsboro, Middlesex County, New Jersey

Prepared for
PENN MEDICINE PRINCETON HEALTH
Township Of Plainsboro, New Jersey

Prepared by
DTS Provident Design Engineering, LLP
One North Broadway
White Plains, New York

April 14, 2023
DTS Provident Project No. 0905

_____
Charles (Carlito) S. Holt, P.E.
New Jersey P.E. #24GE04890500
Partner

DTS • PROVIDENT
Intelligent Land Use

P23-03 Penn Med PB Submission Reports 08/09/23

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Andrew V. Tung, ASLA, Esq., LEED AP
Gerhard M. Schwalbe, P.E.
Charles 'Carlito' Holt, P.E., PTOE
Brian Dempsey, P.E., PTOE, RSP1

TECHNICAL MEMORANDUM

TO: Ms. Bonnie N. Flynn
Director of Planning & Community Development

DATE: April 14, 2023

FROM: Carlito Holt, P.E., PTOE
Partner

RE: Parking Study
Penn Medicine Princeton Health Campus, Plainsboro, NJ

Introduction

DTS Provident Design Engineering, LLP (DTS Provident) has prepared this Technical Memorandum to summarize the evaluation of existing/future parking conditions at the Penn Medicine Princeton Health (PMPH) Campus located along Plainsboro Road and Campus Road in Plainsboro Township, Middlesex County, New Jersey. The purpose of this evaluation is to verify that the parking provisions are consistent with the Amended Redevelopment Plan.

The parking evaluation contained in this Technical Memorandum considers the number of parking spaces required at the existing Health and Medical Office Complex (HMOC) component of the Campus, which consists of the Hospital, Medical Office Building and the former Health/Fitness Center, as well as the future number of parking spaces required as part of the Cancer Center expansion to the HMOC.

Based upon the information contained herein, it is the considered professional opinion of DTS Provident that the parking ratio contained in the Amended Redevelopment Plan for Medical Office Building (4 spaces per 1,000 sf) will be more than adequate to accommodate the proposed Cancer Center expansion based on the comparison of parking ratios to other sources. Furthermore, the parking currently provided at the HMOC, combined with the additional parking spaces to be constructed, will meet the future overall parking needs of the HMOC.

Existing & Future Parking Requirements

Based on the approved "Amended Preliminary and Final Major Site Plan" prepared by French & Parrello Associates on July 22, 2010, the total number of parking spaces required for the existing HMOC component of the Campus is 1,540 parking spaces. Recently, the approximately 48,000 square foot Health/Fitness Center portion of the HMOC was vacated and will be re-purposed in the future to another healthcare-related space that is currently unknown at this time. In addition, the Applicant is looking to construct a new, approximately 200,000 square foot Cancer Center expansion within the HMOC.

The proposed Cancer Center expansion would require four parking spaces for every 1,000 square feet of floor area. This parking ratio is based on the parking requirements contained in the Amended

Redevelopment Plan for Medical Office space. Although the proposed Cancer Center would equal approximately 200,000 square feet of total floor space, DTS Provident has taken into consideration the Township's interpretation of the parking requirement code that allows the facility sized used in the required parking space calculations to be reduced by the amount of common space area (i.e., accessory/mechanical space). The total usable floor area for the proposed Cancer Center is based on the conceptual floor plans submitted by the Applicant.

DTS Provident took a similar approach with the future repurposing of the recently vacated Health/Fitness Center space. Although the vacated Health/Fitness Center equals approximately 48,000 square feet of total floor space, the Applicant has developed a conceptual clinical program for the vacated Health/Fitness Center space, identifying both usable and unusable space.

Copies of the conceptual layout plans for the proposed Cancer Center and re-purposed Health/Fitness Center are included in Attachment A. As noted in the latest conceptual Health/Fitness Center layout, the total usable square footage has been reduced from prior concepts; however, the larger square footage has been utilized in the analysis contained herein to remain conservative. It is further noted that as the latest Cancer Center layout is refined, the usable square footage for this facility will also likely be reduced.

Therefore, for purposes of this evaluation, DTS Provident utilized a space of 151,555 square feet for the proposed Cancer Center expansion (based on the conceptual floor plans prepared by the Applicant) and 44,200 square feet for the repurposed Health/Fitness Center (based on the conceptual clinical program prepared by the Applicant) in determining the future parking requirements.

Using the required parking space parameters outlined above, the HMOC site would require a future parking space supply total of 2,323 parking spaces. This includes the 1,540 parking spaces that are required for the existing HMOC site and using a parking ratio of 4 parking spaces per 1,000 square feet for the 44,200 square foot re-purposed Health/Fitness Center space and the proposed 151,555 square foot Cancer Center expansion.

Existing & Future Parking Supply

The Total Parking Supply currently provided at the HMOC site is 1,539 parking spaces contained within the various surface parking lots surrounding the HMOC site. As a result of the Cancer Center expansion, a multi-level Parking Garage will be constructed within an existing surface parking lot just north of the existing HMOC building to accommodate both the loss of parking spaces due to the Cancer Center expansion as well as the additional parking demand created by patrons/staff of the proposed Cancer Center. The proposed Parking Garage will consist of a total of 1,161 parking spaces. The number of parking spaces that will be displaced by the Cancer Center expansion is 167 parking spaces and the number of parking spaces that will be displaced by construction of the proposed Parking Garage is 182 parking spaces.

Combining the existing parking space supply at the HMOC site (1,539 spaces) with the additional parking space supply created by the proposed Parking Garage (1,161 spaces), while discounting the number of parking spaces displaced by the Cancer Center expansion (167 spaces) and Parking Garage

construction (182 spaces), results in a total future parking space supply of 2,351 parking spaces for the HMOC site, which exceeds the required future parking space supply as outlined above by 28 parking spaces.

Table No. 1 below summarizes the existing/future parking space requirements and supply as described above.

TABLE NO. 1
PARKING REQUIREMENTS & SUPPLY WITHOUT PARKING LOT P10
PENN MEDICINE PRINCETON HEALTH, PLAINSBORO, NEW JERSEY

Parking Demand/Supply	Number of Parking Spaces
Required HMOC Parking (obtained from "Amended Preliminary and Final Major Site Plan", French & Parrello, 7/22/2010)	1,540
Vacant Fitness Center Space (44,200 SF, obtained from Princeton Forward Memorandum dated 3/7/2023) *[using Amended Redevelopment Plan requirement of 4 spaces per 1,000 SF]*	+177
Required Cancer Center Expansion Parking (Proposed 151,555 SF) *[using Amended Redevelopment Plan requirement of 4 spaces per 1,000 SF]*	+606
Total Parking Required	*2,323*
Existing Parking Supply (excluding Lot P10)	1,539
Additional Supply (Proposed Parking Garage)	+1,161
Displaced Parking Supply (due to Cancer Center expansion)	-167
Displaced Parking Supply (due to Parking Garage structure)	-182
Total Parking Supply	*2,351*
Excess Parking Capacity	*+28*

Although not counted towards the parking space supply requirements contained in the Amended Redevelopment Plan, it is noted that the HMOC site also utilizes Parking Lot P10, typically referred to as the "Crescent Lot", located north of the HMOC in the Hospital Auxiliary District (HAD) to allow additional parking availability on the HMOC site to accommodate atypical surges in parking demand for less frequent hospital events (i.e. school bus accident that may bring a high number of parents to the Hospital).

Parking Lot P10 provides an additional 315 parking spaces, bringing the existing Total Parking Supply available to patrons/staff of the HMOC site to 1,854 parking spaces. In addition, Parking Lot P10 is

approved for an expansion to add an additional 128 parking spaces, bringing the total future parking space supply in Parking Lot P10 to 443 parking spaces and the future Total Parking Supply available to patrons/staff of the HMOC site to 1,982 parking spaces.

Accounting for the utilization of parking spaces within Parking Lot P10, the total future parking space supply for the HMOC site equals 2,794, which exceeds the required future parking space supply by 471 parking spaces.

Table No. 2 below summarizes the existing/future parking space requirements and supply while taking into account utilization of the existing/future parking spaces within Parking Lot P10.

TABLE NO. 2
PARKING REQUIREMENTS & SUPPLY WITH PARKING LOT P10
PENN MEDICINE PRINCETON HEALTH, PLAINSBORO, NEW JERSEY

Parking Demand/Supply	Number of Parking Spaces
Required HMOC Parking (obtained from "Amended Preliminary and Final Major Site Plan", French & Parrello, 7/22/2010)	1,540
Vacant Fitness Center Space (44,200 SF, obtained from Princeton Forward Memorandum dated 3/7/2023) *[using Amended Redevelopment Plan requirement of 4 spaces per 1,000 SF]*	+177
Required Cancer Center Expansion Parking (Proposed 151,555 SF) *[using Amended Redevelopment Plan requirement of 4 spaces per 1,000 SF]*	+606
Total Parking Required	*2,323*
Existing Parking Supply (excluding Lot P10)	1,539
Existing Parking Supply (Lot P10)	315
Additional Supply (Lot P10 Expansion)	+128
Additional Supply (Proposed Parking Garage)	+1,161
Displaced Parking Supply (due to Cancer Center expansion)	-167
Displaced Parking Supply (due to Parking Garage structure)	-182
Total Parking Supply	*2,794*
Excess Parking Capacity	*+471*

Proposed Cancer Center Parking Demand

The Amended Redevelopment Plan identifies a Medical Office Building Parking Ratio of 4 parking spaces for every 1,000 square feet of gross floor area. In order to verify that this Parking Ratio is adequate to support the proposed Cancer Center, the following sources were referenced:

- Actual observed parking ratios at two existing Memorial Sloan Kettering Cancer Center facilities
- Parking Count Demand Model utilizing anticipated staffing and patient visitations

The following is a summary for each of these sources:

Observed Memorial Sloan Kettering Cancer Center Facilities

DTS Provident conducted Parking Accumulation Surveys at two existing Memorial Sloan Kettering Cancer Center facilities located in Middletown, New Jersey and Montvale, New Jersey. The facilities are outpatient cancer care centers similar to the proposed Cancer Center expansion within the HMOC component of the PMPH Campus.

Based on Site Plans obtained for the two facilities, the Middletown, New Jersey facility consists of a 245,080 square foot cancer care center while the Montvale, New Jersey facility consists of a 150,000 square foot cancer care center. The Site Plans are contained in Attachment B for reference. The square footage used for determining the required parking is noted on each Site Plan.

DTS Provident also researched the Township of Middletown's and Borough of Montvale's Zoning Code to determine their off-street parking requirements. Both municipal codes require 1 parking space per 300 square feet. The definitions for 'Floor Area' are contained in Attachment B.

The Applicant filed Open Public Records Act (OPRA) requests with the municipalities to obtain floor plans for each facility to help determine which space is accounted for on the Site Plans; however, the requests were denied due to security concerns. In order to further verify the similarity in uses between the two surveyed facilities and the proposed Cancer Center, the websites for each existing facility were researched. The following lists the services provided at each existing facility:

Middletown, NJ Facility

- surgical, medical, and radiation oncology consultations
- outpatient surgical and endoscopic procedures
- chemotherapy
- immunotherapy
- radiation treatment
- gastroenterology clinic and procedures
- interventional radiology procedures, including image-guided biopsies and venous access placement
- mammography, ultrasound, MRI, CT, and PET imaging
- clinical trials
- services at our specialty breast center, including services for at-risk patients
- a cancer-specific retail pharmacy

- supportive services, including rehabilitation, genetic counseling, pain management, lymphedema therapy, social work, and nutrition
- a thyroid nodule assessment program to look for thyroid cancer and determine whether treatment is needed

Montvale, NJ Facility

- surgical, medical, and radiation oncology consultations
- chemotherapy
- immunotherapy
- radiation treatment
- mammography, ultrasound, MRI, CT, and PET imaging
- clinical trials
- a cancer-specific retail pharmacy
- supportive services, including rehabilitation, lymphedema therapy, genetic counseling, social work, and nutrition

The Parking Accumulation Surveys were conducted at each facility between the hours of 10:00 AM and 8:30 PM at 30-minute intervals. The results of the Parking Accumulation Surveys indicate that the Middletown, New Jersey facility experienced a peak parking demand of 507 parking spaces while the Montvale, New Jersey facility experienced a peak parking demand of 330 parking spaces. Utilizing the square footage indicated on the above-referenced Site Plans, the peak parking demand of 507 occupied parking spaces counted at the Middletown, NJ facility results in a peak parking demand ratio of 2.07 parking spaces per 1,000 square feet while the peak parking demand of 330 occupied parking spaces counted at the Montvale, NJ facility results in a peak parking demand ratio of 2.20 parking spaces per 1,000 square feet.

Copies of the Parking Accumulation Surveys at the existing Memorial Sloan Kettering Cancer Center facilities are contained in Attachment C.

Parking Count Demand Model

A final source considered by DTS Provident is a Parking Count Generator Model prepared by the PMPH Consultant Team. The Model estimates a peak parking demand for the proposed Cancer Center expansion based on assumptions on various patient programming parameters such as the number of program spaces in the expansion, visit/session duration (time in treatment), and session overlap duration (how early a patient arrives prior to a visit), as well as accounting for staff parking accommodations. The Model conservatively assumes a visit/session duration of between 30 – 160 minutes and a session overlap duration of between 10 – 120 minutes, depending on the program visited. Based on the Model, the proposed Cancer Center expansion would require a total of 421 parking spaces, or 2.78 parking spaces per 1,000 square feet of usable floor area. A copy of the Parking Count Generator Model is contained in Attachment D.

Table No. 3 below summarizes a comparison of the parking ratio contained in the Amended Redevelopment Plan for a Medical Office Building to the various other sources of parking ratios outlined above.

TABLE NO. 3
PARKING DEMAND RATIO COMPARISON - CANCER CENTER FACILITY
PENN MEDICINE PRINCETON HEALTH, PLAINSBORO, NEW JERSEY

Source		Parking Demand Ratio (Spaces/1,000sf GFA)	Parking Demand for a 151,555 sf Facility (Spaces)
Amended Redevelopment Plan		4.00	606
Parking Accumulation Surveys (conducted at existing Memorial Sloan Kettering Cancer Center facilities)	Middletown, NJ Facility	2.07	314
	Montvale, NJ Facility	2.20	334
Parking Count Demand Model		2.78	421

As shown in Table No. 3 above, the parking ratios obtained from actual parking accumulation surveys at existing similar facilities and estimates obtained from a Parking Count Demand Model prepared by the PMPH Team all indicate the 4.0 parking ratio will be more than adequate to support the proposed Cancer Center use. Additionally, the future total parking supply of 2,351 parking spaces will provide a surplus of 301 to 320 parking spaces on the HMOC Campus even when considering the repurposing of the Health/Fitness Center and applying the observed parking ratios. The surplus parking when factoring in the additional P10 Lot parking spaces would be 744 to 763 parking spaces. Based on the foregoing, the proposed parking to be provided in association with the Cancer Center expansion will be more than adequate to accommodate the proposed use, as well as create surplus parking to support existing operations and repurposing of the Health/Fitness Center. This is even further supported by the extremely conservative parking demand model.

Conclusions

Based on the foregoing, it is the considered professional opinion of DTS Provident that the parking ratio contained in the Amended Redevelopment Plan for Medical Office Building (4 spaces per 1,000 sf) will be more than adequate to accommodate the proposed Cancer Center expansion based on the comparison of parking ratios to other sources. Furthermore, the parking currently provided at the HMOC, combined with the additional parking spaces to be constructed, will meet the future overall parking needs of the HMOC, which includes the repurposing of the Health/Fitness Center.

cc: Jim Watson, P.E.
Lou Ploskonka, P.E.
Trishka Cecil
Ron Yake
PMPH Team
Tom Letizia

Q:\PROJECTS-DTSP\0905 - Penn Medicine Cancer Center Traffic and Parking Study\Memo\Parking Tech Memo_2023-04-14.docx

ATTACHMENTS

ATTACHMENT 'A'

Conceptual Layout Plans/Program – Proposed Cancer Center & Re-purposed Health/Fitness Center

PMPH – Cancer Center

Cancer Center Floor Area Plans

AREA AVAILABLE FOR TREATMENT CARE

FLOOR	SPACE TYPE	AREA (GSF)	AREA (GSF)	
LOWER LEVEL	CLINICAL	16,020 GSF		
	STORAGE		5,976 GSF	
	UNOCCUPIED		13,271 GSF	
FLOOR 1	CLINICAL	43,016 GSF		
	UNOCCUPIED		2,154 GSF	
FLOOR 2	CLINICAL	32,347 GSF		
	UNOCCUPIED		3,308 GSF	
FLOOR 3	CLINICAL	33,586 GSF		
	UNOCCUPIED		2,098 GSF	
FLOOR 4	CLINICAL	26,585 GSF		
	UNOCCUPIED		2,180 GSF	
PENTHOUSE	UNOCCUPIED		23,734 GSF	
TOTAL		**151,555 GSF**	52,721 GSF	204,276 GSF



LEVEL 1 - TOWNSHIP FLOOR AREA PLAN

SCALE 1/16" = 1'-0"



LOWER LEVEL - TOWNSHIP FLOOR AREA PLAN

SCALE 1/16" = 1'-0"

Princeton Forward

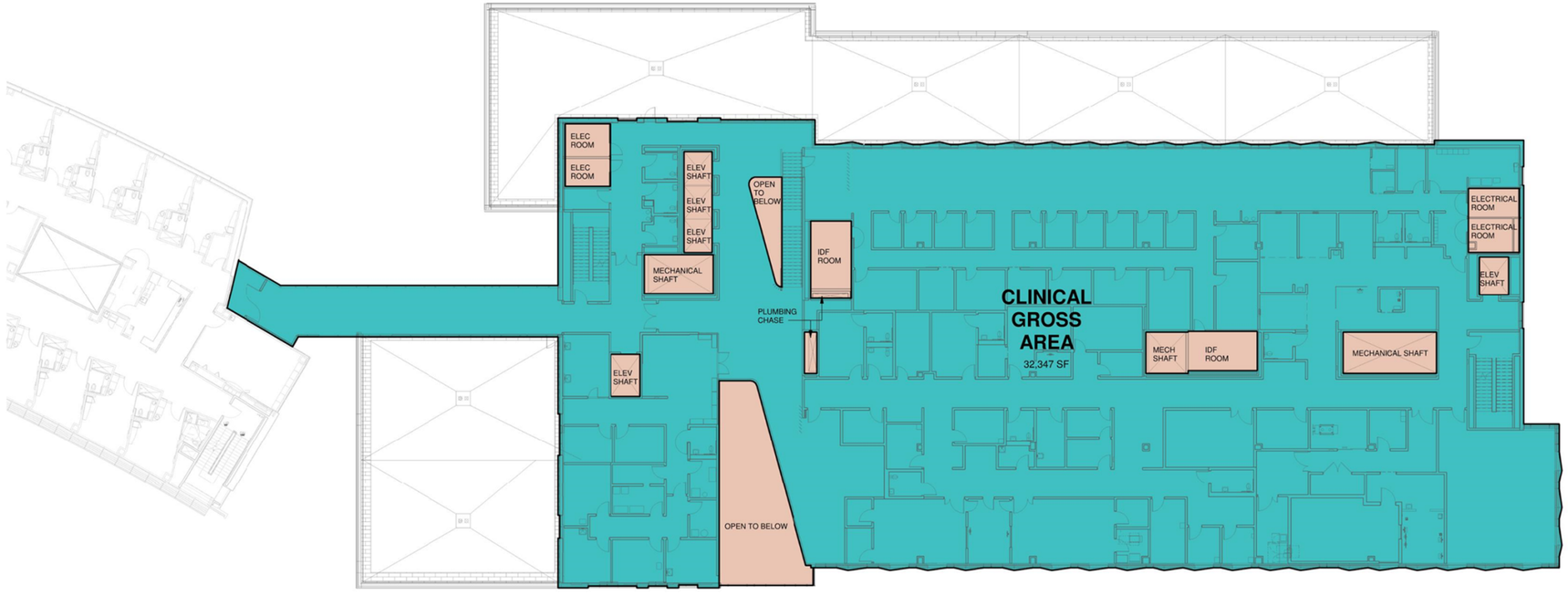
April 5, 2023

PMPH – Cancer Center

Cancer Center Floor Area Plans



LEVEL 3 - TOWNSHIP FLOOR AREA PLAN
SCALE 1/16" = 1'-0"



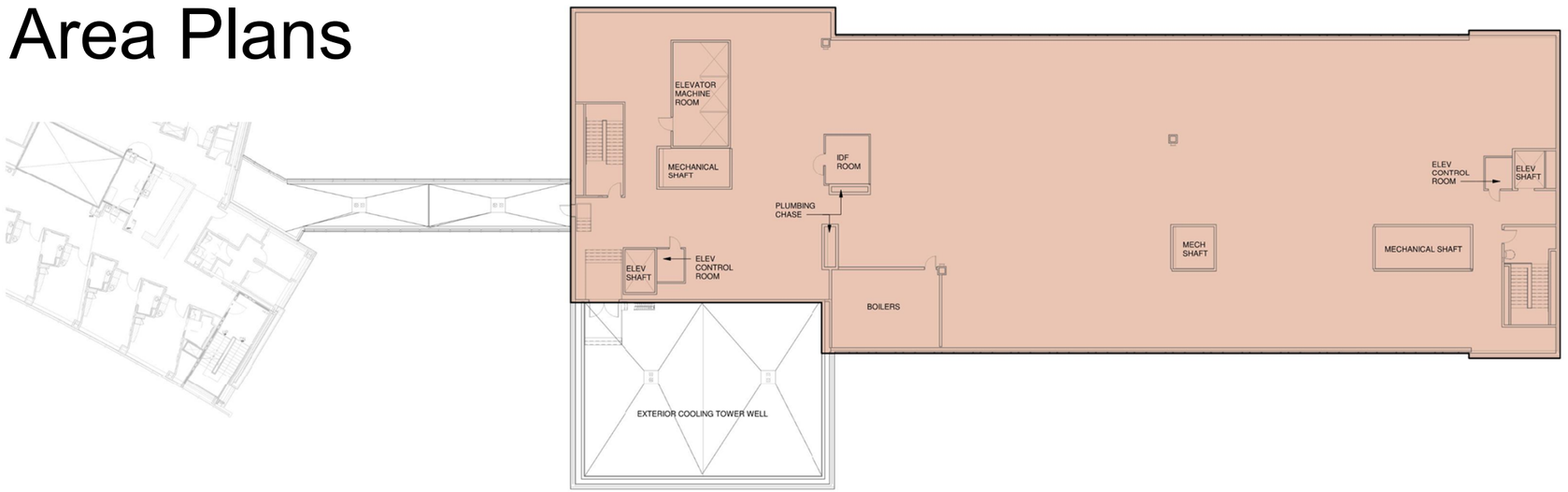
LEVEL 2 - TOWNSHIP FLOOR AREA PLAN
SCALE 1/16" = 1'-0"

Princeton Forward

April 5, 2023

PMPH – Cancer Center

Cancer Center Floor Area Plans



PENTHOUSE - TOWNSHIP FLOOR AREA PLAN

SCALE 1/16" = 1'-0"



LEVEL 4 - TOWNSHIP FLOOR AREA PLAN

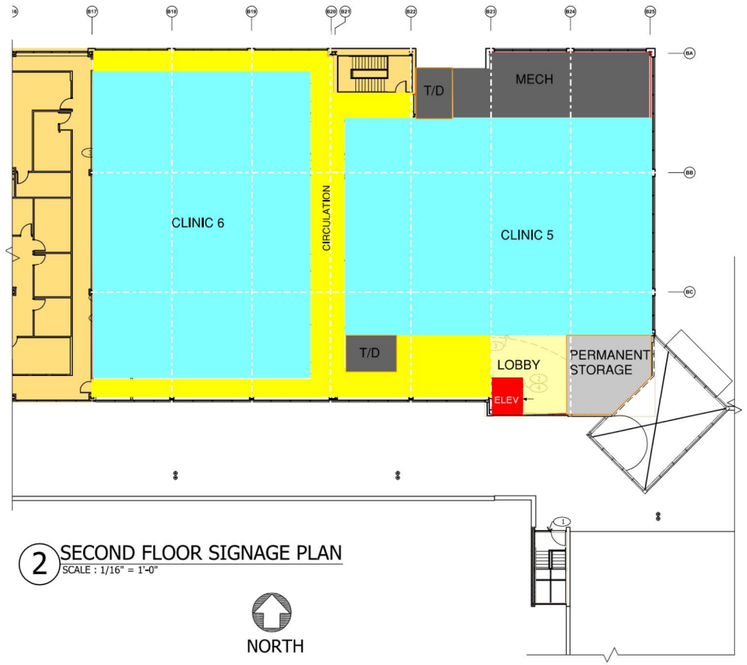
SCALE 1/16" = 1'-0"

Princeton Forward

April 5, 2023

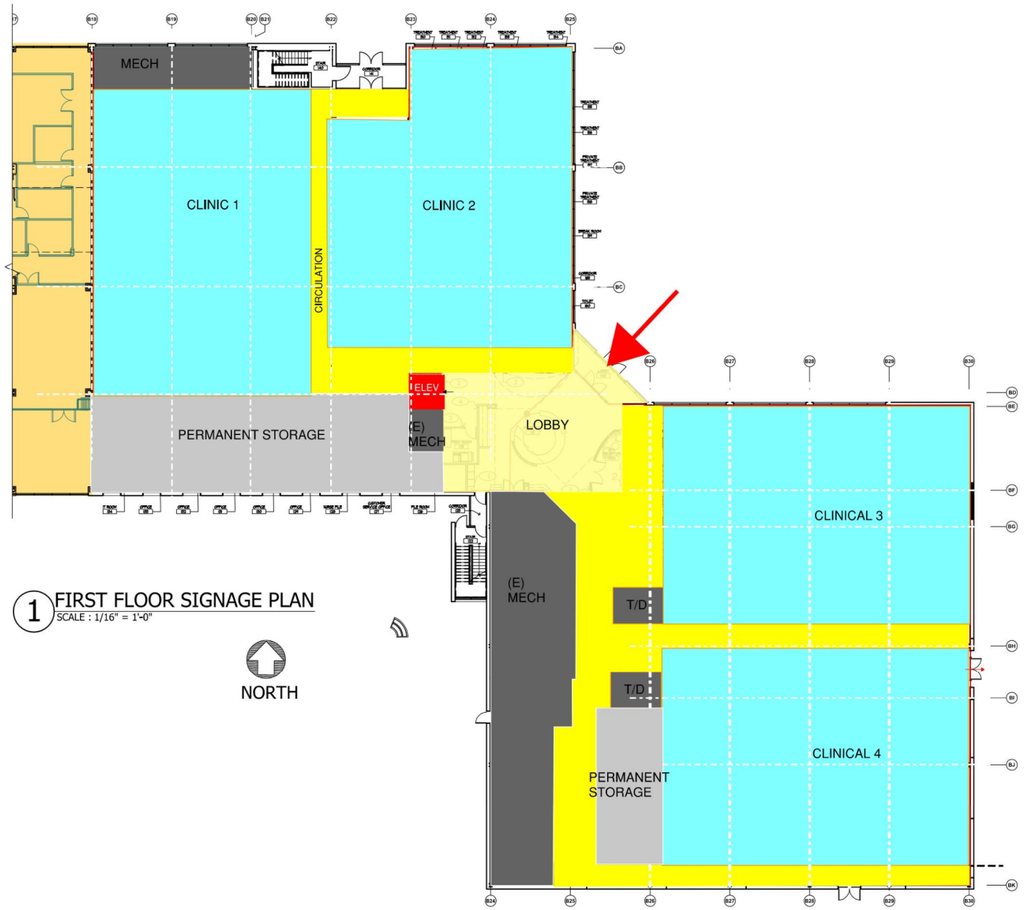
PMPH – Cancer Center

Fitness Center Floorplans



2 SECOND FLOOR SIGNAGE PLAN
SCALE : 1/16" = 1'-0"

NORTH



1 FIRST FLOOR SIGNAGE PLAN
SCALE : 1/16" = 1'-0"

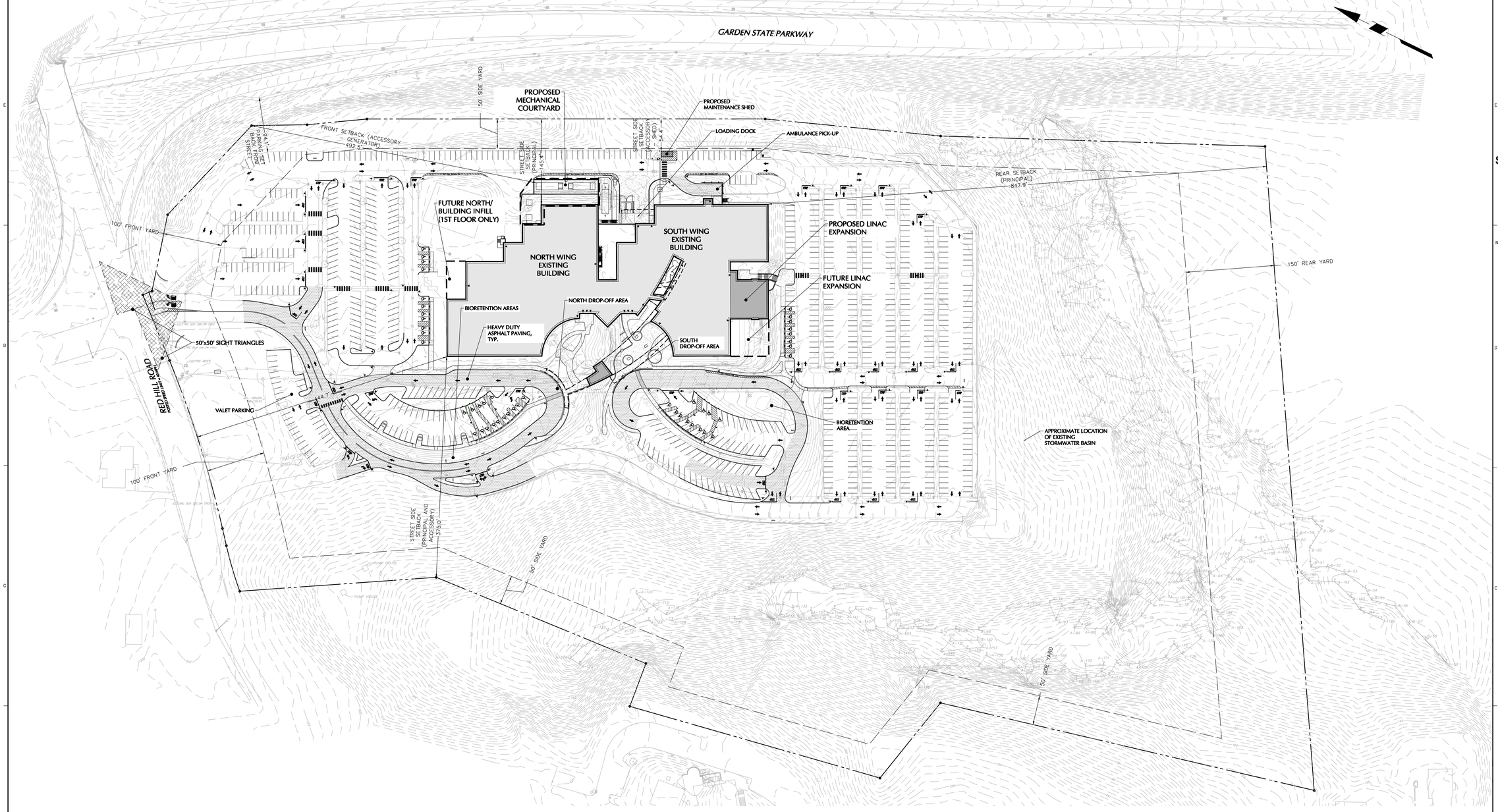
NORTH

AREA AVAILABLE FOR TREATMENT CARE

FLOOR 1	**33,000 SF**
CLINICAL SPACE	20,370 SF
MECHANICAL SPACE	3,120 SF
PERMANENT STORAGE	3,300 SF
BUILDING CIRCULATION	6,210 SF
FLOOR 2	**15,000 SF**
CLINICAL SPACE	10,150 SF
MECHANICAL SPACE	1,205 SF
PERMANENT STORAGE	455 SF
BUILDING CIRCULATION	3,190 SF
TOTAL OF FLOOR 1 & 2	**48,000 SF**
TOTAL USEABLE AREA	**39,920 SF**
TOTAL NON-ACTIVITY AREA	8,080 SF

ATTACHMENT 'B

Site Plans & Zoning Code Definitions – Memorial Sloan Kettering Cancer Center Facilities



PERKINS + WILL

215 Park Avenue South
4th Floor
New York, NY 10003
t 212.251.7000
f 212.251.7111
www.perkinswill.com

MONMOUTH AMBULATORY CARE OUTPATIENT FACILITY

MEMORIAL SLOAN-KETTERING CANCER CENTER

480 RED HILL ROAD
MIDDLETOWN, NJ

SITE/CIVIL, GEOTECHNICAL, & TRAFFIC ENGINEERING, LANDSCAPE ARCHITECTURE & SURVEYING
LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES
619 RIVER DRIVE CENTER 1
ELMWOOD PARK, NJ 07407-1338
t 201.794.6900
f 201.794.0366
N.J CERTIFICATE OF AUTHORIZATION NO. 24GA27996400

STRUCTURAL ENGINEERING
STRATFORD ENGINEERING
57 WEST 38TH STREET, 10TH FLOOR
NEW YORK, NY 10018
t 646.723.1280
f 212.401.4722

M.E.P. ENGINEERING
SYSKA HENNESSY GROUP
105 COLLEGE ROAD E.
PRINCETON, NJ 08540
t 609.378.0335
f 609.514.3907

IT / AV / SECURITY
SHEN MILSOM WILKE, LLC
417 FIFTH AVENUE
NEW YORK, NY 10016
t 212.725.6800
f 212.725.0864

ACOUSTICS
CERAMI & ASSOCIATES
404 FIFTH AVENUE
NEW YORK, NY 10018
t 212.370.1776
f 212.370.1736

LIGHTING CONSULTANT
SBLD STUDIO
132 W. 36TH STREET
NEW YORK, NY 10018
t 212.391.4330
f 212.391.4231

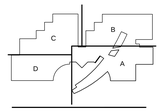
VERTICAL TRANSPORTATION
VAN DEUSEN & ASSOCIATES
7 PENN PLAZA, SUITE 404
NEW YORK, NY 10001
t 212.868.9090
f 212.868.9099

CODE CONSULTANT
CODE CONSULTANTS, INC.
215 WEST 40TH STREET, 15TH FLOOR
NEW YORK, NY 10018
t 212.216.9096
f 212.216.9619

FOODSERVICE CONSULTANT
ROMANO GATLAND
58 ALBANY AVENUE, SUITE 201
AMITYVILLE, NY 11701
t 516.724.0641
f 631.226.7175

SUPPLY CHAIN ENGINEERING
ST. ONGE COMPANY
1400 WILLIAMS ROAD
YORK, PENNSYLVANIA 17402
t 717.840.8181
f 717.840.8182

CIVIL AND LANDSCAPE GMP



ZONING STANDARDS

APPLICABLE REGULATION	REQUIRED / ALLOWABLE	EXISTING	PROPOSED	COMPLIANCE	VARIANCE/WAIVER REQUIRED
16-936 - Standards and Regulations Affecting the OR Zone.					
A. Minimum Standards					
1. Lot Area:					
a. Gross Lot Area	167,000 SQ FT	1,760,950 SQ FT (40.43 AC)	1,760,950 SQ FT	YES	NO
b. Buildable Lot Area	2.5 acres	31.09 ACRES	31.09 ACRES (20.68% CLASS II CRITICAL AREAS)	YES	NO
2. Building Setbacks:					
a. Front (Principal and Accessory)	100 FT	444.7 FT	444.7 FT	YES	NO
b. Side (Principal and Accessory)	100 FT	375.0 FT	375.0 FT	YES	NO
c. Street Side (Principal and Accessory)	50 FT	145.4 FT (P), 129.3 FT (A)	145.4 FT (P), 54.4 FT (A)	YES	NO
d. Rear (Principal and Accessory)	150 FT	847.9 FT	847.9 FT	YES	NO
e. Street Rear (Principal and Accessory)	100 FT	N/A	N/A	YES	NO
3. Lot Frontage:	500 FT	530.13 FT	530.13 FT	YES	NO
4. Gross Floor Area:	20,000 SQ FT	285,187 SQ FT	295,080 SQ FT	YES	NO
5. First Floor Area:	20,000 SQ FT	95,000 SQ FT +/-	11,250 SQ FT	YES	NO
B. Maximum Regulations					
1. Dwelling Unit Density	N/A	N/A	N/A	YES	NO
2. Lot Coverage	35%	32.1% (12.98 AC/40.43 AC)	31.8% (12.87 AC/40.43 AC)	YES	NO
3. Floor Area Ratio	22%	16.2% (285,187/1,760,950)	16.8% (295,080/1,760,950)	YES	NO
4. Building Height	3 story; 50 FT	3 story; 43.4 FT	3 story; 43.4 FT	YES	NO
C. Other Regulations					
1. Temporary construction trailers shall be permitted where active construction work is proposed. Such trailers shall not be placed on site until building permits have been issued and in no case more than seven (7) days prior to the commencement of work. Trailers shall not remain on site more than seven (7) days after completion of all work. Temporary construction trailers shall not be placed within the right-of-way of any improved public road.				WILL COMPLY	NO

Parking Requirements- Total Spaces Required

Use	Existing Floor Area (SF)	Proposed Floor Area (SF)	No. Spaces Req'd per Ordinance Ammendment	Total Spaces Req'd	No. Spaces Provided
Health Care Facility	285,187	245,080	GFA/300	817	
Data Center		50,000	GFA/600	83	
Total	**285,187**	**295,080**		**900**	**900**

Parking Requirements- ADA Spaces Required

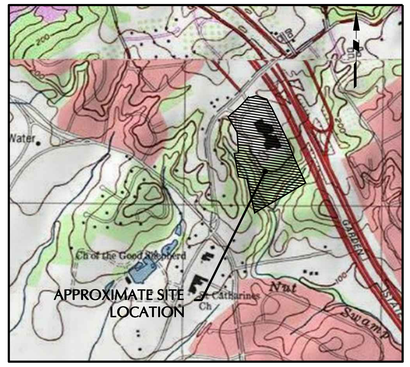
Use	Proposed GFA (SF)	Total Spaces Required	ADA Requirement per IBC	Total ADA Spaces Required
Health Care (Outpatient)	118,400	395	10% of Total Required Spaces for Outpatient Service Use minus number of valet spaces provided for outpatient use*	36
Health Care (Administrative)	30,000	100	2% of Required Spaces	2
Office	96,680	322	2% of Total Required Spaces	6
Data Center	50,000	83	2% of Total Required Spaces	2
Total	**295,080**	**900**		**46**

*Valet spaces provided for outpatient use are excluded in the required ADA parking calculation. ADA Spaces Required = (395 spaces - 34 valet Spaces) * 0.10 = 36 Spaces

ADA Spaces Provided

	Standard	Van Accessible*	Total
ADA Spaces Provided	37	9	46

*1 Van Accessible Space is required for every 6 standard accessible Parking Spaces.



LOCATION MAP
SCALE: 1"=1000'

60 0 20 40 60
SCALE IN FEET

SITE LEGEND

PROPERTY LINE	
EXISTING CURB	
EXISTING TREE	
EXISTING SIGN	
EXISTING SITE LIGHTING	
EXISTING BUILDING (GROUND LEVEL)	
PROPOSED BUILDING (GROUND LEVEL)	
PROPOSED BUILDING OVERHANG	
PROPOSED 6" CURB	
PROPOSED FLUSH CURB	
DECORATIVE CROSSWALK	
PROPOSED CONCRETE PAVING	
PROPOSED HEAVY DUTY ASPHALT PAVING	
PROPOSED CONCRETE GRASS PAVING	
PROPOSED SIGN (SEE SIGN LEGEND)	
PROPOSED ACCESSIBLE RAMP	
PROPOSED PEDESTRIAN CROSS WALK	
PROPOSED PAVEMENT MARKING	
PROPOSED GUIDERAIL	
PROPOSED RETAINING WALL	

Revisions

NO	ISSUE	DATE
5	CIVIL AND LANDSCAPE GMP	06.06.2014
4	DCA SCHEMATIC SUBMISSION	04.29.2014
3	SCHEMATIC DOH SUBMISSION	04.16.2014
2	CIVIL AND LANDSCAPE PERMITTING SUBMISSION	01.22.2014
1	FINAL DD SOUTH & NORTH BUILDINGS - CIVIL AND LANDSCAPE	01.17.2014

Sheet Information

Date	01.22.2014
Job Number	032672.000
Drawn	EDH
Checked	KJM
Approved	CMH

Title

OVERALL SITE PLAN

Sheet

C01-10

4 OF 24

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FLOOR AREA

BASEMENT:	22,500	BGSF
1ST FLOOR:	62,000	BGSF
2ND FLOOR:	60,500	BGSF
TOTAL EXISTING AREA:	145,000	BGSF
NEW LINEAR ACCELERATOR ADDITION:	5,000	BGSF
TOTAL PROPOSED		

PARKING

EXISTING SPACES:	558 SPACES
REDUCED FOR LINEAR ACCELERATOR:	-10 SPACES
REDUCED FOR RESTRIPING FROM 8'-6" WIDE SPACES TO 9'-0" WIDE SPACES:	-41 SPACES
TOTAL PARKING SPACES:	507 SPACES

PARKING RATIO:
507 SPACES / 150,000 BGSF =
1 SPACE / 296 BGSF

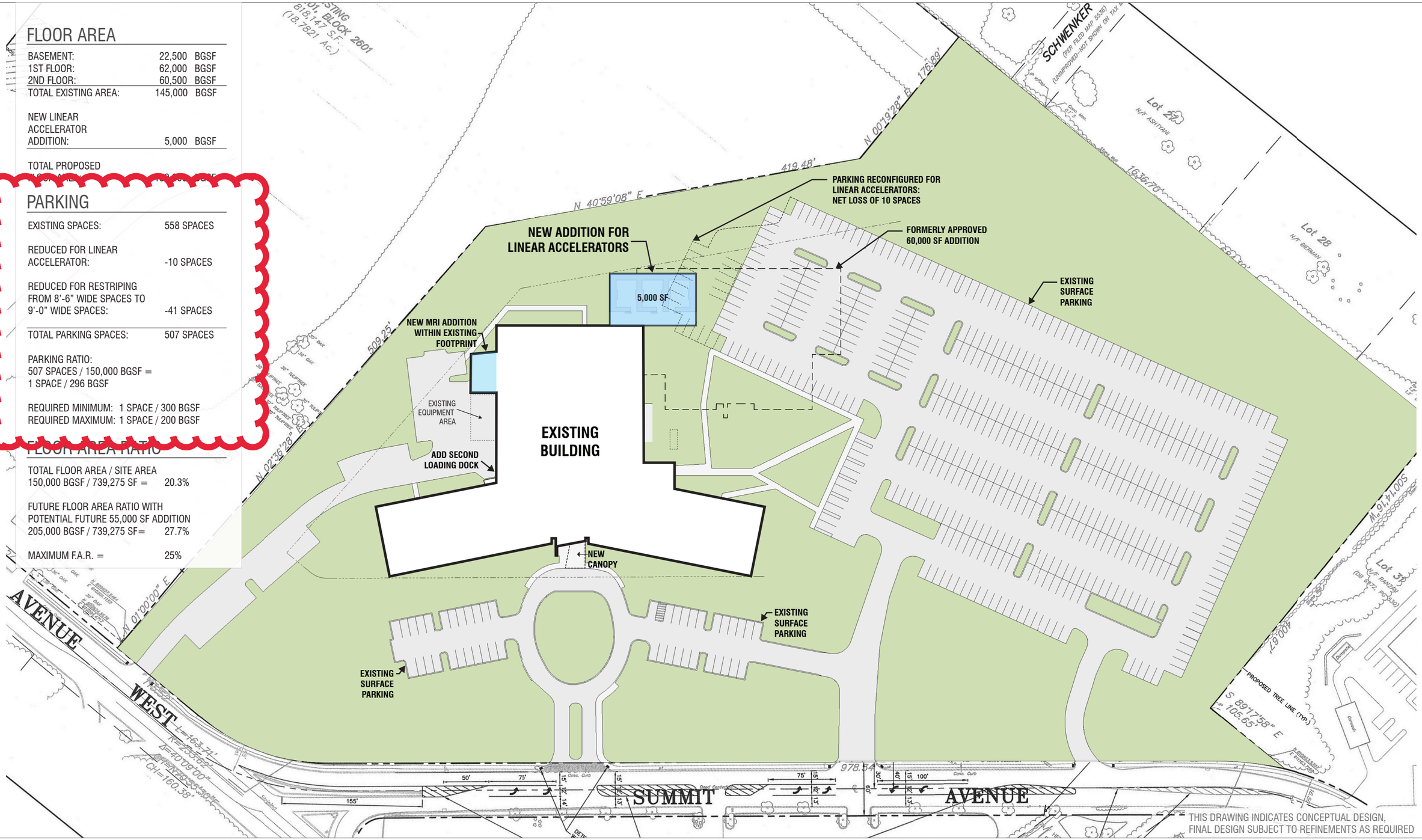
REQUIRED MINIMUM: 1 SPACE / 300 BGSF
REQUIRED MAXIMUM: 1 SPACE / 200 BGSF

FLOOR AREA RATIO

TOTAL FLOOR AREA / SITE AREA
150,000 BGSF / 739,275 SF = 20.3%

FUTURE FLOOR AREA RATIO WITH
POTENTIAL FUTURE 55,000 SF ADDITION
205,000 BGSF / 739,275 SF= 27.7%

MAXIMUM F.A.R. = 25%



THIS DRAWING INDICATES CONCEPTUAL DESIGN, FINAL DESIGN SUBJECT TO REFINEMENTS AS REQUIRED

MEMORIAL SLOAN KETTERING CANCER CENTER
DESIGN + CONSTRUCTION DEPARTMENT
FACILITES MANAGEMENT DIVISION
1233 York Avenue SR201 New York NY 10065

APRIL 15, 2015

PROPOSED SITE PLAN
WITH FORMERLY APPROVED ADDITION

© EwingCole 2015

EWING COLE

§ 540-627 Off-street parking.

(47) Data center: one space per 600 square feet of gross floor area.
[Amended 10-15-2012 by Ord. No. 2012-3071]

(48) Health care facility: one space per 300 square feet of gross floor area.
[Amended 10-15-2012 by Ord. No. 2012-3071]

P23-03 Penn Med PB Submission Reports 08/09/23

§ 540-203 Definitions.

FLOOR AREA, GROSS

The sum of the gross horizontal areas of the floor or several floors of a building measured between the outside face of exterior walls. In the case of residential structures, such area shall be finished in accordance with the requirements of the building code. Any cellar, garage, crawl space, unfinished attic or space of any nature, or accessory building shall not be included. Any space with a clear ceiling height of four feet or more, but less than the minimum ceiling height prescribed in the building code for the type of building concerned, shall not be included when in excess of 10% of the floor area which complied with such prescribed ceiling heights. In the case of bi-level multistory buildings, the first floor area shall be considered to be the first level or levels of the structure over the full perimeter of the structure which are above the average finished grade of the adjoining ground, and constructed on other than a concrete slab or other such floor. Any floor area which is located at grade or on such a slab may, however, be included in the calculations of total floor area, provided it complies with the other terms of this definition. In the case of all multistory buildings, the first floor area shall be considered to be the first level or levels of the structure extending over the full perimeter of the structure and which is above the average finished grade of the adjoining ground, whether or not such level is constructed on a concrete slab or other such floor.

§ 400-57 Off-street parking in B-1 and B-2 Business Districts.

§ 400-58 Off-street parking in OR-1, OR-2, OR-3 and OR-4 Districts.

[Amended 11-10-1981 by Ord. No. 81-740; 1-31-2012 by Ord. No. 2012-1350]

A. Except for fitness centers and hotels, as pursuant to § **400-59**, and for assisted living residences pursuant to § **400-24E(3)**, all uses in the OR-1, OR-2, OR-3 and OR-4 Office and Research Districts shall provide a minimum of one parking space for each 300 square feet of building floor area and a maximum of one parking space for every 200 square feet of building floor area.
[Amended 2-28-2017 by Ord. No. 2017-1423]

P23-03 Penn Med PB Submission Reports 08/09/23

§ 400-8 Definitions and word usage.

FLOOR AREA

For the purpose of this chapter, the aggregate area of all floors, using the outside wall dimensions of all buildings, including the basement and cellar area. To the extent that the basement space within a building is used for mechanical equipment such as heating and ventilating apparatus or dead storage and is not devoted to the principal use of the building or to the extent that the on-grade level or basement or cellar levels of a parking garage are devoted to off-street parking, such floor areas, including aisles, ramps and maneuvering space, shall be excluded.
[Amended 1-31-2012 by Ord. No. 2012-1350]

ATTACHMENT 'C'

Parking Accumulation Surveys – Memorial Sloan Kettering Cancer Center Facilities

P23-03 Penn Med PB Submission Reports 08/09/23

PARKING ACCUMULATION SURVEY
MEMORIAL SLOAN KETTERING CANCER CENTER, MIDDLETOWN, NEW JERSEY

INVENTORY - PARKING SPACE SUPPLY

	LOT A	LOT B	LOT C	LOT D	LOT E	LOT F	LOT G	LOT H	TOTAL - SUPPLY
STRIPED SPACES	459	82	73	33	70	119	91	3	**930**

WEDNESDAY, NOVEMBER 30, 2022
OCCUPIED SPACES

START TIME	LOT A	LOT B	LOT C	LOT D	LOT E	LOT F	LOT G	LOT H	TOTAL
10:00 AM	202	55	63	22	3	54	45	0	**444**
10:30 AM	201	52	69	20	4	61	55	0	**462**
11:00 AM	206	55	64	17	4	61	55	1	**463**
11:30 AM	206	57	65	12	4	56	53	2	**455**
12:00 PM	209	46	65	13	4	55	51	1	**444**
12:30 PM	210	50	66	9	4	57	49	2	**447**
1:00 PM	205	51	70	10	4	58	49	1	**448**
1:30 PM	208	45	66	13	7	54	46	1	**440**
2:00 PM	204	51	70	13	4	54	47	0	**443**
2:30 PM	197	41	70	16	5	53	49	1	**432**
3:00 PM	197	39	70	18	5	56	46	2	**433**
3:30 PM	192	34	71	15	3	53	41	1	**410**

WEDNESDAY, NOVEMBER 30, 2022
PERCENT OCCUPIED

START TIME	LOT A	LOT B	LOT C	LOT D	LOT E	LOT F	LOT G	LOT H	TOTAL
10:00 AM	44%	67%	86%	67%	4%	45%	49%	0%	**48%**
10:30 AM	44%	63%	95%	61%	6%	51%	60%	0%	**50%**
11:00 AM	45%	67%	88%	52%	6%	51%	60%	33%	**50%**
11:30 AM	45%	70%	89%	36%	6%	47%	58%	67%	**49%**
12:00 PM	46%	56%	89%	39%	6%	46%	56%	33%	**48%**
12:30 PM	46%	61%	90%	27%	6%	48%	54%	67%	**48%**
1:00 PM	45%	62%	96%	30%	6%	49%	54%	33%	**48%**
1:30 PM	45%	55%	90%	39%	10%	45%	51%	33%	**47%**
2:00 PM	44%	62%	96%	39%	6%	45%	52%	0%	**48%**
2:30 PM	43%	50%	96%	48%	7%	45%	54%	33%	**46%**
3:00 PM	43%	48%	96%	55%	7%	47%	51%	67%	**47%**
3:30 PM	42%	41%	97%	45%	4%	45%	45%	33%	**44%**

THURSDAY, DECEMBER 01, 2022
OCCUPIED SPACES

START TIME	LOT A	LOT B	LOT C	LOT D	LOT E	LOT F	LOT G	LOT H	TOTAL
10:00 AM	188	51	70	23	4	60	49	0	**445**
10:30 AM	196	56	71	30	3	63	49	0	**468**
11:00 AM	204	63	71	24	6	63	75	1	**507**
11:30 AM	200	61	70	27	6	58	48	1	**471**
12:00 PM	192	49	64	19	5	59	48	0	**436**
12:30 PM	200	46	65	15	4	50	47	0	**427**
1:00 PM	203	48	68	16	4	54	47	1	**441**
1:30 PM	200	45	67	17	4	56	43	1	**433**
2:00 PM	198	46	72	18	4	58	50	0	**446**
2:30 PM	191	37	71	13	4	55	43	0	**414**
3:00 PM	189	36	60	16	4	54	55	1	**415**
3:30 PM	192	35	51	11	5	44	42	2	**382**

THURSDAY, DECEMBER 01, 2022
PERCENT OCCUPIED

START TIME	LOT A	LOT B	LOT C	LOT D	LOT E	LOT F	LOT G	LOT H	TOTAL
10:00 AM	41%	62%	96%	70%	6%	50%	54%	0%	**48%**
10:30 AM	43%	68%	97%	91%	4%	53%	54%	0%	**50%**
11:00 AM	44%	77%	97%	73%	9%	53%	82%	33%	**55%**
11:30 AM	44%	74%	96%	82%	9%	49%	53%	33%	**51%**
12:00 PM	42%	60%	88%	58%	7%	50%	53%	0%	**47%**
12:30 PM	44%	56%	89%	45%	6%	42%	52%	0%	**46%**
1:00 PM	44%	59%	93%	48%	6%	45%	52%	33%	**47%**
1:30 PM	44%	55%	92%	52%	6%	47%	47%	33%	**47%**
2:00 PM	43%	56%	99%	55%	6%	49%	55%	0%	**48%**
2:30 PM	42%	45%	97%	39%	6%	46%	47%	0%	**45%**
3:00 PM	41%	44%	82%	48%	6%	45%	60%	33%	**45%**
3:30 PM	42%	43%	70%	33%	7%	37%	46%	67%	**41%**

WEDNESDAY, MARCH 15, 2023
OCCUPIED SPACES

START TIME	LOT A	LOT B	LOT C	LOT D	LOT E	LOT F	LOT G	LOT H	TOTAL
4:00 PM	169	45	42	9	4	45	33	1	**348**
4:30 PM	191	34	49	8	4	45	25	1	**357**
5:00 PM	176	26	41	6	4	37	22	1	**313**
5:30 PM	124	23	35	4	3	30	19	0	**238**
6:00 PM	95	16	23	3	3	30	19	0	**189**
6:30 PM	65	10	12	3	3	17	18	0	**128**
7:00 PM	49	6	9	2	3	11	16	0	**96**
7:30 PM	41	4	5	0	3	5	16	0	**74**
8:00 PM	40	1	3	0	3	3	15	0	**65**

WEDNESDAY, MARCH 15, 2023
PERCENT OCCUPIED

START TIME	LOT A	LOT B	LOT C	LOT D	LOT E	LOT F	LOT G	LOT H	TOTAL
4:00 PM	37%	55%	58%	27%	6%	38%	36%	33%	**37%**
4:30 PM	42%	41%	67%	24%	6%	38%	27%	33%	**38%**
5:00 PM	38%	32%	56%	18%	6%	31%	24%	33%	**34%**
5:30 PM	27%	28%	48%	12%	4%	25%	21%	0%	**26%**
6:00 PM	21%	20%	32%	9%	4%	25%	21%	0%	**20%**
6:30 PM	14%	12%	16%	9%	4%	14%	20%	0%	**14%**
7:00 PM	11%	7%	12%	6%	4%	9%	18%	0%	**10%**
7:30 PM	9%	5%	7%	0%	4%	4%	18%	0%	**8%**
8:00 PM	9%	1%	4%	0%	4%	3%	16%	0%	**7%**

LEGEND
Overall Peak Hour

P23-03 Penn Med PB Submission Reports 08/09/23

PARKING ACCUMULATION SURVEY
MEMORIAL SLOAN KETTERING CANCER CENTER, MONTVALE, NEW JERSEY

INVENTORY - PARKING SPACE SUPPLY

	LOT A (LARGE LOT IN BACK)	LOT B (FRONT OF BUILDING)	LOT C (LOADING DOCK)	TOTAL - SUPPLY
STRIPED SPACES	474	48	3	**525**

WEDNESDAY, JANUARY 11, 2023
OCCUPIED SPACES

START TIME	LOT A	LOT B	LOT C	TOTAL
10:00 AM	294	32	1	**327**
10:30 AM	295	33	1	**329**
11:00 AM	291	32	0	**323**
11:30 AM	286	28	1	**315**
12:00 PM	290	31	1	**322**
12:30 PM	247	32	0	**279**
1:00 PM	265	32	0	**297**
1:30 PM	276	30	0	**306**
2:00 PM	275	32	1	**308**
2:30 PM	260	33	0	**293**
3:00 PM	266	33	0	**299**
3:30 PM	249	35	0	**284**

WEDNESDAY, JANUARY 11, 2023
PERCENT OCCUPIED

START TIME	LOT A	LOT B	LOT C	TOTAL
10:00 AM	62%	67%	33%	**62%**
10:30 AM	62%	69%	33%	**63%**
11:00 AM	61%	67%	0%	**62%**
11:30 AM	60%	58%	33%	**60%**
12:00 PM	61%	65%	33%	**61%**
12:30 PM	52%	67%	0%	**53%**
1:00 PM	56%	67%	0%	**57%**
1:30 PM	58%	63%	0%	**58%**
2:00 PM	58%	67%	33%	**59%**
2:30 PM	55%	69%	0%	**56%**
3:00 PM	56%	69%	0%	**57%**
3:30 PM	53%	73%	0%	**54%**

THURSDAY, JANUARY 12, 2023
OCCUPIED SPACES

START TIME	LOT A	LOT B	LOT C	TOTAL
10:00 AM	252	39	0	**291**
10:30 AM	275	34	0	**309**
11:00 AM	280	39	0	**319**
11:30 AM	287	42	1	**330**
12:00 PM	278	35	0	**313**
12:30 PM	267	32	0	**299**
1:00 PM	263	34	0	**297**
1:30 PM	272	36	0	**308**
2:00 PM	269	37	1	**307**
2:30 PM	260	36	0	**296**
3:00 PM	251	31	0	**282**
3:30 PM	229	35	0	**264**

THURSDAY, JANUARY 12, 2023
PERCENT OCCUPIED

START TIME	LOT A	LOT B	LOT C	TOTAL
10:00 AM	53%	81%	0%	**55%**
10:30 AM	58%	71%	0%	**59%**
11:00 AM	59%	81%	0%	**61%**
11:30 AM	61%	88%	33%	**63%**
12:00 PM	59%	73%	0%	**60%**
12:30 PM	56%	67%	0%	**57%**
1:00 PM	55%	71%	0%	**57%**
1:30 PM	57%	75%	0%	**59%**
2:00 PM	57%	77%	33%	**58%**
2:30 PM	55%	75%	0%	**56%**
3:00 PM	53%	65%	0%	**54%**
3:30 PM	48%	73%	0%	**50%**

WEDNESDAY, MARCH 15, 2023
OCCUPIED SPACES

START TIME	LOT A	LOT B	LOT C	TOTAL
4:00 PM	234	32	0	**266**
4:30 PM	217	31	0	**248**
5:00 PM	188	30	0	**218**
5:30 PM	149	22	0	**171**
6:00 PM	124	20	0	**144**
6:30 PM	97	15	0	**112**
7:00 PM	83	14	0	**97**
7:30 PM	66	11	0	**77**

WEDNESDAY, MARCH 15, 2023
PERCENT OCCUPIED

START TIME	LOT A	LOT B	LOT C	TOTAL
4:00 PM	49%	67%	0%	**51%**
4:30 PM	46%	65%	0%	**47%**
5:00 PM	40%	63%	0%	**42%**
5:30 PM	31%	46%	0%	**33%**
6:00 PM	26%	42%	0%	**27%**
6:30 PM	20%	31%	0%	**21%**
7:00 PM	18%	29%	0%	**18%**
7:30 PM	14%	23%	0%	**15%**

LEGEND
Overall Peak Hour

ATTACHMENT 'D'

Parking Count Generator Model

PMPH Simple Parking Count Generator

Floor	Type	Program Spaces in Building	Vehicles / Session	Session Overlap (min)	Visit Length (min)	Vehicles at Session Transition
4	Infusion	30	30	20	160	60
3	Clinic Exam	36	36	20	60	72
1	Rad Onc Vaults (3 vaults, HDR, CT Sim)	5	5	10	30	10
1	Rad Onc Exam	9	9	20	30	18
1	Conference Center	2	10	20	30	20
2	Integrative Therapy/Lymphodema	6	6	20	30	12
2	IR Shell	1	1	120	60	3
2	Pet/CT	1	1	120	60	3
2	CT	1	1	60	60	2
2	Ultrasound	2	2	30	30	4
2	Chest Xray	1	1	30	30	2
2	MRI	1	1	30	30	2
2	Multipurpose Procedure	1	1	60	30	3

Patient Load	211
Programed Staff	210
Staff accommodated Off Site	0
Net Parking Required	421