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ENGINEERING REPORT

New Residential Community
Block 104, Lots 1.03, 1.04,1.05, 1.06 & 1.07
(Formerly Block 104, Lots 1.01 and 4)
Plainsboro Township,
Middlesex County, New Jersey

Prepared For:
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I. EXECUTIVE SUMMARY

IVC PFV, LLC. is proposing redevelopment located along the westerly portion of the Princeton Forrestal Village (PFV), a commercial shopping center complex located along College Road and Seminary Drive in the Township of Plainsboro, County of Middlesex, State of New Jersey (Figure 1 USGS Project Site Location Map). The Project is located on existing Block 104, Lots 1.03, part of 1.05, 1.06, and 1.07 (Figure 2).

Current lots (1.03, 1.06 and 1.07) are comprised of a total of approximately 7.60 acres and is bounded by College Road West to the west and northwest. Current lot 1.05 is comprised of a total of approximately 34.97 acres, the proposed redevelopment will occur on 1.69 acres. Lot 1.05 is bounded by Lionsgate Drive to the west and Main Street to the north. Lot 1.07 is comprised of a total of approximately 2.78 acres and is bounded by College Road to the west and Houghton Lane to the east The Project area, within PFV, currently consists of existing surface parking lots, Building C, landbank parking areas, and landscaped lawn area.

The proposed project site received approval from the Township and DRCC in 2014 for a residential development that included the construction of three main, 4-story buildings containing 394 apartment units, each with its own parking garage, recreation areas and pedestrian paths.

PROJECT SITE HISTORY

Sasaki Associates prepared the original General Development Plan (GDP) and stormwater management calculations for the overall PFV complex in 1980. This plan was based on a 66.9-acre study area and designed to mitigate stormwater impacts by meeting the pre-development runoff rate with a proposed basin located adjacent to US Route 1. In 1988, the US Route 1/College Road interchange was designed adjacent to PFV and impacted the area of the SASAKI designed basin. Edwards and Kelcey, Inc. (E&K), the interchange engineers, relocated the existing stormwater management basin to an area in between the on and off ramps of the interchange. They also increased the drainage area to the basin (referred to as the Northwestern basin herein) and analyzed the stormwater management for the Princeton Forrestal Center (PFC) and Princeton Corporate Center (PCC). E&K proposed another basin (Northeastern Basin) to manage a portion of the stormwater runoff from the Princeton Forrestal Center (PFC), located to the east of Route 1. An additional basin (North Basin), located to the north of the Northeastern Basin, manages a portion of the stormwater runoff from both PFC and PCC. As stated in the E&K reports, since the drainage areas to the three basins were modified by the Route 1/College Road interchange, the peak discharges could not be compared at the outlets of the individual basins. Therefore, these basins were designed to provide peak rates of reduction for the 10- and 100-year storm events as well as water quality based upon the confluence point in Bear Brook, per the Delaware and Raritan Canal Commission (DRCC) regulations at the time of the original approval. The overall stormwater management plan was also reviewed and approved by the Township.

Since the time of the original approval, the state stormwater management rules and DRCC rules changed (2023). With the construction of the Harmony Day Care and Eden Institute buildings within the PFV campus (both in 2009), the DRCC required further analysis of the Northwestern basin (PFV regional basin) to confirm the basin met current stormwater management rules. Based on the analysis prepared in the report entitled, "DRCC Supplemental Report Harmony School and Eden Institute at Princeton Forrestal Village" prepared by Van Note-Harvey Associates P.C., it was determined the basin not only could provide peak rates of reduction for the specified storms at full build out (40.1 acres impervious), but could provide peak rates of reduction for an additional 4 acres of impervious surface for an approximate total of 44.1 acres of the 66.9 total drainage area.

PROPOSED PROJECT DEVELOPMENT

The Project improvements will include the reconstruction of existing parking areas, three new 4-story buildings with 394 dwelling units and 424 parking garage spaces, 376 surface parking areas, pedestrian walks, courtyard areas, and landscape areas.

The construction of the proposed Project will yield a net increase in impervious surface of approximately 1.80 acres. With this increase in impervious surface, the total impervious coverage for PFV would be 42.45 acres, which is below the 44.1 acres allowed within the drainage area of the Northwestern basin.

Proposed stormwater runoff from the proposed development will be conveyed via new stormwater collection pipes and structures and a subsurface basin. The subsurface basin is routed to an existing stormwater collection system that beyond the limits of the project site to the existing regional basin. The proposed on-site stormwater management system, in conjunction with the existing Northwestern basin, have been designed to provide the reduction of peak rates of runoff, enhanced water quality, and recharge requirements of the DRCC Stormwater Management Rules and Plainsboro Township stormwater management ordinance. Information and calculations supporting the design of the proposed stormwater management system are further discussed and detailed herein.

Plans entitled "Preliminary and Final Site Plans and Major Subdivision of New Residential Community at Princeton Forrestal Village" have been prepared in concert with this report.

II. STORMWATER MANAGEMENT

A. LAND USE/LAND COVER ANALYSIS

This section of the report demonstrates the ability of the Project's stormwater management system to mitigate the increase in runoff anticipated from the proposed development. The projects stormwater study area is defined as area within the proposed limit of disturbance. Compliance with design assumptions will be verified upon build-out of the site after development.

EXISTING PROJECT SITE DESCRIPTION AND METHODOLOGY

As previously discussed, Sasaki Associates prepared the original GDP and stormwater management calculations for PFV. This plan was based on a 66.9-acre study area and designed to mitigate predevelopment runoff with the Northwestern basin located adjacent to US Route 1. Plainsboro Township reviewed and approved the Sasaki GDP stormwater management calculations in 1985, which was later revised by Edwards and Kelcey, Inc to provide an updated stormwater management basin, designed for peak rate reduction factors of 50%, 75% and 80% for the 2-year, 10-year, and 100-year storm events respectively and to meet the water quality standards of the DRCC at that time. Both of these reports assumed the full build out of the Princeton Forrestal Village at 60% impervious coverage for the 66.9-acre area site, allowing a maximum of 40.1 acres of impervious area.

With the construction of the Harmony Day Care and Eden Institute buildings within the PFV campus (both in 2009), the DRCC required further analysis of the Northwestern basin to confirm it could still provide the peak rates of reduction for the 2-year (analysis not required under 1980 submission), 10- and 100-yr storm events (refer to Appendix J for basin routings). It was determined the basin not only could provide peak rates of reduction for the specified storms at full build out (40.1 acres impervious), but could provide peak rates of reduction for an additional 4 acres of impervious surface for an approximate total of 44.1 acres of the 66.9 total drainage area. With the construction of the Harmony and Eden buildings, the current overall PFV impervious coverage served by the basin is approximately 37.1 acres.

Therefore, the remaining impervious credit to the Northwestern basin is currently approximately 7.0 acres prior to the development of the proposed residential community.

The total Project study area for stormwater management is approximately 10.3 acres (see Study Area Maps Appendix C), which consists of existing parking lots, sidewalks, landbank parking and lawn area. The landbank parking area is approximately 1.5 acres. All runoff from the existing study area is currently collected by a combination of overland flow and piping beyond the limits of the project site. These existing piped drainage systems discharge to the Northwestern basin.

The proposed project site received approval from the Township and DRCC in 2014 for a residential development that included the construction of three main, 4-story buildings containing 394 apartment units, each with its own parking garage, recreation areas and pedestrian paths.

According to the "Soil Survey Geographic Database" (SSURGO) for Middlesex County, New Jersey, the project site soils consist primarily of Nixon loam, 0 to 2% slopes (approximately 75% of site) with the remaining portion of the site soils consisting of Nixon loam, 2 to 5% slopes (approximately 25% of site). Nixon is considered a Hydrologic Soil Group (HSG) Type B soil.

PROPOSED PROJECT SITE DESCRIPTION AND METHODOLOGY

The proposed Project improvements for the new residential development include the construction of three main buildings containing 394 apartment units, each with its own parking garage, recreation areas, and pedestrian paths. Of the 10.3-acre study area, 8 acres will be impervious surface consisting of the buildings/parking garage areas, and walks, which accounts for a 1.8-acre increase in impervious coverage from existing conditions. Therefore, the overall constructed impervious area to the Northwestern basin will be approximately 42.45 acres under proposed conditions. The area of disturbance associated with the site improvements is approximately 10.9 acres (including all utility improvements within Lionsgate Road that are not included in the Project stormwater management study area).

Table 1 below provides a comparison of the existing versus the proposed land coverage within the overall study area as well as for the overall Northwestern basin drainage area.

TABLE 1 – PROJECT STUDY AREA IMPERVIOUS COVERAGE SUMMARY

	Impervious Coverage (acres)	+	Pervious Coverage (acres)	=	Total Coverage (acres)
Existing Conditions	6.20*	+	4.10	=	10.30
Proposed Conditions	8.00	+	2.30	=	10.30
Δ	+1.8	+	-1.8		

* *Including Approved Landbanked Parking*

As shown above there will be an increase of 1.8 acres of impervious coverage. Table 2 on the following page has been provided to summarize the impervious area within the overall drainage area to the Northwestern basin drainage area.

TABLE 2 – OVERALL NORTHWESTERN BASIN DRAINAGE AREA IMPERVIOUS COVERAGE SUMMARY

Coverage	Acres
Impervious Coverage from Original GDP Approved Stormwater Management Report	40.1 Acres* (Including Approved Landbanked Parking)
Maximum Allowable Impervious Coverage Per Eden/Harmony DRCC Approval*	**44.1 Acres****
Existing Impervious Coverage	*37.1 Acres* *(39.6 Acres Including Approved Landbanked Parking)*
Proposed Net Increase in Impervious Coverage	+1.80 Acres
Proposed Impervious Coverage	**42.45 Acres**
Remaining Impervious Credit in Northwestern Basin	***1.65 Acres***

**"Storm Water Management Plan Phase II – Application to the Delaware and Raritan Canal Commission under the Regulations for the Review Zone of the Delaware and Raritan Canal State Park" prepared by Sasaki Associates, undated, indicates the detention basins have been designed for full build-out of the site (maximum 60% impervious coverage). Based on the study area of 66.9 acres, maximum allowable impervious coverage would therefore be 40.1 acres.*

***From approved report prepared by Van Note-Harvey Associates entitled, ", "New Residential Community, Block 104, Lots 1.03, 1.04 & 1.05" dated September 28, 2014.*

As shown in Tables 1 and 2, the proposed impervious coverage will be below the maximum impervious coverage within the drainage area to the Northwestern basin. As previously discussed, the basin has been designed to meet peak rate reduction requirements and provides extended detention for some water quality treatment. However, as indicated previously, the basin was designed prior to the new stormwater management rules and does not provide adequate stormwater management to meet all of the governing criteria. The following sections provide descriptions of how the stormwater management regulations have evolved since the time of the GDP and how each will be satisfied as a part of this application.

B. STORMWATER WATER QUANTITY CONTROL

The water quantity standard per N.J.A.C. 7:45-8.6 (DRCC) and Ord. 85-28.1.6a-3 (Township) applies for any project that disturbs at least one (1) acre of land or increases impervious surface by 0.25 acres. As stated above the project disturbs more than one (1) acre and has a net increase in impervious surface greater than 0.25 acres; therefore, the requirement for peak rate reductions apply.

One of the following peak runoff requirements must be met: (1) demonstrate that the post development hydrograph is less than the pre-development hydrograph at all points during 2, 10 and 100 year storm events; (2) demonstrate that the there is no increase in peak runoff rates of stormwater leaving the site for the 2, 10 and 100 year storm events and that the increased volume or change in timing will not increase flood damage at or downstream of the site; or (3) reduce the post-development peak discharge for the 2, 10, and 100-year storm events to release 50%, 75% and 80%, respectively as a result of the proposed development. The project will comply with number 2 above.

There is no increase in peak runoff rate or runoff volumes leaving the project study area. A subsurface basin is proposed beneath the proposed parking area on Lot 1.07. The subsurface basin will infiltrate and detain stormwater runoff prior to routing to the existing piping system that extends beyond the limits of the project site. The piping system terminates at the downstream stormwater management basin. Since there is no increase in runoff rate or volume the existing downstream basin will function as currently constructed.

Table 3 below provides a comparison of the project study area Pre-Developed and Post-Developed peak runoff rates and volumes for the current rainfall precipitation depth.

TABLE 3 – PRE-DEVELOPED VS. POST-DEVELOPED (CURRENT YEAR)

Storm (Year)	Pre-Developed Runoff Rate (cfs)	Pre-Developed Runoff Volume (cf)	Post-Developed Runoff Rate (cfs)	Post-Developed Runoff Volume (cf)	Runoff Rate Increase from Pre-Developed (cfs)	Runoff Volume Increase from Pre-Developed (cfs)
2	22.76	79,124	22.12	78,250	-0.64	-874
10	38.26	133,856	36.09	127,330	-2.17	-6,526
100	72.65	256,525	66.22	232,161	-6.43	-24,364

Table 4 below provides a comparison of the project study area Pre-Developed and Post-Developed peak runoff rates and volumes for the projected rainfall precipitation depth.

TABLE 4 – PRE-DEVELOPED VS. POST-DEVELOPED (PROJECTED YEAR 2100)

Storm (Year)	Pre-Developed Runoff Rate (cfs)	Pre-Developed Runoff Volume (cf)	Post-Developed Runoff Rate (cfs)	Post-Developed Runoff Volume (cf)	Runoff Rate Increase from Pre-Developed (cfs)	Runoff Volume Increase from Pre-Developed (cfs)
2	27.97	96,824	26.77	94,412	-1.20	-2,412
10	47.71	166,020	44.22	155,257	-3.49	-10,763
100	98.72	346,951	88.17	307,464	-10.55	-39,487

As previously noted, for the GDP approval the Northwestern basin was reanalyzed in 2014 for the current rainfall data for the 2-, 10-, and 100-year storm events to verify that peak rate reductions are provided. As previously approved by DRCC, the basin can mitigate up to 44.1 acres of impervious surface within the PFV drainage area and meet the reduction requirements of the current stormwater management rules. As indicated in Table 2, the construction of the project will increase impervious area by approximately 1.80 acres, resulting in a total post construction impervious coverage for PFV of 42.45 acres, which is below the 44.1 acres allowed to the basin.

Refer to Appendix I for excerpts from the report entitled, "New Residential Community, Block 104, Lots 1.03, 1.04 & 1.05" dated September 24, 2014, for routings of the Northwestern basin to determine the allowable flow rates.

C. STORMWATER QUALITY

The runoff quality standards N.J.A.C. 7:45-8.7 (DRCC) and Ord. 85-28.1.7 (Township) apply if there is a net increase in impervious surface of 0.25 acres or more. As indicated in section II-A, above, the proposed project will yield a net increase in impervious surface; therefore, the runoff quality standards do apply for the project.

The original design and approval (1980) for the Northwestern basin was to provide the water quality requirements of the Delaware and Raritan Canal Commission (DRCC). Since construction of the Harmony Day Care and Eden Institute buildings in 2009, the stormwater management rules have changed, and the basin no longer meets the current water quality requirements. Although the basin does provide an amount of water quality treatment, it cannot provide the full 80% total suspended solids (TSS) removal rate of acceptable treatment to meet the current stormwater management rules. Currently, the basin provides approximately 51% TSS removal based on the current NJBMP Manual, Chapter 9.4. Refer to Appendix J for calculations.

As indicated in Section II-A, above, the proposed project will yield a net increase of 1.8 acres in impervious surface within the study area, and the water quality requirements must be met. Accordingly, it should also be noted that according to the New Jersey Department of Environmental

Protection (NJDEP), 'Clean roof runoff and runoff from lawns, walkways, patios or decks do not have to be treated for TSS removal'. This information can be found at www.njstormwater.org, "Stormwater Management Rules Frequently Asked Questions" revised July 14, 2008, Section 7.0 Water Quality. Therefore, only the change in pavement surface is required to be reviewed for impacts to the water quality standard. Refer to Table 5 below for a comparison of pavement surfaces under existing and proposed site conditions.

TABLE 5 – WATER QUALITY PAVEMENT SURFACE COVERAGE
(IMPERVIOUS REQUIRING WATER QUALITY TREATMENT – VEHICULAR PAVEMENT)

	Acres
Existing Conditions*	4.2 (5.7 if previously approved landbank parking is included)
Proposed Conditions	3.3
∆ Pavement Surface	-0.9

As demonstrated in Table 3, the amount of pavement surface area will decrease with the proposed improvements. As there will be a net reduction in the pavement area under proposed conditions that will produce polluted runoff, water quality treatment is not required for the new pavement surfaces, therefore the Project meets the Township requirements for water quality.

Note: The proposed surface parking space areas will independently provide the required water quality treatment through its construction as porous pavement. Per the NJBMP Manual, porous pavement has a TSS removal rate of 80%.

SPECIFIC DRCC WATER QUALITY ANALYSIS

Per DRCC requirements (N.J.A.C. 7:45-8.7), any project that disturbs at least one acre of land or cumulatively increases impervious surface on-site by more than 0.25 acres since 1980 is required to meet peak rates of reduction. This site has already exceeded the 0.25 acres of cumulative impervious coverage since 1980. DRCC also requires that any new or reconstructed vehicular pavement surface undergo water quality treatment. As indicated in Section II-A, the proposed project will yield a net increase of 1.8 acres in hard surface including the buildings, parking garages, sidewalks, and recreation areas. Consequently, water quality requirements must be met.

The proposed stormwater management plan has been designed in accordance with the DRCC requirements and the NJDEP Stormwater BMP Manual. Under the stormwater rules, the water quality requirement requires the removal of 80% of the Total Suspended Solids (TSS) from the proposed stormwater runoff pollutant load as generated by the 1.25inch/2hr storm – the NJDEP has developed a non-linear rainfall distribution of 1.25 inches over a 2-hour period.

The NJDEP Stormwater BMP Manual outlines various structural design strategies, in addition to non-structural LIDs, that can achieve 80% TSS removal in the proposed stormwater runoff.

In order to provide water quality for this reconstructed pavement, the pavement will be replaced with porous pavement. According to the NJBMP Manual, porous pavement is assigned a TSS removal rating of 80%.

Note: The proposed surface parking space areas will independently provide the required water quality treatment through its construction as porous pavement. Per the NJBMP Manual, porous pavement has a TSS removal rate of 80% therefore water quality is met.

D. GROUNDWATER RECHARGE

The groundwater recharge standards of N.J.A.C. 7:8-5.7 (NJDEP), N.J.A.C. 7:45-8.5 (DRCC), Ord. 85-28.1.6a-2 (Township) applies for any project that disturbs at least one acre of land or increases impervious surface by 0.25 acres. As indicated in section II-A, above, the proposed project will yield a net increase in impervious surface and disturb more than one acre of land; therefore, the runoff quality standards do apply for the project.

At the time of the GDP, there were no groundwater recharge requirements that had to be met for new construction. Since that time, the stormwater management rules have evolved and now include groundwater recharge criteria. As the existing Northwestern basin was designed as an extended detention basin, it does not provide any recharge. Therefore, additional BMP measures will be required to offset the annual groundwater recharge deficit resulting from the increase in impervious surface.

In accordance with NJDEP Stormwater Management Rules (N.J.A.C. 7:8) and the Best Management Practices Manual, groundwater recharge for the site is required such that post-development groundwater recharge meets pre-development groundwater recharge conditions by way of the following:

- Maintain 100% of the site's average annual pre-developed groundwater recharge volume.

or

- Infiltrate 100% of the difference between the site's existing and post-development 2-year runoff volumes.

Compliance with this groundwater recharge requirement must be verified through a hydrologic and hydraulic analysis of the site in its existing and proposed condition. The proposed project will be designed to maintain the site's annual pre-developed ground water recharge volume as prescribed above. Refer to the Recharge Analysis section for a detailed analysis and design description. The following steps were used to demonstrate the procedure involved in the analysis:

1. Compute the existing hydrologic condition at the site using the New Jersey Groundwater Recharge Spreadsheet (NJGSR-32).
2. Compute the proposed hydrologic condition at the site using NJGSR-32.
3. Determine the annual volume of groundwater that must be recharged by structural means.
4. Determine the proposed method(s) of recharge.
5. Design the proposed facility/facilities to meet the annual recharge requirement.

Based on the information provided from steps 1, 2, and 3, as well as the total proposed contributing impervious area over the site for recharge, the 'BMP Calculations' Excel spreadsheet tab of NJGSR-

32 was used to help design the recharge facility to meet the recharge volume requirement. Refer to Appendix E for a copy of the NJGSR-32 spreadsheet computations.

Test pits have been advanced at the site by Melick-Tully and Associates (MTA) to determine the suitability and physical characteristics of the on-site soils for use of the porous pavement with underground stone storage area (See Appendix G for Geotechnical Report). Based on the test pits completed, adequate depth will be provided between the bottom of the porous pavement underground stone storage area and mottling or groundwater. The permeability rates at the test pits meet the infiltration requirements indicated in the NJBMP Manual.

E. NON-STRUCTURAL STORMWATER MANAGEMENT STRATEGIES

In accordance with N.J.A.C. 7:45-8.4 (DRCC) and Ord. 85-28.1.5 (Township), the design of any development that disturbs at least one acre of land or increases impervious surface by 0.25 acres must incorporate non-structural stormwater management strategies. Since this project will disturb more than one acre of land and increases the impervious surface by more than 0.25 acres, non-structural stormwater management strategies must be incorporated into the design of the site.

To better mitigate the effects of the proposed project on stormwater runoff and given the various hydrogeological and environmental site constraints, stormwater management for the project site will integrate the use of Best Management Practices (BMPs) and non-structural Low Impact Development (LID) techniques, as published in the NJDEPs Best Management Practice Manual. Based on the proposed use, a thorough analysis of the site topography, hydrogeology, and environmental limitations was conducted to determine the most appropriate stormwater management BMPs for the site. To accomplish a better site design and further mitigate the impacts of proposed stormwater runoff, provisions have been made in the Project's design to incorporate a combination of non-structural, LIDs. These LIDs are listed as follows:

- Utilization of existing impervious credit in the regional basin to minimize disturbance;
- Utilization of porous pavement at reconstructed and proposed surface parking areas to improve water quality and promote groundwater recharge;
- Disconnected impervious surfaces;
- Low-maintenance landscaping, where practical;
- Reuse of previously developed site.
- Decrease in vehicular pavement

To assist in determining that the non-structural stormwater management strategies have been incorporated into the site design "to the maximum extent practical," the New Jersey Department of Environmental Protection has developed the New Jersey Non-structural Stormwater Management Strategies Point System (NSPS) spreadsheet. The NSPS is a tool that quantifies the level of non-structural strategies utilized in the design of a site.

Refer to Appendix G for a copy of the NSPS, demonstrating that sufficient use of non-structural strategies has been incorporated into the design of this site.

GREEN INFRASTRUCTURE:

To satisfy the groundwater recharge and runoff quality the project design utilizes green infrastructure BMP's (GI BMP) as identified in Table 5-1 at N.J.A.C. 7:8-5.2 (f) or an alternative stormwater management measure approved in accordance with N.J.A.C. 7:8-5.2(g). The following green infrastructure BMP's from Table 5-1 at N.J.A.C. 7:8-5.2 (b) have been incorporated into the project design:

1. Pervious paving- porous asphalt areas are provided as part of the project design. As required by N.J.A.C. 7:8-5.3 (b), area of additional inflow cannot exceed three times the area occupied by the pervious paving systems.

The area of additional inflow does not exceed three times the area occupied by the proposed porous asphalt areas. The proposed green infrastructure BMP's comply with N.J.A.C. 7:8-5.3 (b).

Parking Area PA-Build A allowable additional inflow area = 8,371 sf porous asphalt area x 3 = 25,113 sf. Total proposed inflow area to porous asphalt = 17,461 sf

Parking Area PA-Build B allowable additional inflow area = 40,480 sf porous asphalt area x 3 = 121,440 sf. Total proposed inflow area to porous asphalt = 77,173 sf.

The proposed porous asphalt section consists of a surface course (3" thickness), a choker course (1" thickness), and stone storage detention system (8" min.). Rainwater is infiltrated through the surface course where the goal is to control stormwater at the source, reduce runoff and improve water quality by filtering pollutants primarily in the porous pavement surface structure.

Calculations are provided in Appendix D for sample sections of the porous asphalt to determine the stone storage bed volume. The stone storage bed volume utilizes a 40% stone void area.

F. PROPOSED STORMWATER MANAGEMENT DESIGN

TECHNIQUES OF ANALYSIS

In accordance with the stormwater runoff calculation methodology at N.J.A.C. 7:8-5.6, the quantity (volume and rate) of stormwater runoff for pre- and post-developed conditions is calculated based on the USDA NRCS methodology as described in NRCS National Engineering Handbook, Part 630.

Pre- and post-developed times of concentration (Tc) are determined using the hydraulically longest flow path. Curve numbers (CN) for the drainage areas are based on the hydrologic soil group and land use. The developed area is made up of Type B soils, and therefore the following CN values were utilized:

Type B soils – Woods 55; Open Space 61 and Impervious 98

The impervious areas were calculated as separate subareas to generate hydrographs without weighted CNs as outlined in the CMP N.J.A.C. 7:50-6.84(a) 6.i (2) and the BMP manual chapter 5.

A 24-hour, NOAA _D (Region D) storm distribution was utilized with the following precipitation amounts, within Middlesex County for each storm analyzed. Precipitation adjustment factors are included in the precipitation depths below. (reference Appendix J)

Storm Event	Current	Projected (year 2100)
2 year	3.4 inches	4.0 inches
10 year	5.2 inches	6.2 inches
100 year	8.9 inches	11.5 inches

Water Quality Storm 1.25 inches / 2 hours

Stormwater management for the project area is designed to demonstrate that the there is no increase in peak runoff rates or volume of stormwater leaving the site for the 2-, 10- and 100-year storm events, for current and projected rainfall. Bentley's Pondpack Connect Edition was used to perform the calculations. Pre- and post-developed drainage area delineations can be found on Sheets CS-9001 through CS-9003 in Appendix H.

A subsurface basin is proposed beneath the proposed parking area on Lot 1.07. The subsurface basin will infiltrate and detain stormwater runoff prior to routing to the existing piping system that extends beyond the limits of the project site. The piping system terminates at the downstream stormwater management basin.

PROPOSED SUBSURFACE BASIN

The proposed subsurface basin consists of plastic geocellular stormwater management system (StormBrixx). The outlet structure consists of a pre-cast concrete box with a 3" dia. orifice (el. 108.67) and weir wall (el. 110.90). The subsurface basin outflow is routed towards the existing piping system that extends beyond the limits of the project site.

Table 6 below provides a summary of the basin inflow rates, outflow rates, storage volumes and elevations for the current year rainfall, and Table 7 provides summary of the basin inflow rates, outflow rates, storage volumes and elevations for the projected year 2100 rainfall.

TABLE 6 (CURRENT RAINFALL)
SUBSURFACE BASIN - PROPOSED BASIN PARAMETERS

Storm (year)	Peak Inflow (cfs)	Peak Outflow Routed (cfs)	Storage Volume (cf)	Peak Elevations (ft)
2	7.30	0.13	18,796	109.12
10	11.46	0.20	30,033	109.48
100	20.15	0.29	54,442	110.29

TABLE 7 (PROJECTED YEAR 2100)
SUBSURFACE BASIN - PROPOSED BASIN PARAMETERS

Storm (year)	Peak Inflow (cfs)	Peak Outflow Routed (cfs)	Storage Volume (cf)	Peak Elevations (ft)
2	8.68	0.16	22,473	109.24
10	13.80	0.22	36,481	109.70
100	26.30	0.34	72,320	110.87

G. SOIL EROSION AND SEDIMENT CONTROL

The project will comply with the minimum design and performance standards for erosion control established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq. and implementing rules. Anticipated BMP's to be included in the Soil Erosion and Sediment Control Plan will include, structural and non-structural soil erosion BMP's to be implemented during construction, including: minimizing the area of disturbance, placement of silt fencing around the limit of disturbance, temporary soil stockpiles surrounded with silt fencing, temporary vegetative cover standards, inlet filter covers over existing and proposed stormwater inlets, and an anti-tracking stabilized construction entrance (see Dwg. CE-17 and CE-18). The project will be submitted to the Freehold Soil Conservation District for certification of a Soil Erosion and Sediment Control Plan prior to commencement of construction.

H. STORM SEWER DESIGN

Storm sewer design consists of Type "B" inlets, trench drains, manholes, and PVC and RCP storm pipes. All proposed conveyance systems have been sized to accommodate the 25-year storm event.

I. REVIEW AGENCIES

1. Plainsboro Township Planning Board, Amended Preliminary/Final Site Plan approval.
2. Middlesex County Planning Board, Site Plan approval.
3. Delaware and Raritan Canal Commission, project certification.
4. Freehold Soil Erosion and Sediment Control Plan approval.

J. PROJECT SITE SOIL TYPES

1. NknA Nixon loam, 0 to 2 percent slopes; Type B Soil.
2. NknB Nixon loam, 2 to 5 percent slopes; Type B Soil.
3. NKrA Nixon variant loam, 0 to 2 percent slopes; Type B Soil.

III. UTILITY SERVICES

A. Water

The site is located within the service area of New Jersey American Water Company (NJAW). A review of NJAW Raritan Atlas Sheet 403 indicates that the proposed site will be served off 12" piping located in Main Street. This 12" main extends westerly (through Main Street, and Village Boulevard) and easterly (through College Road West and Windrows Drive) and connects at each end into a 24" main in College Road West/ Seminary Drive. From our discussions with NJAW it is our understanding that a main extension will not be required; domestic and fire services will be extended to the buildings from the existing mains.

Domestic Demand

The domestic water demand has been estimated in the table below based on information as published in Table 5.1 of Residential Site Improvement Standards, under N.J.A.C. Title 5, Chapter 21, Subchapter 5 Water Supply:

Size of Dwelling	Units	Demand per Unit (gpd)	Average Demand (gpd)
studio*	20	80	1,600
1-bedroom	229	125	28,625
2-bedroom	135	150	20,250
3-bedroom	10	210	2,100
Totals			52,575

* Studio rate not provided for Townhouse - taken from High-Rise

Fire Demand

It is anticipated that the buildings will be provided with fire sprinklers; a sprinkler design has not been developed as of this writing and the sprinkler demand will be provided at a later date.

It is our understanding that adequate water is available. Requests for "will serve confirmation" and hydrant testing have been made to NJAW, and will be provided upon receipt.

NJAW currently holds a Master Permit from the NJDEP for this area; it is anticipated that the project will be included in the Master Plan, and an individual NJDEP Bureau of Safe Drinking Water Permit will not be required.

B. Sewerage Facilities

The site is located within the service area of South Brunswick Township, with final treatment and disposal at the River Road treatment facilities of the Stony Brook Regional Sewerage Authority (SBRSA). The collection piping within the Forrestal Village is 8" which drains into 12" piping through the Princeton Nursery Project north of College Road West.

It is anticipated that a sewer main extension through Lionsgate Drive will be required to serve the development.

Flow generation rates have been estimated as required by the current NJDEP criteria published under N.J.A.C. 7:14A-23.3.

Size of Dwelling	Units	Demand per Unit (gpd)	**Average Demand (gpd)**
studio	20	150	3,000
1-bedroom	229	150	34,350
2-bedroom	135	225	30,375
3-bedroom	10	300	3,000
Totals			**70,725**

* Studio rate not included - using 1-bedroom rate

This equates to 329 ERUs, as defined by the Township of South Brunswick.

As flows will be greater than 8,000 GPD, a Treatment Works Approval (TWA) will be required from the NJDEP. Prior to submission to the NJDEP endorsements of the application will be required by the Property Owner, Township of Plainsboro (as the municipality of the Project), Township of South Brunswick (as provider of sewer service) and the SBRSA.

C. Electric and Gas

The site is located within the service area of the Public Service Electric and Gas Utility Company (PSE&G). PSE&G has advised that while specific capacity information cannot be provided without a formal request and project specific load tabulation, it is anticipated that capacity is available in their system. As the project develops further PSE&G electric and gas load sheets will be prepared and submitted to PSE&G for a will serve confirmation letter for the project.

Existing underground gas and electric services are located along College Road West.

D. Telephone

The site is located within the service area of Verizon Communications. It is our understanding that capacity is available in their system. Existing underground telephone service is located along College Road West.

A copy of the will serve confirmation letter dated July 9, 2014 has been included in this report.

E. Cable Access Television

The site is located within the service area of Comcast Corporation. Comcast's will serve confirmation letter dated May 16, 2014 included in this report confirms that capacity is available in their system. Existing underground cable service is located along College Road West.

IV. RESIDENTIAL SITE IMPROVEMENTS STANDARDS (RSIS) COMPLIANCE SUMMARY

The design of the proposed development has been prepared in compliance with the current Residential Site Improvements Standards (RSIS). Below is a summary of the items that meet RSIS standards:

- Sidewalk locations and walks
- Right-of-way, cartway, and parking lane widths
- Average daily vehicle computations/analysis
- Storm sewer system design
- Stormwater management system design
- Water system and fire hydrant design (in progress)
- Sanitary collection system design (in progress)
- Remaining underground utilities
- Parking requirements and dimensions
- Roadway alignment (unchanged from existing) and grade standards
- Curbing requirements
- Bikeways locations and dimensions
- Traffic signage
- Site easements

V. CONCLUSION

A summary of the stormwater management design is as follows:

- Pursuant to N.J.A.C. 7:8-5.6(b)2 the stormwater management measures are designed to reduce the post-development peak discharge for the 2, 10, and 100-year storm events to release 50%, 75% and 80%, respectively of the pre-development runoff rates, for the proposed development area.

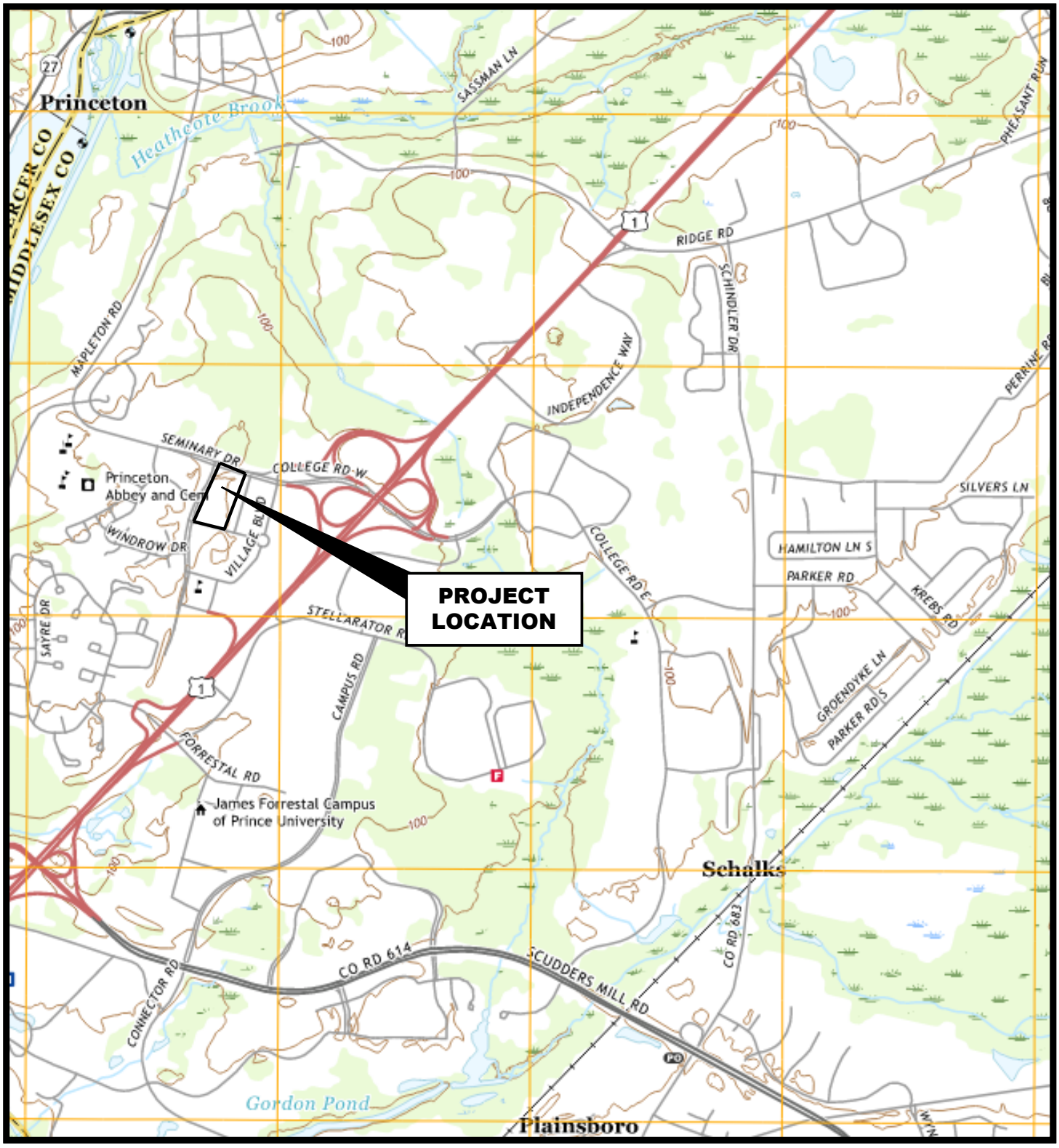
- The subsurface basin meets the definition the small-scale infiltration basins; having a contributory drainage area of 2.25 acres, which is less than the maximum 2.5 acres.

- Groundwater recharge has been met by infiltrating 100 percent of the site's average annual pre-developed groundwater recharge volume after development. The water will be infiltrated within the subsurface infiltration basin.

- The project reduces motor vehicle surfaces by 0.90 acres. Pursuant to N.J.A.C. 7:8-5.5 (b)1, eighty percent TSS removal will be achieved for the proposed surface parking area utilizing porous asphalt.

- Green infrastructure BMP's are incorporated into the project design utilizing porous asphalt.

Exhibits



USGS Quad Map, Hightstown, NJ

vanote-harvey division of pennoni	NEW RESIDENTIAL COMMUNITY BLOCK 104, LOTS 1.03, 1.04, 1.05, 1.06 & 1.07 PLAINSBORO TOWNSHIP MIDDLESEX COUNTY, NEW JERSEY	
Job No. PRFOV23001	Scale: 1"=2,000'	Figure 1 – Location Map

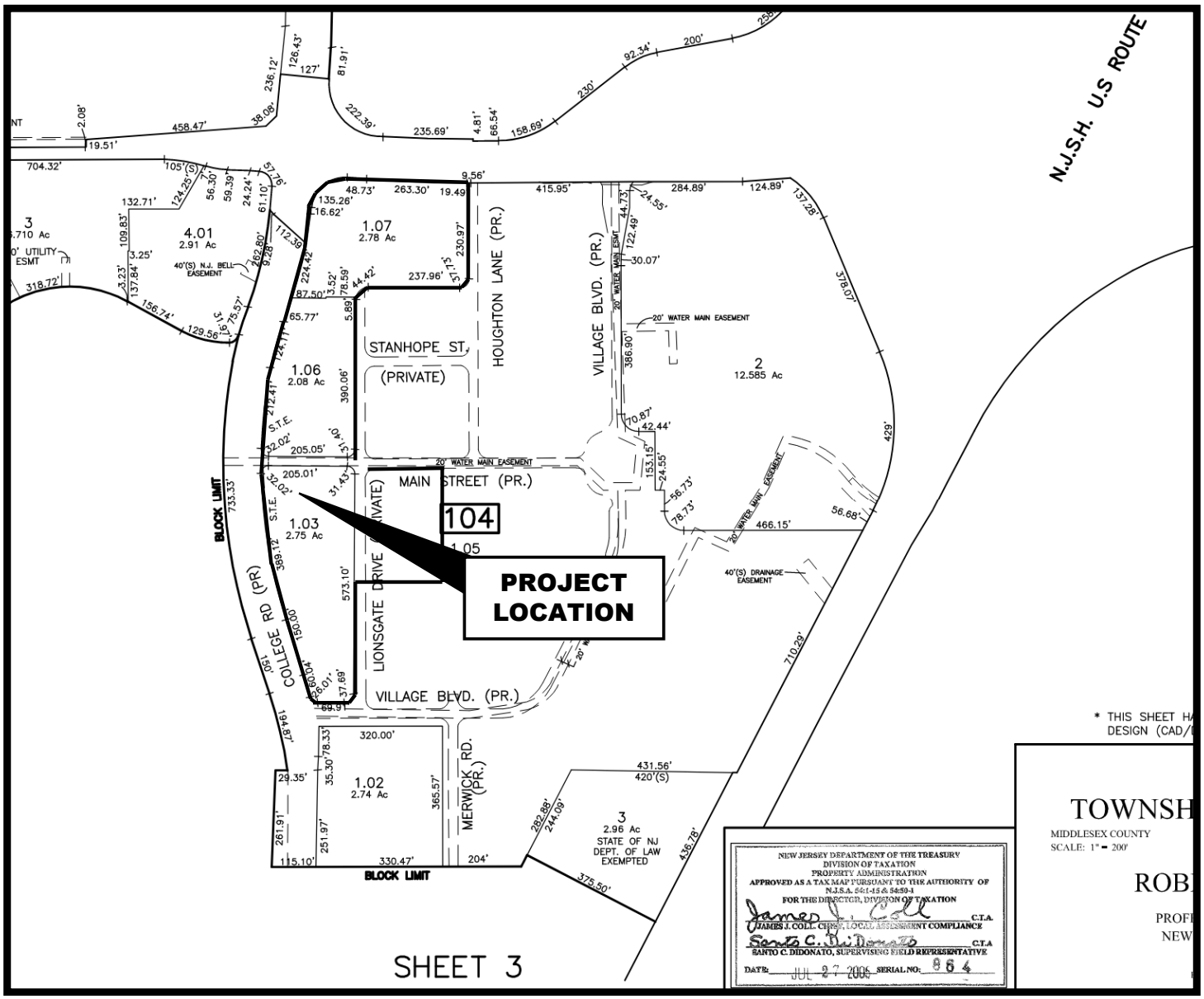


Plate 1, Township of Plainsboro, Tax Map

		NEW RESIDENTIAL COMMUNITY BLOCK 104, LOTS 1.03, 1.04, 1.05, 1.06 & 1.07 PLAINSBORO TOWNSHIP MIDDLESEX COUNTY, NEW JERSEY
Job No. PRFOV23001	Scale: NTS	Figure 2 – Tax Map

Map unit symbol	Map unit name
NknA	Nixon loam, 0 to 2 percent slopes
NknB	Nixon loam, 2 to 5 percent slopes

NRCS WebSoil Survey, Middlesex County, NJ

vnh van note-harvey division of pennoni		NEW RESIDENTIAL COMMUNITY BLOCK 104, LOTS 1.03, 1.04, 1.05, 1.06 & 1.07 PLAINSBORO TOWNSHIP MIDDLESEX COUNTY, NEW JERSEY
Job No. PRFOV23001	Scale: NTS	Figure 3 – Soils Map

Appendix A

CN Area Collection - EXIST IMP (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
Impervious Vehicular	98.000	4.200	0.0	0.0
Impervious non-vehicular	98.000	0.500	0.0	0.0
Landbank Parking	98.000	1.500	0.0	0.0

CN Area Collection - EXIST PERV (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
Grass	61.000	4.100	0.0	0.0

Pre-Developed Current

Subsection: Time of Concentration Calculations
Label: EXIST IMP
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.011
Slope	0.005 ft/ft
2 Year 24 Hour Depth	3.4 in
Average Velocity	0.81 ft/s
Segment Time of Concentration	0.034 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	211.00 ft
Is Paved?	True
Slope	0.020 ft/ft
Average Velocity	2.87 ft/s
Segment Time of Concentration	0.020 hours

Segment #3: TR-55 Channel Flow	
Flow Area	1.2 ft²
Hydraulic Length	42.00 ft
Manning's n	0.015
Slope	0.008 ft/ft
Wetted Perimeter	3.90 ft
Average Velocity	3.95 ft/s
Segment Time of Concentration	0.003 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.057 hours

Pre-Developed Current

Subsection: Time of Concentration Calculations
Label: EXIST IMP
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Sheet Flow

Tc = (0.007 * ((n * Lf)**0.8)) / ((P**0.5) * (Sf**0.4))

Where:
Tc= Time of concentration, hours
n= Manning's n
Lf= Flow length, feet
P= 2yr, 24hr Rain depth, inches
Sf= Slope, %

Pre-Developed Current

Subsection: Time of Concentration Calculations
Label: EXIST PERV
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.150
Slope	0.042 ft/ft
2 Year 24 Hour Depth	3.4 in
Average Velocity	0.24 ft/s
Segment Time of Concentration	0.118 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	19.00 ft
Is Paved?	False
Slope	0.053 ft/ft
Average Velocity	3.71 ft/s
Segment Time of Concentration	0.001 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	256.00 ft
Is Paved?	True
Slope	0.020 ft/ft
Average Velocity	2.87 ft/s
Segment Time of Concentration	0.025 hours

Segment #4: TR-55 Channel Flow	
Flow Area	1.2 ft²
Hydraulic Length	42.00 ft
Manning's n	0.015
Slope	0.008 ft/ft
Wetted Perimeter	3.90 ft
Average Velocity	3.95 ft/s
Segment Time of Concentration	0.003 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.147 hours

==== SCS Channel Flow

Tc =	R = Qa / Wp
	V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n
	(Lf / V) / 3600
Where:	R= Hydraulic radius
	Aq= Flow area, square feet
	Wp= Wetted perimeter, feet
	V= Velocity, ft/sec
	Sf= Slope, ft/ft
	n= Manning's n
	Tc= Time of concentration, hours
	Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =	Unpaved surface:
	V = 16.1345 * (Sf**0.5)
	Paved Surface:
	V = 20.3282 * (Sf**0.5)
	(Lf / V) / 3600
Where:	V= Velocity, ft/sec
	Sf= Slope, ft/ft
	Tc= Time of concentration, hours
	Lf= Flow length, feet

==== SCS TR-55 Sheet Flow

Tc =	(0.007 * ((n * Lf)**0.8)) / ((P**0.5) * (Sf**0.4))
Where:	Tc= Time of concentration, hours
	n= Manning's n
	Lf= Flow length, feet
	P= 2yr, 24hr Rain depth, inches
	Sf= Slope, %

Pre-Developed Current

Subsection: Unit Hydrograph Summary
Label: EXIST IMP
Scenario: Middlesex 2-yr Current

Return Event: 2 years
Storm Event: 2yr Current NOAA D

Storm Event	2yr Current NOAA D
Return Event	2 years
Duration	24.000 hours
Depth	3.4 in
Time of Concentration (Composite)	0.057 hours
Area (User Defined)	6.200 acres

Computational Time Increment	0.008 hours
Time to Peak (Computed)	12.004 hours
Flow (Peak, Computed)	21.55 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	21.55 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	6.200 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.2 in
Runoff Volume (Pervious)	71,271.777 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	71,267.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.057 hours
Computational Time Increment	0.008 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Pre-Developed Current

Subsection: Unit Hydrograph Summary
Label: EXIST IMP
Scenario: Middlesex 2-yr Current

Return Event: 2 years
Storm Event: 2yr Current NOAA D

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	122.27 ft^3/s
Unit peak time, Tp	0.038 hours
Unit receding limb, Tr	0.153 hours
Total unit time, Tb	0.192 hours

Pre-Developed Current

Subsection: Unit Hydrograph Summary
Label: EXIST IMP
Scenario: Middlesex 10-yr Current

Return Event: 10 years
Storm Event: 10yr Current NOAA D

Storm Event	10yr Current NOAA D
Return Event	10 years
Duration	24.000 hours
Depth	5.2 in
Time of Concentration (Composite)	0.057 hours
Area (User Defined)	6.200 acres

Computational Time Increment	0.008 hours
Time to Peak (Computed)	12.004 hours
Flow (Peak, Computed)	33.15 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	33.15 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	6.200 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	5.0 in
Runoff Volume (Pervious)	111,694.299 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	111,687.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.057 hours
Computational Time Increment	0.008 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Pre-Developed Current

Subsection: Unit Hydrograph Summary
Return Event: 10 years
Label: EXIST IMP
Storm Event: 10yr Current NOAA D
Scenario: Middlesex 10-yr Current

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	122.27 ft^3/s
Unit peak time, Tp	0.038 hours
Unit receding limb, Tr	0.153 hours
Total unit time, Tb	0.192 hours

Pre-Developed Current

Subsection: Unit Hydrograph Summary
Label: EXIST IMP
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

Storm Event	100yr Current NOAA D
Return Event	100 years
Duration	24.000 hours
Depth	8.9 in
Time of Concentration (Composite)	0.057 hours
Area (User Defined)	6.200 acres

Computational Time Increment	0.008 hours
Time to Peak (Computed)	12.004 hours
Flow (Peak, Computed)	56.91 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	56.91 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	6.200 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.7 in
Runoff Volume (Pervious)	194,895.151 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	194,884.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.057 hours
Computational Time Increment	0.008 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Pre-Developed Current

Subsection: Unit Hydrograph Summary
Return Event: 100 years
Label: EXIST IMP
Storm Event: 100yr Current NOAA D
Scenario: Middlesex 100-yr Current

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	122.27 ft^3/s
Unit peak time, Tp	0.038 hours
Unit receding limb, Tr	0.153 hours
Total unit time, Tb	0.192 hours

Pre-Developed Current

Subsection: Unit Hydrograph Summary
Label: EXIST PERV
Scenario: Middlesex 2-yr Current

Return Event: 2 years
Storm Event: 2yr Current NOAA D

Storm Event	2yr Current NOAA D
Return Event	2 years
Duration	24.000 hours
Depth	3.4 in
Time of Concentration (Composite)	0.147 hours
Area (User Defined)	4.100 acres

Computational Time Increment	0.020 hours
Time to Peak (Computed)	12.062 hours
Flow (Peak, Computed)	1.68 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	1.65 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	4.100 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.5 in
Runoff Volume (Pervious)	7,865.517 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	7,857.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.147 hours
Computational Time Increment	0.020 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Pre-Developed Current

Subsection: Unit Hydrograph Summary
Return Event: 2 years
Label: EXIST PERV
Storm Event: 2yr Current NOAA D
Scenario: Middlesex 2-yr Current

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	31.63 ft^3/s
Unit peak time, Tp	0.098 hours
Unit receding limb, Tr	0.392 hours
Total unit time, Tb	0.490 hours

Pre-Developed Current

Subsection: Unit Hydrograph Summary
Label: EXIST PERV
Scenario: Middlesex 10-yr Current

Return Event: 10 years
Storm Event: 10yr Current NOAA D

Storm Event	10yr Current NOAA D
Return Event	10 years
Duration	24.000 hours
Depth	5.2 in
Time of Concentration (Composite)	0.147 hours
Area (User Defined)	4.100 acres

Computational Time Increment	0.020 hours
Time to Peak (Computed)	12.042 hours
Flow (Peak, Computed)	6.10 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	6.07 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	4.100 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.5 in
Runoff Volume (Pervious)	22,186.776 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	22,168.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.147 hours
Computational Time Increment	0.020 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Pre-Developed Current

Subsection: Unit Hydrograph Summary
Label: EXIST PERV
Scenario: Middlesex 10-yr Current

Return Event: 10 years
Storm Event: 10yr Current NOAA D

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	31.63 ft^3/s
Unit peak time, Tp	0.098 hours
Unit receding limb, Tr	0.392 hours
Total unit time, Tb	0.490 hours

Pre-Developed Current

Subsection: Unit Hydrograph Summary
Label: EXIST PERV
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

Storm Event	100yr Current NOAA D
Return Event	100 years
Duration	24.000 hours
Depth	8.9 in
Time of Concentration (Composite)	0.147 hours
Area (User Defined)	4.100 acres

Computational Time Increment	0.020 hours
Time to Peak (Computed)	12.042 hours
Flow (Peak, Computed)	18.00 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	17.81 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	4.100 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.1 in
Runoff Volume (Pervious)	61,682.848 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	61,641.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.147 hours
Computational Time Increment	0.020 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Pre-Developed Current

Subsection: Unit Hydrograph Summary
Return Event: 100 years
Label: EXIST PERV
Storm Event: 100yr Current NOAA D
Scenario: Middlesex 100-yr Current

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	31.63 ft^3/s
Unit peak time, Tp	0.098 hours
Unit receding limb, Tr	0.392 hours
Total unit time, Tb	0.490 hours

Pre-Developed Projected

Subsection: Time of Concentration Calculations
Label: EXIST IMP
Scenario: Middlesex 100-yr Projected

Return Event: 100 years
Storm Event: Region D 100yr Projected

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.011
Slope	0.005 ft/ft
2 Year 24 Hour Depth	3.9 in
Average Velocity	0.87 ft/s
Segment Time of Concentration	0.032 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	211.00 ft
Is Paved?	True
Slope	0.020 ft/ft
Average Velocity	2.87 ft/s
Segment Time of Concentration	0.020 hours

Segment #3: TR-55 Channel Flow	
Flow Area	1.2 ft²
Hydraulic Length	42.00 ft
Manning's n	0.015
Slope	0.008 ft/ft
Wetted Perimeter	3.90 ft
Average Velocity	3.95 ft/s
Segment Time of Concentration	0.003 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.055 hours

==== SCS Channel Flow

Tc =	R = Qa / Wp
	V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n
	(Lf / V) / 3600
Where:	R= Hydraulic radius
	Aq= Flow area, square feet
	Wp= Wetted perimeter, feet
	V= Velocity, ft/sec
	Sf= Slope, ft/ft
	n= Manning's n
	Tc= Time of concentration, hours
	Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =	Unpaved surface:
	V = 16.1345 * (Sf**0.5)
	Paved Surface:
	V = 20.3282 * (Sf**0.5)
	(Lf / V) / 3600
Where:	V= Velocity, ft/sec
	Sf= Slope, ft/ft
	Tc= Time of concentration, hours
	Lf= Flow length, feet

==== SCS TR-55 Sheet Flow

Tc =	(0.007 * ((n * Lf)**0.8)) / ((P**0.5) * (Sf**0.4))
Where:	Tc= Time of concentration, hours
	n= Manning's n
	Lf= Flow length, feet
	P= 2yr, 24hr Rain depth, inches
	Sf= Slope, %

Pre-Developed Projected

Subsection: Time of Concentration Calculations
Label: EXIST PERV
Scenario: Middlesex 100-yr Projected

Return Event: 100 years
Storm Event: Region D 100yr Projected

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.150
Slope	0.042 ft/ft
2 Year 24 Hour Depth	3.9 in
Average Velocity	0.25 ft/s
Segment Time of Concentration	0.110 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	19.00 ft
Is Paved?	False
Slope	0.053 ft/ft
Average Velocity	3.71 ft/s
Segment Time of Concentration	0.001 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	256.00 ft
Is Paved?	True
Slope	0.020 ft/ft
Average Velocity	2.87 ft/s
Segment Time of Concentration	0.025 hours

Segment #4: TR-55 Channel Flow	
Flow Area	1.2 ft²
Hydraulic Length	42.00 ft
Manning's n	0.015
Slope	0.008 ft/ft
Wetted Perimeter	3.90 ft
Average Velocity	3.95 ft/s
Segment Time of Concentration	0.003 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.139 hours

==== SCS Channel Flow

Tc =	R = Qa / Wp
	V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n
	(Lf / V) / 3600
Where:	R= Hydraulic radius
	Aq= Flow area, square feet
	Wp= Wetted perimeter, feet
	V= Velocity, ft/sec
	Sf= Slope, ft/ft
	n= Manning's n
	Tc= Time of concentration, hours
	Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =	Unpaved surface:
	V = 16.1345 * (Sf**0.5)
	Paved Surface:
	V = 20.3282 * (Sf**0.5)
	(Lf / V) / 3600
Where:	V= Velocity, ft/sec
	Sf= Slope, ft/ft
	Tc= Time of concentration, hours
	Lf= Flow length, feet

==== SCS TR-55 Sheet Flow

Tc =	(0.007 * ((n * Lf)**0.8)) / ((P**0.5) * (Sf**0.4))
Where:	Tc= Time of concentration, hours
	n= Manning's n
	Lf= Flow length, feet
	P= 2yr, 24hr Rain depth, inches
	Sf= Slope, %

Pre-Developed Projected

Subsection: Unit Hydrograph Summary
Label: EXIST IMP
Scenario: Middlesex 2-yr Projected

Return Event: 2 years
Storm Event: Region D 2yr Projected

Storm Event	Region D 2yr Projected
Return Event	2 years
Duration	24.000 hours
Depth	4.0 in
Time of Concentration (Composite)	0.055 hours
Area (User Defined)	6.200 acres

Computational Time Increment	0.007 hours
Time to Peak (Computed)	12.002 hours
Flow (Peak, Computed)	25.51 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	25.50 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	6.200 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.8 in
Runoff Volume (Pervious)	84,737.475 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	84,740.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.055 hours
Computational Time Increment	0.007 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Pre-Developed Projected

Subsection: Unit Hydrograph Summary
Return Event: 2 years
Label: EXIST IMP
Storm Event: Region D 2yr Projected
Scenario: Middlesex 2-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	127.28 ft^3/s
Unit peak time, Tp	0.037 hours
Unit receding limb, Tr	0.147 hours
Total unit time, Tb	0.184 hours

Pre-Developed Projected

Subsection: Unit Hydrograph Summary
Label: EXIST IMP
Scenario: Middlesex 10-yr Projected

Return Event: 10 years
Storm Event: Region D 10yr Projected

Storm Event	Region D 10yr Projected
Return Event	10 years
Duration	24.000 hours
Depth	6.2 in
Time of Concentration (Composite)	0.055 hours
Area (User Defined)	6.200 acres

Computational Time Increment	0.007 hours
Time to Peak (Computed)	12.002 hours
Flow (Peak, Computed)	39.72 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	39.70 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	6.200 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.0 in
Runoff Volume (Pervious)	134,172.828 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	134,178.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.055 hours
Computational Time Increment	0.007 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Pre-Developed Projected

Subsection: Unit Hydrograph Summary
Return Event: 10 years
Label: EXIST IMP
Storm Event: Region D 10yr Projected
Scenario: Middlesex 10-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	127.28 ft^3/s
Unit peak time, Tp	0.037 hours
Unit receding limb, Tr	0.147 hours
Total unit time, Tb	0.184 hours

Pre-Developed Projected

Subsection: Unit Hydrograph Summary
Label: EXIST IMP
Scenario: Middlesex 100-yr Projected

Return Event: 100 years
Storm Event: Region D 100yr Projected

Storm Event	Region D 100yr Projected
Return Event	100 years
Duration	24.000 hours
Depth	11.5 in
Time of Concentration (Composite)	0.055 hours
Area (User Defined)	6.200 acres

Computational Time Increment	0.007 hours
Time to Peak (Computed)	12.002 hours
Flow (Peak, Computed)	73.85 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	73.81 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	6.200 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	11.3 in
Runoff Volume (Pervious)	253,387.695 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	253,398.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.055 hours
Computational Time Increment	0.007 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Pre-Developed Projected

Subsection: Unit Hydrograph Summary
Return Event: 100 years
Label: EXIST IMP
Storm Event: Region D 100yr Projected
Scenario: Middlesex 100-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	127.28 ft^3/s
Unit peak time, Tp	0.037 hours
Unit receding limb, Tr	0.147 hours
Total unit time, Tb	0.184 hours

Pre-Developed Projected

Subsection: Unit Hydrograph Summary
Label: EXIST PERV
Scenario: Middlesex 2-yr Projected

Return Event: 2 years
Storm Event: Region D 2yr Projected

Storm Event	Region D 2yr Projected
Return Event	2 years
Duration	24.000 hours
Depth	4.0 in
Time of Concentration (Composite)	0.139 hours
Area (User Defined)	4.100 acres

Computational Time Increment	0.019 hours
Time to Peak (Computed)	12.051 hours
Flow (Peak, Computed)	3.05 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	3.05 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	4.100 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.8 in
Runoff Volume (Pervious)	12,092.108 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	12,084.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.139 hours
Computational Time Increment	0.019 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Pre-Developed Projected

Subsection: Unit Hydrograph Summary
Return Event: 2 years
Label: EXIST PERV
Storm Event: Region D 2yr Projected
Scenario: Middlesex 2-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	33.41 ft^3/s
Unit peak time, Tp	0.093 hours
Unit receding limb, Tr	0.371 hours
Total unit time, Tb	0.463 hours

Pre-Developed Projected

Subsection: Unit Hydrograph Summary
Label: EXIST PERV
Scenario: Middlesex 10-yr Projected

Return Event: 10 years
Storm Event: Region D 10yr Projected

Storm Event	Region D 10yr Projected
Return Event	10 years
Duration	24.000 hours
Depth	6.2 in
Time of Concentration (Composite)	0.139 hours
Area (User Defined)	4.100 acres

Computational Time Increment	0.019 hours
Time to Peak (Computed)	12.051 hours
Flow (Peak, Computed)	9.16 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	9.16 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	4.100 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.1 in
Runoff Volume (Pervious)	31,857.157 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	31,842.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.139 hours
Computational Time Increment	0.019 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Pre-Developed Projected

Subsection: Unit Hydrograph Summary
Return Event: 10 years
Label: EXIST PERV
Storm Event: Region D 10yr Projected
Scenario: Middlesex 10-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	33.41 ft^3/s
Unit peak time, Tp	0.093 hours
Unit receding limb, Tr	0.371 hours
Total unit time, Tb	0.463 hours

Pre-Developed Projected

Subsection: Unit Hydrograph Summary
Label: EXIST PERV
Scenario: Middlesex 100-yr Projected

Return Event: 100 years
Storm Event: Region D 100yr Projected

Storm Event	Region D 100yr Projected
Return Event	100 years
Duration	24.000 hours
Depth	11.5 in
Time of Concentration (Composite)	0.139 hours
Area (User Defined)	4.100 acres

Computational Time Increment	0.019 hours
Time to Peak (Computed)	12.032 hours
Flow (Peak, Computed)	27.71 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	27.38 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	4.100 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.3 in
Runoff Volume (Pervious)	93,585.768 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	93,554.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.139 hours
Computational Time Increment	0.019 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Pre-Developed Projected

Subsection: Unit Hydrograph Summary
Return Event: 100 years
Label: EXIST PERV
Storm Event: Region D 100yr Projected
Scenario: Middlesex 100-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	33.41 ft^3/s
Unit peak time, Tp	0.093 hours
Unit receding limb, Tr	0.371 hours
Total unit time, Tb	0.463 hours

Appendix B

CN Area Collection - PROP IMP (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
Impervious	98.000	2.650	0.0	0.0
Building Area	98.000	3.000	0.0	0.0
Impervious non vehicular	98.000	0.320	0.0	0.0

CN Area Collection - PROP IMP TO UGB (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
Impervious Vehicular	98.000	1.140	0.0	0.0
Imervious Porous asphalt	98.000	0.870	0.0	0.0
Impervious non-vehicular	98.000	0.020	0.0	0.0

CN Area Collection - PROP PERV (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
Grass	61.000	2.080	0.0	0.0

CN Area Collection - PROP PERV TO UGB (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
Grass	61.000	0.220	0.0	0.0

Post Developed Current Rainfall

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PROP IMP	Middlesex 2-yr Current	2	68,636.000	12.000	21.12
PROP IMP	Middlesex 10-yr Current	10	107,562.000	12.000	32.48
PROP IMP	Middlesex 100-yr Current	100	187,682.000	12.000	55.75
PROP PERV	Middlesex 2-yr Current	2	3,989.000	12.000	0.94
PROP PERV	Middlesex 10-yr Current	10	11,253.000	12.000	3.48
PROP PERV	Middlesex 100-yr Current	100	31,288.000	12.000	10.26
EXIST IMP	Middlesex 2-yr Current	2	71,267.000	12.000	21.55
EXIST IMP	Middlesex 10-yr Current	10	111,687.000	12.000	33.15
EXIST IMP	Middlesex 100-yr Current	100	194,884.000	12.000	56.91
EXIST PERV	Middlesex 2-yr Current	2	7,857.000	12.050	1.65
EXIST PERV	Middlesex 10-yr Current	10	22,168.000	12.050	6.07
EXIST PERV	Middlesex 100-yr Current	100	61,641.000	12.050	17.81
PROP IMP TO UGB	Middlesex 2-yr Current	2	23,335.000	12.000	7.17
PROP IMP TO UGB	Middlesex 10-yr Current	10	36,570.000	12.000	11.02
PROP IMP TO UGB	Middlesex 100-yr Current	100	63,812.000	12.000	18.92
PROP PERV TO UGB	Middlesex 2-yr Current	2	424.000	12.000	0.13
PROP PERV TO UGB	Middlesex 10-yr Current	10	1,194.000	12.000	0.44
PROP PERV TO UGB	Middlesex 100-yr Current	100	3,316.000	12.000	1.23

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PROP-FLOW	Middlesex 2-yr Current	2	78,250.000	12.000	22.12
PROP-FLOW	Middlesex 10-yr Current	10	127,330.000	12.000	36.09

Post Developed Current Rainfall

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PROP-FLOW	Middlesex 100-yr Current	100	232,161.000	12.000	66.22
EXIST FLOW	Middlesex 2-yr Current	2	79,124.000	12.000	22.76
EXIST FLOW	Middlesex 10-yr Current	10	133,856.000	12.000	38.26
EXIST FLOW	Middlesex 100-yr Current	100	256,525.000	12.000	72.65

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
UGB (IN)	Middlesex 2-yr Current	2	23,759.000	12.000	7.30	(N/A)	(N/A)
UGB (OUT)	Middlesex 2-yr Current	2	5,625.000	17.750	0.13	109.12	18,796.000
UGB (IN)	Middlesex 10-yr Current	10	37,764.000	12.000	11.46	(N/A)	(N/A)
UGB (OUT)	Middlesex 10-yr Current	10	8,516.000	18.250	0.20	109.48	30,033.000
UGB (IN)	Middlesex 100-yr Current	100	67,127.000	12.000	20.15	(N/A)	(N/A)
UGB (OUT)	Middlesex 100-yr Current	100	13,192.000	20.500	0.29	110.29	54,442.000

Post Developed Current Rainfall

Subsection: Time of Concentration Calculations
Label: PROP IMP
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.011
Slope	0.025 ft/ft
2 Year 24 Hour Depth	3.4 in
Average Velocity	1.55 ft/s
Segment Time of Concentration	0.018 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	132.00 ft
Is Paved?	True
Slope	0.024 ft/ft
Average Velocity	3.15 ft/s
Segment Time of Concentration	0.012 hours

Segment #3: TR-55 Channel Flow	
Flow Area	3.1 ft²
Hydraulic Length	48.00 ft
Manning's n	0.015
Slope	0.006 ft/ft
Wetted Perimeter	6.30 ft
Average Velocity	4.80 ft/s
Segment Time of Concentration	0.003 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.032 hours

Post Developed Current Rainfall

Subsection: Time of Concentration Calculations
Label: PROP IMP
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Sheet Flow

Tc = (0.007 * ((n * Lf)**0.8)) / ((P**0.5) * (Sf**0.4))

Where:
Tc= Time of concentration, hours
n= Manning's n
Lf= Flow length, feet
P= 2yr, 24hr Rain depth, inches
Sf= Slope, %

Post Developed Current Rainfall

Subsection: Time of Concentration Calculations
Label: PROP IMP TO UGB
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.011
Slope	0.020 ft/ft
2 Year 24 Hour Depth	3.4 in
Average Velocity	1.42 ft/s
Segment Time of Concentration	0.020 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	193.00 ft
Is Paved?	True
Slope	0.020 ft/ft
Average Velocity	2.87 ft/s
Segment Time of Concentration	0.019 hours

Segment #3: TR-55 Channel Flow	
Flow Area	1.2 ft²
Hydraulic Length	54.00 ft
Manning's n	0.015
Slope	0.010 ft/ft
Wetted Perimeter	3.90 ft
Average Velocity	4.53 ft/s
Segment Time of Concentration	0.003 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.042 hours

Post Developed Current Rainfall

Subsection: Time of Concentration Calculations
Label: PROP IMP TO UGB
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Sheet Flow

Tc = (0.007 * ((n * Lf)**0.8)) / ((P**0.5) * (Sf**0.4))

Where:
Tc= Time of concentration, hours
n= Manning's n
Lf= Flow length, feet
P= 2yr, 24hr Rain depth, inches
Sf= Slope, %

Post Developed Current Rainfall

Subsection: Time of Concentration Calculations
Label: PROP PERV
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.150
Slope	0.200 ft/ft
2 Year 24 Hour Depth	3.4 in
Average Velocity	0.44 ft/s
Segment Time of Concentration	0.063 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	232.00 ft
Is Paved?	True
Slope	0.024 ft/ft
Average Velocity	3.15 ft/s
Segment Time of Concentration	0.020 hours

Segment #3: TR-55 Channel Flow	
Flow Area	3.1 ft^2
Hydraulic Length	48.00 ft
Manning's n	0.015
Slope	0.006 ft/ft
Wetted Perimeter	6.30 ft
Average Velocity	4.80 ft/s
Segment Time of Concentration	0.003 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.086 hours

Post Developed Current Rainfall

Subsection: Time of Concentration Calculations
Label: PROP PERV
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Sheet Flow

Tc = (0.007 * ((n * Lf)**0.8)) / ((P**0.5) * (Sf**0.4))

Where:
Tc= Time of concentration, hours
n= Manning's n
Lf= Flow length, feet
P= 2yr, 24hr Rain depth, inches
Sf= Slope, %

Post Developed Current Rainfall

Subsection: Time of Concentration Calculations
Label: PROP PERV TO UGB
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	26.00 ft
Manning's n	0.150
Slope	0.300 ft/ft
2 Year 24 Hour Depth	3.4 in
Average Velocity	0.40 ft/s
Segment Time of Concentration	0.018 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	18.00 ft
Is Paved?	True
Slope	0.010 ft/ft
Average Velocity	2.03 ft/s
Segment Time of Concentration	0.002 hours

Segment #3: TR-55 Channel Flow	
Flow Area	1.2 ft²
Hydraulic Length	132.00 ft
Manning's n	0.015
Slope	0.010 ft/ft
Wetted Perimeter	3.90 ft
Average Velocity	4.53 ft/s
Segment Time of Concentration	0.008 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.029 hours

Post Developed Current Rainfall

Subsection: Time of Concentration Calculations
Label: PROP PERV TO UGB
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Sheet Flow

Tc = (0.007 * ((n * Lf)**0.8)) / ((P**0.5) * (Sf**0.4))

Where:
Tc= Time of concentration, hours
n= Manning's n
Lf= Flow length, feet
P= 2yr, 24hr Rain depth, inches
Sf= Slope, %

Post Developed Current Rainfall

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

Return Event: 2 years
Storm Event: 2yr Current NOAA D

Storm Event	2yr Current NOAA D
Return Event	2 years
Duration	24.000 hours
Depth	3.4 in
Time of Concentration (Composite)	0.032 hours
Area (User Defined)	5.970 acres

Computational Time Increment	0.004 hours
Time to Peak (Computed)	11.997 hours
Flow (Peak, Computed)	21.15 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	21.12 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	5.970 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.2 in
Runoff Volume (Pervious)	68,627.794 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	68,636.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.032 hours
Computational Time Increment	0.004 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Current Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 2 years
Label: PROP IMP
Storm Event: 2yr Current NOAA D
Scenario: Middlesex 2-yr Current

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	209.15 ft^3/s
Unit peak time, Tp	0.022 hours
Unit receding limb, Tr	0.086 hours
Total unit time, Tb	0.108 hours

Post Developed Current Rainfall

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

Return Event: 10 years
Storm Event: 10yr Current NOAA D

Storm Event	10yr Current NOAA D
Return Event	10 years
Duration	24.000 hours
Depth	5.2 in
Time of Concentration (Composite)	0.032 hours
Area (User Defined)	5.970 acres

Computational Time Increment	0.004 hours
Time to Peak (Computed)	11.997 hours
Flow (Peak, Computed)	32.52 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	32.48 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	5.970 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	5.0 in
Runoff Volume (Pervious)	107,550.776 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	107,562.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.032 hours
Computational Time Increment	0.004 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Current Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 10 years
Label: PROP IMP
Storm Event: 10yr Current NOAA D
Scenario: Middlesex 10-yr Current

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	209.15 ft^3/s
Unit peak time, Tp	0.022 hours
Unit receding limb, Tr	0.086 hours
Total unit time, Tb	0.108 hours

Post Developed Current Rainfall

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

Return Event: 100 years
Storm Event: 100yr Current NOAA D

Storm Event	100yr Current NOAA D
Return Event	100 years
Duration	24.000 hours
Depth	8.9 in
Time of Concentration (Composite)	0.032 hours
Area (User Defined)	5.970 acres

Computational Time Increment	0.004 hours
Time to Peak (Computed)	11.997 hours
Flow (Peak, Computed)	55.83 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	55.75 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	5.970 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.7 in
Runoff Volume (Pervious)	187,665.162 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	187,682.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.032 hours
Computational Time Increment	0.004 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Current Rainfall

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

Return Event: 100 years
Storm Event: 100yr Current NOAA D

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	209.15 ft^3/s
Unit peak time, Tp	0.022 hours
Unit receding limb, Tr	0.086 hours
Total unit time, Tb	0.108 hours

Post Developed Current Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP IMP TO UGB
Scenario: Middlesex 2-yr Current

Return Event: 2 years
Storm Event: 2yr Current NOAA D

Storm Event	2yr Current NOAA D
Return Event	2 years
Duration	24.000 hours
Depth	3.4 in
Time of Concentration (Composite)	0.042 hours
Area (User Defined)	2.030 acres

Computational Time Increment	0.006 hours
Time to Peak (Computed)	12.000 hours
Flow (Peak, Computed)	7.17 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	7.17 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.030 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.2 in
Runoff Volume (Pervious)	23,335.756 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	23,335.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.042 hours
Computational Time Increment	0.006 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Current Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 2 years
Label: PROP IMP TO UGB
Storm Event: 2yr Current NOAA D
Scenario: Middlesex 2-yr Current

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	55.35 ft^3/s
Unit peak time, Tp	0.028 hours
Unit receding limb, Tr	0.111 hours
Total unit time, Tb	0.139 hours

Post Developed Current Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP IMP TO UGB
Scenario: Middlesex 10-yr Current

Return Event: 10 years
Storm Event: 10yr Current NOAA D

Storm Event	10yr Current NOAA D
Return Event	10 years
Duration	24.000 hours
Depth	5.2 in
Time of Concentration (Composite)	0.042 hours
Area (User Defined)	2.030 acres

Computational Time Increment	0.006 hours
Time to Peak (Computed)	12.000 hours
Flow (Peak, Computed)	11.02 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	11.02 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.030 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	5.0 in
Runoff Volume (Pervious)	36,570.875 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	36,570.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.042 hours
Computational Time Increment	0.006 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Current Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 10 years
Label: PROP IMP TO UGB
Storm Event: 10yr Current NOAA D
Scenario: Middlesex 10-yr Current

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	55.35 ft^3/s
Unit peak time, Tp	0.028 hours
Unit receding limb, Tr	0.111 hours
Total unit time, Tb	0.139 hours

Post Developed Current Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP IMP TO UGB
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

Storm Event	100yr Current NOAA D
Return Event	100 years
Duration	24.000 hours
Depth	8.9 in
Time of Concentration (Composite)	0.042 hours
Area (User Defined)	2.030 acres

Computational Time Increment	0.006 hours
Time to Peak (Computed)	12.000 hours
Flow (Peak, Computed)	18.92 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	18.92 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.030 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.7 in
Runoff Volume (Pervious)	63,812.442 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	63,812.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.042 hours
Computational Time Increment	0.006 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Current Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP IMP TO UGB
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	55.35 ft^3/s
Unit peak time, Tp	0.028 hours
Unit receding limb, Tr	0.111 hours
Total unit time, Tb	0.139 hours

Post Developed Current Rainfall

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

Return Event: 2 years
Storm Event: 2yr Current NOAA D

Storm Event	2yr Current NOAA D
Return Event	2 years
Duration	24.000 hours
Depth	3.4 in
Time of Concentration (Composite)	0.086 hours
Area (User Defined)	2.080 acres

Computational Time Increment	0.012 hours
Time to Peak (Computed)	12.026 hours
Flow (Peak, Computed)	1.04 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	0.94 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	2.080 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.5 in
Runoff Volume (Pervious)	3,990.311 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,989.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.086 hours
Computational Time Increment	0.012 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Current Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 2 years
Label: PROP PERV
Storm Event: 2yr Current NOAA D
Scenario: Middlesex 2-yr Current

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	27.30 ft^3/s
Unit peak time, Tp	0.058 hours
Unit receding limb, Tr	0.230 hours
Total unit time, Tb	0.288 hours

Post Developed Current Rainfall

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

Return Event: 10 years
Storm Event: 10yr Current NOAA D

Storm Event	10yr Current NOAA D
Return Event	10 years
Duration	24.000 hours
Depth	5.2 in
Time of Concentration (Composite)	0.086 hours
Area (User Defined)	2.080 acres

Computational Time Increment	0.012 hours
Time to Peak (Computed)	12.015 hours
Flow (Peak, Computed)	3.63 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	3.48 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	2.080 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.5 in
Runoff Volume (Pervious)	11,255.732 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	11,253.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.086 hours
Computational Time Increment	0.012 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Current Rainfall

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

Return Event: 10 years
Storm Event: 10yr Current NOAA D

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	27.30 ft^3/s
Unit peak time, Tp	0.058 hours
Unit receding limb, Tr	0.230 hours
Total unit time, Tb	0.288 hours

Post Developed Current Rainfall

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

Return Event: 100 years
Storm Event: 100yr Current NOAA D

Storm Event	100yr Current NOAA D
Return Event	100 years
Duration	24.000 hours
Depth	8.9 in
Time of Concentration (Composite)	0.086 hours
Area (User Defined)	2.080 acres

Computational Time Increment	0.012 hours
Time to Peak (Computed)	12.015 hours
Flow (Peak, Computed)	10.52 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	10.26 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	2.080 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.1 in
Runoff Volume (Pervious)	31,292.762 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	31,288.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.086 hours
Computational Time Increment	0.012 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Current Rainfall

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

Return Event: 100 years
Storm Event: 100yr Current NOAA D

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	27.30 ft^3/s
Unit peak time, Tp	0.058 hours
Unit receding limb, Tr	0.230 hours
Total unit time, Tb	0.288 hours

Post Developed Current Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP PERV TO UGB
Scenario: Middlesex 2-yr Current

Return Event: 2 years
Storm Event: 2yr Current NOAA D

Storm Event	2yr Current NOAA D
Return Event	2 years
Duration	24.000 hours
Depth	3.4 in
Time of Concentration (Composite)	0.029 hours
Area (User Defined)	0.220 acres

Computational Time Increment	0.004 hours
Time to Peak (Computed)	12.001 hours
Flow (Peak, Computed)	0.13 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	0.13 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.220 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.5 in
Runoff Volume (Pervious)	422.051 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	424.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.029 hours
Computational Time Increment	0.004 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Current Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP PERV TO UGB
Scenario: Middlesex 2-yr Current

Return Event: 2 years
Storm Event: 2yr Current NOAA D

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	8.65 ft^3/s
Unit peak time, Tp	0.019 hours
Unit receding limb, Tr	0.077 hours
Total unit time, Tb	0.096 hours

Post Developed Current Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP PERV TO UGB
Scenario: Middlesex 10-yr Current

Return Event: 10 years
Storm Event: 10yr Current NOAA D

Storm Event	10yr Current NOAA D
Return Event	10 years
Duration	24.000 hours
Depth	5.2 in
Time of Concentration (Composite)	0.029 hours
Area (User Defined)	0.220 acres

Computational Time Increment	0.004 hours
Time to Peak (Computed)	12.001 hours
Flow (Peak, Computed)	0.44 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	0.44 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.220 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.5 in
Runoff Volume (Pervious)	1,190.509 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,194.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.029 hours
Computational Time Increment	0.004 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Current Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP PERV TO UGB
Scenario: Middlesex 10-yr Current

Return Event: 10 years
Storm Event: 10yr Current NOAA D

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	8.65 ft^3/s
Unit peak time, Tp	0.019 hours
Unit receding limb, Tr	0.077 hours
Total unit time, Tb	0.096 hours

Post Developed Current Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP PERV TO UGB
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

Storm Event	100yr Current NOAA D
Return Event	100 years
Duration	24.000 hours
Depth	8.9 in
Time of Concentration (Composite)	0.029 hours
Area (User Defined)	0.220 acres

Computational Time Increment	0.004 hours
Time to Peak (Computed)	12.001 hours
Flow (Peak, Computed)	1.23 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	1.23 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.220 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.1 in
Runoff Volume (Pervious)	3,309.810 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,316.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.029 hours
Computational Time Increment	0.004 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Current Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP PERV TO UGB
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	8.65 ft^3/s
Unit peak time, Tp	0.019 hours
Unit receding limb, Tr	0.077 hours
Total unit time, Tb	0.096 hours

Post Developed Projected Rainfall

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PROP IMP	Middlesex 2-yr Projected	2	81,604.000	12.000	24.93
PROP IMP	Middlesex 10-yr Projected	10	129,208.000	12.000	38.81
PROP IMP	Middlesex 100-yr Projected	100	244,008.000	12.000	72.14
PROP PERV	Middlesex 2-yr Projected	2	6,132.000	12.000	1.73
PROP PERV	Middlesex 10-yr Projected	10	16,157.000	12.000	5.25
PROP PERV	Middlesex 100-yr Projected	100	47,468.000	12.000	15.76
EXIST IMP	Middlesex 2-yr Projected	2	84,740.000	12.000	25.50
EXIST IMP	Middlesex 10-yr Projected	10	134,178.000	12.000	39.70
EXIST IMP	Middlesex 100-yr Projected	100	253,398.000	12.000	73.81
EXIST PERV	Middlesex 2-yr Projected	2	12,084.000	12.050	3.05
EXIST PERV	Middlesex 10-yr Projected	10	31,842.000	12.050	9.16
EXIST PERV	Middlesex 100-yr Projected	100	93,554.000	12.050	27.38
PROP IMP TO UGB	Middlesex 2-yr Projected	2	27,744.000	12.000	8.45
PROP IMP TO UGB	Middlesex 10-yr Projected	10	43,930.000	12.000	13.16
PROP IMP TO UGB	Middlesex 100-yr Projected	100	82,962.000	12.000	24.46
PROP PERV TO UGB	Middlesex 2-yr Projected	2	652.000	12.000	0.23
PROP PERV TO UGB	Middlesex 10-yr Projected	10	1,714.000	12.000	0.64
PROP PERV TO UGB	Middlesex 100-yr Projected	100	5,029.000	12.000	1.84

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PROP-FLOW	Middlesex 2-yr Projected	2	94,412.000	12.000	26.77
PROP-FLOW	Middlesex 10-yr Projected	10	155,257.000	12.000	44.22

Post Developed Projected Rainfall

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PROP-FLOW	Middlesex 100-yr Projected	100	307,464.000	12.000	88.17
EXIST FLOW	Middlesex 2-yr Projected	2	96,824.000	12.000	27.97
EXIST FLOW	Middlesex 10-yr Projected	10	166,020.000	12.000	47.71
EXIST FLOW	Middlesex 100-yr Projected	100	346,951.000	12.000	98.72

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
UGB (IN)	Middlesex 2-yr Projected	2	28,396.000	12.000	8.68	(N/A)	(N/A)
UGB (OUT)	Middlesex 2-yr Projected	2	6,676.000	17.750	0.16	109.24	22,473.000
UGB (IN)	Middlesex 10-yr Projected	10	45,644.000	12.000	13.80	(N/A)	(N/A)
UGB (OUT)	Middlesex 10-yr Projected	10	9,892.000	18.650	0.22	109.70	36,481.000
UGB (IN)	Middlesex 100-yr Projected	100	87,991.000	12.000	26.30	(N/A)	(N/A)
UGB (OUT)	Middlesex 100-yr Projected	100	15,988.000	21.750	0.34	110.87	72,320.000

Post Developed Projected Rainfall

Subsection: Time of Concentration Calculations
Label: PROP IMP
Scenario: Middlesex 100-yr Projected

Return Event: 100 years
Storm Event: Region D 100yr Projected

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.011
Slope	0.025 ft/ft
2 Year 24 Hour Depth	3.9 in
Average Velocity	1.66 ft/s
Segment Time of Concentration	0.017 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	132.00 ft
Is Paved?	True
Slope	0.024 ft/ft
Average Velocity	3.15 ft/s
Segment Time of Concentration	0.012 hours

Segment #3: TR-55 Channel Flow	
Flow Area	3.1 ft²
Hydraulic Length	48.00 ft
Manning's n	0.015
Slope	0.006 ft/ft
Wetted Perimeter	6.30 ft
Average Velocity	4.80 ft/s
Segment Time of Concentration	0.003 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.031 hours

Post Developed Projected Rainfall

Subsection: Time of Concentration Calculations
Label: PROP IMP
Scenario: Middlesex 100-yr Projected

Return Event: 100 years
Storm Event: Region D 100yr Projected

==== SCS Channel Flow

Tc =	R = Qa / Wp V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n (Lf / V) / 3600
Where:	R= Hydraulic radius Aq= Flow area, square feet Wp= Wetted perimeter, feet V= Velocity, ft/sec Sf= Slope, ft/ft n= Manning's n Tc= Time of concentration, hours Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =	Unpaved surface: V = 16.1345 * (Sf**0.5) Paved Surface: V = 20.3282 * (Sf**0.5) (Lf / V) / 3600
Where:	V= Velocity, ft/sec Sf= Slope, ft/ft Tc= Time of concentration, hours Lf= Flow length, feet

==== SCS TR-55 Sheet Flow

Tc =	(0.007 * ((n * Lf)**0.8)) / ((P**0.5) * (Sf**0.4))
Where:	Tc= Time of concentration, hours n= Manning's n Lf= Flow length, feet P= 2yr, 24hr Rain depth, inches Sf= Slope, %

Post Developed Projected Rainfall

Subsection: Time of Concentration Calculations
Label: PROP IMP TO UGB
Scenario: Middlesex 100-yr Projected

Return Event: 100 years
Storm Event: Region D 100yr Projected

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.011
Slope	0.020 ft/ft
2 Year 24 Hour Depth	3.9 in
Average Velocity	1.52 ft/s
Segment Time of Concentration	0.018 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	193.00 ft
Is Paved?	True
Slope	0.020 ft/ft
Average Velocity	2.87 ft/s
Segment Time of Concentration	0.019 hours

Segment #3: TR-55 Channel Flow	
Flow Area	1.2 ft²
Hydraulic Length	54.00 ft
Manning's n	0.015
Slope	0.010 ft/ft
Wetted Perimeter	3.90 ft
Average Velocity	4.53 ft/s
Segment Time of Concentration	0.003 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.040 hours

Post Developed Projected Rainfall

Subsection: Time of Concentration Calculations
Label: PROP IMP TO UGB
Scenario: Middlesex 100-yr Projected

Return Event: 100 years
Storm Event: Region D 100yr Projected

==== SCS Channel Flow

Tc =	R = Qa / Wp
	V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n
	(Lf / V) / 3600
Where:	R= Hydraulic radius
	Aq= Flow area, square feet
	Wp= Wetted perimeter, feet
	V= Velocity, ft/sec
	Sf= Slope, ft/ft
	n= Manning's n
	Tc= Time of concentration, hours
	Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =	Unpaved surface:
	V = 16.1345 * (Sf**0.5)
	Paved Surface:
	V = 20.3282 * (Sf**0.5)
	(Lf / V) / 3600
Where:	V= Velocity, ft/sec
	Sf= Slope, ft/ft
	Tc= Time of concentration, hours
	Lf= Flow length, feet

==== SCS TR-55 Sheet Flow

Tc =	(0.007 * ((n * Lf)**0.8)) / ((P**0.5) * (Sf**0.4))
Where:	Tc= Time of concentration, hours
	n= Manning's n
	Lf= Flow length, feet
	P= 2yr, 24hr Rain depth, inches
	Sf= Slope, %

Post Developed Projected Rainfall

Subsection: Time of Concentration Calculations
Return Event: 100 years
Label: PROP PERV
Storm Event: Region D 100yr Projected
Scenario: Middlesex 100-yr Projected

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.150
Slope	0.200 ft/ft
2 Year 24 Hour Depth	3.9 in
Average Velocity	0.47 ft/s
Segment Time of Concentration	0.059 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	232.00 ft
Is Paved?	True
Slope	0.024 ft/ft
Average Velocity	3.15 ft/s
Segment Time of Concentration	0.020 hours

Segment #3: TR-55 Channel Flow	
Flow Area	3.1 ft^2
Hydraulic Length	48.00 ft
Manning's n	0.015
Slope	0.006 ft/ft
Wetted Perimeter	6.30 ft
Average Velocity	4.80 ft/s
Segment Time of Concentration	0.003 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.082 hours

Post Developed Projected Rainfall

Subsection: Time of Concentration Calculations
Label: PROP PERV
Scenario: Middlesex 100-yr Projected

Return Event: 100 years
Storm Event: Region D 100yr Projected

==== SCS Channel Flow

Tc =	R = Qa / Wp
	V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n
	(Lf / V) / 3600
Where:	R= Hydraulic radius
	Aq= Flow area, square feet
	Wp= Wetted perimeter, feet
	V= Velocity, ft/sec
	Sf= Slope, ft/ft
	n= Manning's n
	Tc= Time of concentration, hours
	Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =	Unpaved surface:
	V = 16.1345 * (Sf**0.5)
	Paved Surface:
	V = 20.3282 * (Sf**0.5)
	(Lf / V) / 3600
Where:	V= Velocity, ft/sec
	Sf= Slope, ft/ft
	Tc= Time of concentration, hours
	Lf= Flow length, feet

==== SCS TR-55 Sheet Flow

Tc =	(0.007 * ((n * Lf)**0.8)) / ((P**0.5) * (Sf**0.4))
Where:	Tc= Time of concentration, hours
	n= Manning's n
	Lf= Flow length, feet
	P= 2yr, 24hr Rain depth, inches
	Sf= Slope, %

Post Developed Projected Rainfall

Subsection: Time of Concentration Calculations
Label: PROP PERV TO UGB
Scenario: Middlesex 100-yr Projected

Return Event: 100 years
Storm Event: Region D 100yr Projected

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	26.00 ft
Manning's n	0.150
Slope	0.300 ft/ft
2 Year 24 Hour Depth	3.9 in
Average Velocity	0.42 ft/s
Segment Time of Concentration	0.017 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	18.00 ft
Is Paved?	True
Slope	0.010 ft/ft
Average Velocity	2.03 ft/s
Segment Time of Concentration	0.002 hours

Segment #3: TR-55 Channel Flow	
Flow Area	1.2 ft²
Hydraulic Length	132.00 ft
Manning's n	0.015
Slope	0.010 ft/ft
Wetted Perimeter	3.90 ft
Average Velocity	4.53 ft/s
Segment Time of Concentration	0.008 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.028 hours

Post Developed Projected Rainfall

Subsection: Time of Concentration Calculations
Label: PROP PERV TO UGB
Scenario: Middlesex 100-yr Projected

Return Event: 100 years
Storm Event: Region D 100yr Projected

==== SCS Channel Flow

Tc =	R = Qa / Wp
	V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n
	(Lf / V) / 3600
Where:	R= Hydraulic radius
	Aq= Flow area, square feet
	Wp= Wetted perimeter, feet
	V= Velocity, ft/sec
	Sf= Slope, ft/ft
	n= Manning's n
	Tc= Time of concentration, hours
	Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =	Unpaved surface:
	V = 16.1345 * (Sf**0.5)
	Paved Surface:
	V = 20.3282 * (Sf**0.5)
	(Lf / V) / 3600
Where:	V= Velocity, ft/sec
	Sf= Slope, ft/ft
	Tc= Time of concentration, hours
	Lf= Flow length, feet

==== SCS TR-55 Sheet Flow

Tc =	(0.007 * ((n * Lf)**0.8)) / ((P**0.5) * (Sf**0.4))
Where:	Tc= Time of concentration, hours
	n= Manning's n
	Lf= Flow length, feet
	P= 2yr, 24hr Rain depth, inches
	Sf= Slope, %

Post Developed Projected Rainfall

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

Return Event: 2 years
Storm Event: Region D 2yr Projected

Storm Event	Region D 2yr Projected
Return Event	2 years
Duration	24.000 hours
Depth	4.0 in
Time of Concentration (Composite)	0.031 hours
Area (User Defined)	5.970 acres

Computational Time Increment	0.004 hours
Time to Peak (Computed)	11.996 hours
Flow (Peak, Computed)	24.95 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	24.93 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	5.970 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.8 in
Runoff Volume (Pervious)	81,593.967 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	81,604.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.031 hours
Computational Time Increment	0.004 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 2 years
Label: PROP IMP
Storm Event: Region D 2yr Projected
Scenario: Middlesex 2-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	217.13 ft^3/s
Unit peak time, Tp	0.021 hours
Unit receding limb, Tr	0.083 hours
Total unit time, Tb	0.104 hours

Post Developed Projected Rainfall

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

Return Event: 10 years
Storm Event: Region D 10yr Projected

Storm Event	Region D 10yr Projected
Return Event	10 years
Duration	24.000 hours
Depth	6.2 in
Time of Concentration (Composite)	0.031 hours
Area (User Defined)	5.970 acres

Computational Time Increment	0.004 hours
Time to Peak (Computed)	11.996 hours
Flow (Peak, Computed)	38.84 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	38.81 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	5.970 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.0 in
Runoff Volume (Pervious)	129,195.443 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	129,208.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.031 hours
Computational Time Increment	0.004 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 10 years
Label: PROP IMP
Storm Event: Region D 10yr Projected
Scenario: Middlesex 10-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	217.13 ft^3/s
Unit peak time, Tp	0.021 hours
Unit receding limb, Tr	0.083 hours
Total unit time, Tb	0.104 hours

Post Developed Projected Rainfall

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

Return Event: 100 years
Storm Event: Region D 100yr Projected

Storm Event	Region D 100yr Projected
Return Event	100 years
Duration	24.000 hours
Depth	11.5 in
Time of Concentration (Composite)	0.031 hours
Area (User Defined)	5.970 acres

Computational Time Increment	0.004 hours
Time to Peak (Computed)	11.996 hours
Flow (Peak, Computed)	72.20 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	72.14 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	5.970 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	11.3 in
Runoff Volume (Pervious)	243,987.829 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	244,008.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.031 hours
Computational Time Increment	0.004 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 100 years
Label: PROP IMP
Storm Event: Region D 100yr Projected
Scenario: Middlesex 100-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	217.13 ft^3/s
Unit peak time, Tp	0.021 hours
Unit receding limb, Tr	0.083 hours
Total unit time, Tb	0.104 hours

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP IMP TO UGB
Scenario: Middlesex 2-yr Projected

Return Event: 2 years
Storm Event: Region D 2yr Projected

Storm Event	Region D 2yr Projected
Return Event	2 years
Duration	24.000 hours
Depth	4.0 in
Time of Concentration (Composite)	0.040 hours
Area (User Defined)	2.030 acres

Computational Time Increment	0.005 hours
Time to Peak (Computed)	11.996 hours
Flow (Peak, Computed)	8.46 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	8.45 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.030 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.8 in
Runoff Volume (Pervious)	27,744.685 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	27,744.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.040 hours
Computational Time Increment	0.005 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 2 years
Label: PROP IMP TO UGB
Storm Event: Region D 2yr Projected
Scenario: Middlesex 2-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	57.14 ft^3/s
Unit peak time, Tp	0.027 hours
Unit receding limb, Tr	0.107 hours
Total unit time, Tb	0.134 hours

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP IMP TO UGB
Scenario: Middlesex 10-yr Projected

Return Event: 10 years
Storm Event: Region D 10yr Projected

Storm Event	Region D 10yr Projected
Return Event	10 years
Duration	24.000 hours
Depth	6.2 in
Time of Concentration (Composite)	0.040 hours
Area (User Defined)	2.030 acres

Computational Time Increment	0.005 hours
Time to Peak (Computed)	11.996 hours
Flow (Peak, Computed)	13.17 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	13.16 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.030 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.0 in
Runoff Volume (Pervious)	43,930.780 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	43,930.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.040 hours
Computational Time Increment	0.005 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 10 years
Label: PROP IMP TO UGB
Storm Event: Region D 10yr Projected
Scenario: Middlesex 10-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	57.14 ft^3/s
Unit peak time, Tp	0.027 hours
Unit receding limb, Tr	0.107 hours
Total unit time, Tb	0.134 hours

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP IMP TO UGB
Scenario: Middlesex 100-yr Projected

Return Event: 100 years
Storm Event: Region D 100yr Projected

Storm Event	Region D 100yr Projected
Return Event	100 years
Duration	24.000 hours
Depth	11.5 in
Time of Concentration (Composite)	0.040 hours
Area (User Defined)	2.030 acres

Computational Time Increment	0.005 hours
Time to Peak (Computed)	11.996 hours
Flow (Peak, Computed)	24.48 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	24.46 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.030 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	11.3 in
Runoff Volume (Pervious)	82,964.036 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	82,962.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.040 hours
Computational Time Increment	0.005 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 100 years
Label: PROP IMP TO UGB
Storm Event: Region D 100yr Projected
Scenario: Middlesex 100-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	57.14 ft^3/s
Unit peak time, Tp	0.027 hours
Unit receding limb, Tr	0.107 hours
Total unit time, Tb	0.134 hours

Post Developed Projected Rainfall

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

Return Event: 2 years
Storm Event: Region D 2yr Projected

Storm Event	Region D 2yr Projected
Return Event	2 years
Duration	24.000 hours
Depth	4.0 in
Time of Concentration (Composite)	0.082 hours
Area (User Defined)	2.080 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.024 hours
Flow (Peak, Computed)	1.83 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	1.73 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	2.080 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.8 in
Runoff Volume (Pervious)	6,134.533 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	6,132.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.082 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 2 years
Label: PROP PERV
Storm Event: Region D 2yr Projected
Scenario: Middlesex 2-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	28.69 ft^3/s
Unit peak time, Tp	0.055 hours
Unit receding limb, Tr	0.219 hours
Total unit time, Tb	0.274 hours

Post Developed Projected Rainfall

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

Return Event: 10 years
Storm Event: Region D 10yr Projected

Storm Event	Region D 10yr Projected
Return Event	10 years
Duration	24.000 hours
Depth	6.2 in
Time of Concentration (Composite)	0.082 hours
Area (User Defined)	2.080 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.013 hours
Flow (Peak, Computed)	5.41 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	5.25 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	2.080 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.1 in
Runoff Volume (Pervious)	16,161.681 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	16,157.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.082 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 10 years
Label: PROP PERV
Storm Event: Region D 10yr Projected
Scenario: Middlesex 10-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	28.69 ft^3/s
Unit peak time, Tp	0.055 hours
Unit receding limb, Tr	0.219 hours
Total unit time, Tb	0.274 hours

Post Developed Projected Rainfall

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

Return Event: 100 years
Storm Event: Region D 100yr Projected

Storm Event	Region D 100yr Projected
Return Event	100 years
Duration	24.000 hours
Depth	11.5 in
Time of Concentration (Composite)	0.082 hours
Area (User Defined)	2.080 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.013 hours
Flow (Peak, Computed)	16.05 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	15.76 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	2.080 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.3 in
Runoff Volume (Pervious)	47,477.655 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	47,468.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.082 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 100 years
Label: PROP PERV
Storm Event: Region D 100yr Projected
Scenario: Middlesex 100-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	28.69 ft^3/s
Unit peak time, Tp	0.055 hours
Unit receding limb, Tr	0.219 hours
Total unit time, Tb	0.274 hours

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP PERV TO UGB
Scenario: Middlesex 2-yr Projected

Return Event: 2 years
Storm Event: Region D 2yr Projected

Storm Event	Region D 2yr Projected
Return Event	2 years
Duration	24.000 hours
Depth	4.0 in
Time of Concentration (Composite)	0.028 hours
Area (User Defined)	0.220 acres

Computational Time Increment	0.004 hours
Time to Peak (Computed)	12.002 hours
Flow (Peak, Computed)	0.23 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	0.23 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.220 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.8 in
Runoff Volume (Pervious)	648.845 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	652.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.028 hours
Computational Time Increment	0.004 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 2 years
Label: PROP PERV TO UGB
Storm Event: Region D 2yr Projected
Scenario: Middlesex 2-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	9.03 ft^3/s
Unit peak time, Tp	0.018 hours
Unit receding limb, Tr	0.074 hours
Total unit time, Tb	0.092 hours

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP PERV TO UGB
Scenario: Middlesex 10-yr Projected

Return Event: 10 years
Storm Event: Region D 10yr Projected

Storm Event	Region D 10yr Projected
Return Event	10 years
Duration	24.000 hours
Depth	6.2 in
Time of Concentration (Composite)	0.028 hours
Area (User Defined)	0.220 acres

Computational Time Increment	0.004 hours
Time to Peak (Computed)	12.002 hours
Flow (Peak, Computed)	0.64 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	0.64 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.220 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.1 in
Runoff Volume (Pervious)	1,709.407 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,714.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.028 hours
Computational Time Increment	0.004 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 10 years
Label: PROP PERV TO UGB
Storm Event: Region D 10yr Projected
Scenario: Middlesex 10-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	9.03 ft^3/s
Unit peak time, Tp	0.018 hours
Unit receding limb, Tr	0.074 hours
Total unit time, Tb	0.092 hours

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: PROP PERV TO UGB
Scenario: Middlesex 100-yr Projected

Return Event: 100 years
Storm Event: Region D 100yr Projected

Storm Event	Region D 100yr Projected
Return Event	100 years
Duration	24.000 hours
Depth	11.5 in
Time of Concentration (Composite)	0.028 hours
Area (User Defined)	0.220 acres

Computational Time Increment	0.004 hours
Time to Peak (Computed)	11.998 hours
Flow (Peak, Computed)	1.84 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	1.84 ft³/s

Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.220 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.3 in
Runoff Volume (Pervious)	5,021.674 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	5,029.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.028 hours
Computational Time Increment	0.004 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Post Developed Projected Rainfall

Subsection: Unit Hydrograph Summary
Return Event: 100 years
Label: PROP PERV TO UGB
Storm Event: Region D 100yr Projected
Scenario: Middlesex 100-yr Projected

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	9.03 ft^3/s
Unit peak time, Tp	0.018 hours
Unit receding limb, Tr	0.074 hours
Total unit time, Tb	0.092 hours

Appendix C

Basin Volume

Subsection: Elevation-Area Volume Curve
Return Event: 100 years
Label: UGB
Storm Event: 100yr Current NOAA D
Scenario: Middlesex 100-yr Current

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ft^3)	Volume (Total) (ft^3)
108.50	0.0	0.700	0.000	0.000	0.000
109.00	0.0	0.700	2.100	15,246.000	15,246.000
110.00	0.0	0.700	2.100	30,492.000	45,738.000
111.00	0.0	0.700	2.100	30,492.000	76,230.000
112.00	0.0	0.700	2.100	30,492.000	106,722.000
112.50	0.0	0.700	2.100	15,246.000	121,968.000

150' wide x 215' long Stormbrixx System 95% void area

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

Requested Pond Water Surface Elevations	
Minimum (Headwater)	108.50 ft
Increment (Headwater)	0.05 ft
Maximum (Headwater)	112.50 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	108.67	112.50
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	108.67 ft
Orifice Diameter	3.0 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

4' wide weir wall elevation 110.90

Basin Routings Current Rainfall

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PROP IMP	Middlesex 2-yr Current	2	68,636.000	12.000	21.12
PROP IMP	Middlesex 10-yr Current	10	107,562.000	12.000	32.48
PROP IMP	Middlesex 100-yr Current	100	187,682.000	12.000	55.75
PROP PERV	Middlesex 2-yr Current	2	3,989.000	12.000	0.94
PROP PERV	Middlesex 10-yr Current	10	11,253.000	12.000	3.48
PROP PERV	Middlesex 100-yr Current	100	31,288.000	12.000	10.26
EXIST IMP	Middlesex 2-yr Current	2	71,267.000	12.000	21.55
EXIST IMP	Middlesex 10-yr Current	10	111,687.000	12.000	33.15
EXIST IMP	Middlesex 100-yr Current	100	194,884.000	12.000	56.91
EXIST PERV	Middlesex 2-yr Current	2	7,857.000	12.050	1.65
EXIST PERV	Middlesex 10-yr Current	10	22,168.000	12.050	6.07
EXIST PERV	Middlesex 100-yr Current	100	61,641.000	12.050	17.81
PROP IMP TO UGB	Middlesex 2-yr Current	2	23,335.000	12.000	7.17
PROP IMP TO UGB	Middlesex 10-yr Current	10	36,570.000	12.000	11.02
PROP IMP TO UGB	Middlesex 100-yr Current	100	63,812.000	12.000	18.92
PROP PERV TO UGB	Middlesex 2-yr Current	2	424.000	12.000	0.13
PROP PERV TO UGB	Middlesex 10-yr Current	10	1,194.000	12.000	0.44
PROP PERV TO UGB	Middlesex 100-yr Current	100	3,316.000	12.000	1.23

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PROP-FLOW	Middlesex 2-yr Current	2	78,250.000	12.000	22.12
PROP-FLOW	Middlesex 10-yr Current	10	127,330.000	12.000	36.09

Basin Routings Current Rainfall

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PROP-FLOW	Middlesex 100-yr Current	100	232,161.000	12.000	66.22
EXIST FLOW	Middlesex 2-yr Current	2	79,124.000	12.000	22.76
EXIST FLOW	Middlesex 10-yr Current	10	133,856.000	12.000	38.26
EXIST FLOW	Middlesex 100-yr Current	100	256,525.000	12.000	72.65

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
UGB (IN)	Middlesex 2-yr Current	2	23,759.000	12.000	7.30	(N/A)	(N/A)
UGB (OUT)	Middlesex 2-yr Current	2	5,625.000	17.750	0.13	109.12	18,796.000
UGB (IN)	Middlesex 10-yr Current	10	37,764.000	12.000	11.46	(N/A)	(N/A)
UGB (OUT)	Middlesex 10-yr Current	10	8,516.000	18.250	0.20	109.48	30,033.000
UGB (IN)	Middlesex 100-yr Current	100	67,127.000	12.000	20.15	(N/A)	(N/A)
UGB (OUT)	Middlesex 100-yr Current	100	13,192.000	20.500	0.29	110.29	54,442.000

Basin Routings Current Rainfall

Subsection: Elevation-Volume-Flow Table (Pond)
Label: UGB
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	108.50 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 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
108.50	0.00	0.000	0.700	0.00	0.00	0.00
108.55	0.00	1,524.600	0.700	0.00	0.00	16.94
108.60	0.00	3,049.200	0.700	0.00	0.00	33.88
108.65	0.00	4,573.800	0.700	0.00	0.00	50.82
108.67	0.00	5,183.640	0.700	0.00	0.00	57.60
108.70	0.00	6,098.400	0.700	0.00	0.00	67.76
108.75	0.01	7,623.000	0.700	0.00	0.01	84.71
108.80	0.03	9,147.600	0.700	0.00	0.03	101.67
108.85	0.05	10,672.200	0.700	0.00	0.05	118.63
108.90	0.07	12,196.800	0.700	0.00	0.07	135.59
108.95	0.09	13,721.400	0.700	0.00	0.09	152.55
109.00	0.11	15,246.000	0.700	0.00	0.11	169.51
109.05	0.12	16,770.600	0.700	0.00	0.12	186.46
109.10	0.13	18,295.200	0.700	0.00	0.13	203.41
109.15	0.14	19,819.800	0.700	0.00	0.14	220.36
109.20	0.15	21,344.400	0.700	0.00	0.15	237.31
109.25	0.16	22,869.000	0.700	0.00	0.16	254.26
109.30	0.17	24,393.600	0.700	0.00	0.17	271.21
109.35	0.18	25,918.200	0.700	0.00	0.18	288.16
109.40	0.18	27,442.800	0.700	0.00	0.18	305.10
109.45	0.19	28,967.400	0.700	0.00	0.19	322.05
109.50	0.20	30,492.000	0.700	0.00	0.20	339.00
109.55	0.21	32,016.600	0.700	0.00	0.21	355.95
109.60	0.21	33,541.200	0.700	0.00	0.21	372.89
109.65	0.22	35,065.800	0.700	0.00	0.22	389.84
109.70	0.22	36,590.400	0.700	0.00	0.22	406.78
109.75	0.23	38,115.000	0.700	0.00	0.23	423.73
109.80	0.24	39,639.600	0.700	0.00	0.24	440.68
109.85	0.24	41,164.200	0.700	0.00	0.24	457.62

Basin Routings Current Rainfall

Subsection: Elevation-Volume-Flow Table (Pond) Return Event: 100 years

Label: UGB Storm Event: 100yr Current NOAA D

Scenario: Middlesex 100-yr Current

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
109.90	0.25	42,688.800	0.700	0.00	0.25	474.57
109.95	0.25	44,213.400	0.700	0.00	0.25	491.51
110.00	0.26	45,738.000	0.700	0.00	0.26	508.46
110.05	0.26	47,262.600	0.700	0.00	0.26	525.40
110.10	0.27	48,787.200	0.700	0.00	0.27	542.35
110.15	0.28	50,311.800	0.700	0.00	0.28	559.30
110.20	0.28	51,836.400	0.700	0.00	0.28	576.24
110.25	0.28	53,361.000	0.700	0.00	0.28	593.18
110.30	0.29	54,885.600	0.700	0.00	0.29	610.13
110.35	0.29	56,410.200	0.700	0.00	0.29	627.07
110.40	0.30	57,934.800	0.700	0.00	0.30	644.02
110.45	0.30	59,459.400	0.700	0.00	0.30	660.96
110.50	0.31	60,984.000	0.700	0.00	0.31	677.91
110.55	0.31	62,508.600	0.700	0.00	0.31	694.85
110.60	0.32	64,033.200	0.700	0.00	0.32	711.80
110.65	0.32	65,557.800	0.700	0.00	0.32	728.74
110.70	0.33	67,082.400	0.700	0.00	0.33	745.69
110.75	0.33	68,607.000	0.700	0.00	0.33	762.63
110.80	0.33	70,131.600	0.700	0.00	0.33	779.57
110.85	0.34	71,656.200	0.700	0.00	0.34	796.52
110.90	0.34	73,180.800	0.700	0.00	0.34	813.46
110.95	0.35	74,705.400	0.700	0.00	0.35	830.41
111.00	0.35	76,230.000	0.700	0.00	0.35	847.35
111.05	0.35	77,754.600	0.700	0.00	0.35	864.29
111.10	0.36	79,279.200	0.700	0.00	0.36	881.24
111.15	0.36	80,803.800	0.700	0.00	0.36	898.18
111.20	0.37	82,328.400	0.700	0.00	0.37	915.13
111.25	0.37	83,853.000	0.700	0.00	0.37	932.07
111.30	0.37	85,377.600	0.700	0.00	0.37	949.01
111.35	0.38	86,902.200	0.700	0.00	0.38	965.96
111.40	0.38	88,426.800	0.700	0.00	0.38	982.90
111.45	0.38	89,951.400	0.700	0.00	0.38	999.84
111.50	0.39	91,476.000	0.700	0.00	0.39	1,016.79
111.55	0.39	93,000.600	0.700	0.00	0.39	1,033.73
111.60	0.40	94,525.200	0.700	0.00	0.40	1,050.68
111.65	0.40	96,049.800	0.700	0.00	0.40	1,067.62
111.70	0.40	97,574.400	0.700	0.00	0.40	1,084.56
111.75	0.41	99,099.000	0.700	0.00	0.41	1,101.51
111.80	0.41	100,623.600	0.700	0.00	0.41	1,118.45
111.85	0.41	102,148.200	0.700	0.00	0.41	1,135.39
111.90	0.42	103,672.800	0.700	0.00	0.42	1,152.34
111.95	0.42	105,197.400	0.700	0.00	0.42	1,169.28
112.00	0.42	106,722.000	0.700	0.00	0.42	1,186.22

Basin Routings Current Rainfall

Subsection: Elevation-Volume-Flow Table (Pond) Return Event: 100 years

Label: UGB Storm Event: 100yr Current NOAA D

Scenario: Middlesex 100-yr Current

Elevation (ft)	Outflow (ft^3/s)	Storage (ft^3)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
112.05	0.43	108,246.600	0.700	0.00	0.43	1,203.17
112.10	0.43	109,771.200	0.700	0.00	0.43	1,220.11
112.15	0.43	111,295.800	0.700	0.00	0.43	1,237.05
112.20	0.44	112,820.400	0.700	0.00	0.44	1,254.00
112.25	0.44	114,345.000	0.700	0.00	0.44	1,270.94
112.30	0.44	115,869.600	0.700	0.00	0.44	1,287.88
112.35	0.45	117,394.200	0.700	0.00	0.45	1,304.83
112.40	0.45	118,918.800	0.700	0.00	0.45	1,321.77
112.45	0.45	120,443.400	0.700	0.00	0.45	1,338.71
112.50	0.45	121,968.000	0.700	0.00	0.45	1,355.65

Basin Routings Current Rainfall

Subsection: Level Pool Pond Routing Summary
Label: UGB (IN)
Scenario: Middlesex 2-yr Current

Return Event: 2 years
Storm Event: 2yr Current NOAA D

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	108.50 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 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	7.30 ft³/s	Time to Peak (Flow, In)	12.000 hours
Flow (Peak Outlet)	0.13 ft³/s	Time to Peak (Flow, Outlet)	17.750 hours

Elevation (Water Surface, Peak)	109.12 ft
Volume (Peak)	18,796.336 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	23,759.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	5,625.000 ft³
Volume (Retained)	18,111.000 ft³
Volume (Unrouted)	-23.000 ft³
Error (Mass Balance)	0.1 %

Basin Routings Current Rainfall

Subsection: Level Pool Pond Routing Summary
Label: UGB (IN)
Scenario: Middlesex 10-yr Current

Return Event: 10 years
Storm Event: 10yr Current NOAA D

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	108.50 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 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	11.46 ft³/s	Time to Peak (Flow, In)	12.000 hours
Flow (Peak Outlet)	0.20 ft³/s	Time to Peak (Flow, Outlet)	18.250 hours

Elevation (Water Surface, Peak)	109.48 ft
Volume (Peak)	30,033.173 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	37,764.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	8,516.000 ft³
Volume (Retained)	29,214.000 ft³
Volume (Unrouted)	-35.000 ft³
Error (Mass Balance)	0.1 %

Basin Routings Current Rainfall

Subsection: Level Pool Pond Routing Summary
Label: UGB (IN)
Scenario: Middlesex 100-yr Current

Return Event: 100 years
Storm Event: 100yr Current NOAA D

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	108.50 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 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	20.15 ft³/s	Time to Peak (Flow, In)	12.000 hours
Flow (Peak Outlet)	0.29 ft³/s	Time to Peak (Flow, Outlet)	20.500 hours

Elevation (Water Surface, Peak)	110.29 ft
Volume (Peak)	54,442.256 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	67,127.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	13,192.000 ft³
Volume (Retained)	53,884.000 ft³
Volume (Unrouted)	-52.000 ft³
Error (Mass Balance)	0.1 %

Basin Routings Projected Rainfall

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PROP IMP	Middlesex 2-yr Projected	2	81,604.000	12.000	24.93
PROP IMP	Middlesex 10-yr Projected	10	129,208.000	12.000	38.81
PROP IMP	Middlesex 100-yr Projected	100	244,008.000	12.000	72.14
PROP PERV	Middlesex 2-yr Projected	2	6,132.000	12.000	1.73
PROP PERV	Middlesex 10-yr Projected	10	16,157.000	12.000	5.25
PROP PERV	Middlesex 100-yr Projected	100	47,468.000	12.000	15.76
EXIST IMP	Middlesex 2-yr Projected	2	84,740.000	12.000	25.50
EXIST IMP	Middlesex 10-yr Projected	10	134,178.000	12.000	39.70
EXIST IMP	Middlesex 100-yr Projected	100	253,398.000	12.000	73.81
EXIST PERV	Middlesex 2-yr Projected	2	12,084.000	12.050	3.05
EXIST PERV	Middlesex 10-yr Projected	10	31,842.000	12.050	9.16
EXIST PERV	Middlesex 100-yr Projected	100	93,554.000	12.050	27.38
PROP IMP TO UGB	Middlesex 2-yr Projected	2	27,744.000	12.000	8.45
PROP IMP TO UGB	Middlesex 10-yr Projected	10	43,930.000	12.000	13.16
PROP IMP TO UGB	Middlesex 100-yr Projected	100	82,962.000	12.000	24.46
PROP PERV TO UGB	Middlesex 2-yr Projected	2	652.000	12.000	0.23
PROP PERV TO UGB	Middlesex 10-yr Projected	10	1,714.000	12.000	0.64
PROP PERV TO UGB	Middlesex 100-yr Projected	100	5,029.000	12.000	1.84

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PROP-FLOW	Middlesex 2-yr Projected	2	94,412.000	12.000	26.77
PROP-FLOW	Middlesex 10-yr Projected	10	155,257.000	12.000	44.22

Basin Routings Projected Rainfall

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PROP-FLOW	Middlesex 100-yr Projected	100	307,464.000	12.000	88.17
EXIST FLOW	Middlesex 2-yr Projected	2	96,824.000	12.000	27.97
EXIST FLOW	Middlesex 10-yr Projected	10	166,020.000	12.000	47.71
EXIST FLOW	Middlesex 100-yr Projected	100	346,951.000	12.000	98.72

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
UGB (IN)	Middlesex 2-yr Projected	2	28,396.000	12.000	8.68	(N/A)	(N/A)
UGB (OUT)	Middlesex 2-yr Projected	2	6,676.000	17.750	0.16	109.24	22,473.000
UGB (IN)	Middlesex 10-yr Projected	10	45,644.000	12.000	13.80	(N/A)	(N/A)
UGB (OUT)	Middlesex 10-yr Projected	10	9,892.000	18.650	0.22	109.70	36,481.000
UGB (IN)	Middlesex 100-yr Projected	100	87,991.000	12.000	26.30	(N/A)	(N/A)
UGB (OUT)	Middlesex 100-yr Projected	100	15,988.000	21.750	0.34	110.87	72,320.000

Basin Routings Projected Rainfall

Subsection: Elevation-Volume-Flow Table (Pond)
Label: UGB
Scenario: Middlesex 100-yr Projected

Return Event: 100 years
Storm Event: Region D 100yr Projected

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	108.50 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 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
108.50	0.00	0.000	0.700	0.00	0.00	0.00
108.55	0.00	1,524.600	0.700	0.00	0.00	16.94
108.60	0.00	3,049.200	0.700	0.00	0.00	33.88
108.65	0.00	4,573.800	0.700	0.00	0.00	50.82
108.67	0.00	5,183.640	0.700	0.00	0.00	57.60
108.70	0.00	6,098.400	0.700	0.00	0.00	67.76
108.75	0.01	7,623.000	0.700	0.00	0.01	84.71
108.80	0.03	9,147.600	0.700	0.00	0.03	101.67
108.85	0.05	10,672.200	0.700	0.00	0.05	118.63
108.90	0.07	12,196.800	0.700	0.00	0.07	135.59
108.95	0.09	13,721.400	0.700	0.00	0.09	152.55
109.00	0.11	15,246.000	0.700	0.00	0.11	169.51
109.05	0.12	16,770.600	0.700	0.00	0.12	186.46
109.10	0.13	18,295.200	0.700	0.00	0.13	203.41
109.15	0.14	19,819.800	0.700	0.00	0.14	220.36
109.20	0.15	21,344.400	0.700	0.00	0.15	237.31
109.25	0.16	22,869.000	0.700	0.00	0.16	254.26
109.30	0.17	24,393.600	0.700	0.00	0.17	271.21
109.35	0.18	25,918.200	0.700	0.00	0.18	288.16
109.40	0.18	27,442.800	0.700	0.00	0.18	305.10
109.45	0.19	28,967.400	0.700	0.00	0.19	322.05
109.50	0.20	30,492.000	0.700	0.00	0.20	339.00
109.55	0.21	32,016.600	0.700	0.00	0.21	355.95
109.60	0.21	33,541.200	0.700	0.00	0.21	372.89
109.65	0.22	35,065.800	0.700	0.00	0.22	389.84
109.70	0.22	36,590.400	0.700	0.00	0.22	406.78
109.75	0.23	38,115.000	0.700	0.00	0.23	423.73
109.80	0.24	39,639.600	0.700	0.00	0.24	440.68
109.85	0.24	41,164.200	0.700	0.00	0.24	457.62

Basin Routings Projected Rainfall

Subsection: Elevation-Volume-Flow Table (Pond) Return Event: 100 years
Label: UGB Storm Event: Region D 100yr Projected
Scenario: Middlesex 100-yr Projected

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
109.90	0.25	42,688.800	0.700	0.00	0.25	474.57
109.95	0.25	44,213.400	0.700	0.00	0.25	491.51
110.00	0.26	45,738.000	0.700	0.00	0.26	508.46
110.05	0.26	47,262.600	0.700	0.00	0.26	525.40
110.10	0.27	48,787.200	0.700	0.00	0.27	542.35
110.15	0.28	50,311.800	0.700	0.00	0.28	559.30
110.20	0.28	51,836.400	0.700	0.00	0.28	576.24
110.25	0.28	53,361.000	0.700	0.00	0.28	593.18
110.30	0.29	54,885.600	0.700	0.00	0.29	610.13
110.35	0.29	56,410.200	0.700	0.00	0.29	627.07
110.40	0.30	57,934.800	0.700	0.00	0.30	644.02
110.45	0.30	59,459.400	0.700	0.00	0.30	660.96
110.50	0.31	60,984.000	0.700	0.00	0.31	677.91
110.55	0.31	62,508.600	0.700	0.00	0.31	694.85
110.60	0.32	64,033.200	0.700	0.00	0.32	711.80
110.65	0.32	65,557.800	0.700	0.00	0.32	728.74
110.70	0.33	67,082.400	0.700	0.00	0.33	745.69
110.75	0.33	68,607.000	0.700	0.00	0.33	762.63
110.80	0.33	70,131.600	0.700	0.00	0.33	779.57
110.85	0.34	71,656.200	0.700	0.00	0.34	796.52
110.90	0.34	73,180.800	0.700	0.00	0.34	813.46
110.95	0.35	74,705.400	0.700	0.00	0.35	830.41
111.00	0.35	76,230.000	0.700	0.00	0.35	847.35
111.05	0.35	77,754.600	0.700	0.00	0.35	864.29
111.10	0.36	79,279.200	0.700	0.00	0.36	881.24
111.15	0.36	80,803.800	0.700	0.00	0.36	898.18
111.20	0.37	82,328.400	0.700	0.00	0.37	915.13
111.25	0.37	83,853.000	0.700	0.00	0.37	932.07
111.30	0.37	85,377.600	0.700	0.00	0.37	949.01
111.35	0.38	86,902.200	0.700	0.00	0.38	965.96
111.40	0.38	88,426.800	0.700	0.00	0.38	982.90
111.45	0.38	89,951.400	0.700	0.00	0.38	999.84
111.50	0.39	91,476.000	0.700	0.00	0.39	1,016.79
111.55	0.39	93,000.600	0.700	0.00	0.39	1,033.73
111.60	0.40	94,525.200	0.700	0.00	0.40	1,050.68
111.65	0.40	96,049.800	0.700	0.00	0.40	1,067.62
111.70	0.40	97,574.400	0.700	0.00	0.40	1,084.56
111.75	0.41	99,099.000	0.700	0.00	0.41	1,101.51
111.80	0.41	100,623.600	0.700	0.00	0.41	1,118.45
111.85	0.41	102,148.200	0.700	0.00	0.41	1,135.39
111.90	0.42	103,672.800	0.700	0.00	0.42	1,152.34
111.95	0.42	105,197.400	0.700	0.00	0.42	1,169.28
112.00	0.42	106,722.000	0.700	0.00	0.42	1,186.22

Basin Routings Projected Rainfall

Subsection: Elevation-Volume-Flow Table (Pond) Return Event: 100 years
Label: UGB Storm Event: Region D 100yr Projected
Scenario: Middlesex 100-yr Projected

Elevation (ft)	Outflow (ft^3/s)	Storage (ft^3)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
112.05	0.43	108,246.600	0.700	0.00	0.43	1,203.17
112.10	0.43	109,771.200	0.700	0.00	0.43	1,220.11
112.15	0.43	111,295.800	0.700	0.00	0.43	1,237.05
112.20	0.44	112,820.400	0.700	0.00	0.44	1,254.00
112.25	0.44	114,345.000	0.700	0.00	0.44	1,270.94
112.30	0.44	115,869.600	0.700	0.00	0.44	1,287.88
112.35	0.45	117,394.200	0.700	0.00	0.45	1,304.83
112.40	0.45	118,918.800	0.700	0.00	0.45	1,321.77
112.45	0.45	120,443.400	0.700	0.00	0.45	1,338.71
112.50	0.45	121,968.000	0.700	0.00	0.45	1,355.65

Basin Routings Projected Rainfall

Subsection: Level Pool Pond Routing Summary
Label: UGB (IN)
Scenario: Middlesex 2-yr Projected

Return Event: 2 years
Storm Event: Region D 2yr Projected

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	108.50 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 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	8.68 ft³/s	Time to Peak (Flow, In)	12.000 hours
Flow (Peak Outlet)	0.16 ft³/s	Time to Peak (Flow, Outlet)	17.750 hours

Elevation (Water Surface, Peak)	109.24 ft
Volume (Peak)	22,472.952 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	28,396.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	6,676.000 ft³
Volume (Retained)	21,692.000 ft³
Volume (Unrouted)	-27.000 ft³
Error (Mass Balance)	0.1 %

Basin Routings Projected Rainfall

Subsection: Level Pool Pond Routing Summary
Return Event: 10 years
Label: UGB (IN)
Storm Event: Region D 10yr Projected
Scenario: Middlesex 10-yr Projected

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	108.50 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 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	13.80 ft³/s	Time to Peak (Flow, In)	12.000 hours
Flow (Peak Outlet)	0.22 ft³/s	Time to Peak (Flow, Outlet)	18.650 hours

Elevation (Water Surface, Peak)	109.70 ft
Volume (Peak)	36,481.300 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	45,644.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	9,892.000 ft³
Volume (Retained)	35,712.000 ft³
Volume (Unrouted)	-40.000 ft³
Error (Mass Balance)	0.1 %

Basin Routings Projected Rainfall

Subsection: Level Pool Pond Routing Summary
Return Event: 100 years
Label: UGB (IN)
Storm Event: Region D 100yr Projected
Scenario: Middlesex 100-yr Projected

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	108.50 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 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	26.30 ft³/s	Time to Peak (Flow, In)	12.000 hours
Flow (Peak Outlet)	0.34 ft³/s	Time to Peak (Flow, Outlet)	21.750 hours

Elevation (Water Surface, Peak)	110.87 ft
Volume (Peak)	72,319.814 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	87,991.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	15,988.000 ft³
Volume (Retained)	71,942.000 ft³
Volume (Unrouted)	-61.000 ft³
Error (Mass Balance)	0.1 %

Appendix D

Table of Contents

WQ Hydrographs

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
parking sample size (Bld B)	WQ	1	950.000	1.050	0.77
parking sample size (Bld A)	WQ	1	494.000	1.050	0.40

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
Porous Asph Bed A (IN)	WQ	1	494.000	1.050	0.40	(N/A)	(N/A)
Porous Asph Bed A (OUT)	WQ	1	0.000	0.000	0.00	113.54	494.000
Porous Asph Bed B (IN)	WQ	1	950.000	1.050	0.77	(N/A)	(N/A)
Porous Asph Bed B (OUT)	WQ	1	0.000	0.000	0.00	113.36	950.000

WQ Hydrographs

Subsection: Unit Hydrograph Summary
Label: parking sample size (Bld B)
Scenario: WQ

Return Event: 1 years
Storm Event: wq

Storm Event	wq
Return Event	1 years
Duration	24.000 hours
Depth	1.3 in
Time of Concentration (Composite)	0.020 hours
Area (User Defined)	0.250 acres

Computational Time Increment	0.003 hours
Time to Peak (Computed)	1.083 hours
Flow (Peak, Computed)	0.77 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	1.050 hours
Flow (Peak Interpolated Output)	0.77 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.250 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	938.874 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	950.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.020 hours
Computational Time Increment	0.003 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

WQ Hydrographs

Subsection: Unit Hydrograph Summary
Label: parking sample size (Bld B)
Scenario: WQ

Return Event: 1 years
Storm Event: wq

SCS Unit Hydrograph Parameters	
Unit peak, qp	14.16 ft³/s
Unit peak time, Tp	0.013 hours
Unit receding limb, Tr	0.053 hours
Total unit time, Tb	0.067 hours

WQ Hydrographs

Subsection: Unit Hydrograph Summary
Label: parking sample size(Bld A)
Scenario: WQ

Return Event: 1 years
Storm Event: wq

Storm Event	wq
Return Event	1 years
Duration	24.000 hours
Depth	1.3 in
Time of Concentration (Composite)	0.020 hours
Area (User Defined)	0.130 acres

Computational Time Increment	0.003 hours
Time to Peak (Computed)	1.083 hours
Flow (Peak, Computed)	0.40 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	1.050 hours
Flow (Peak Interpolated Output)	0.40 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.130 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	488.214 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	494.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.020 hours
Computational Time Increment	0.003 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

WQ Hydrographs

Subsection: Unit Hydrograph Summary
Label: parking sample size(Bld A)
Scenario: WQ

Return Event: 1 years
Storm Event: wq

SCS Unit Hydrograph Parameters	
Unit peak, qp	7.36 ft³/s
Unit peak time, Tp	0.013 hours
Unit receding limb, Tr	0.053 hours
Total unit time, Tb	0.067 hours

Appendix E

New Jersey Groundwater Recharge Spreadsheet Version 2.0 November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

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

Project Name:	**PFV RESIDENTIAL**
Description:	
Analysis Date:	**07/18/24**

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	6.2	Impervious areas	Nixon	0.0	-
2	4.1	Open space	Nixon	13.7	203,674
3					
4					
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	10.3			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				5.4	203,674

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	8	Impervious areas	Nixon	0.0	-
2	2.3	Open space	Nixon	13.7	114,256
3					
4					
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	10.3			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				3.1	114,256

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft) 348,480
Post-Development Annual Recharge Deficit=	***89,418***	(cubic feet)

Recharge Efficiency Parameters Calculations (area averages)

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

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

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

Project Name	Description	Analysis Date	BMP or LID Type
PFV RESIDENTIAL	0	07/18/24	

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	29025.0	sq.ft
BMP Effective Depth, this is the design variable	dBMP	0.5	in
Upper level of the BMP surface (negative if above ground)	dBMPu	70.1	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	78.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	2	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	1.49	in
ERWC Modified to consider dEXC	EDRWC	0.00	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.00	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.04	in
Inches of Rainfall to capture	Pdesign	0.09	in
Recharge Provided Avg. over Imp. Area		3.1	in
Runoff Captured Avg. over imp. Area		3.1	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.08	unitless
BMP Volume	VBMP	1,132	cu.ft

CALCULATION CHECK MESSAGES

Volume Balance-> OK
dBMP Check---> OK
dEXC Check---> OK
BMP Location---> OK

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	89,418	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	348,480	sq.ft
Root Zone Water Capacity	RWC	5.24	in
RWC Modified to consider dEXC	DRWC	0.00	in
Climatic Factor	C-factor	1.43	no units
Average Annual P	Pavg	44.9	in
Recharge Requirement over Imp. Area	dr	3.1	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		89,418	cu.ft
Avg BMP Recharge Efficiency		100.0%	Represents % Infiltration Recharged
%Rainfall became Runoff		77.7%	%
%Runoff Infiltrated		8.8%	%
%Runoff Recharged		8.8%	%
%Rainfall Recharged		6.9%	%

OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

Appendix F

515 Grove Street
Suite 1B
Haddon Heights, NJ 08035
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F: 856-547-9174

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August 4, 2023

PRFOV23001

Mr. Navid Moshtaghi
M Capital Partner Inc.
9584 National Blvd #147
Los Angeles, California 90034

RE: Infiltration Testing Summary Report
Plainsboro Township
Princeton Forrestal Village – New Residential Buildings
206 Rockingham Row, Princeton, NJ 08540

Dear Mr. Moshtaghi:

Pennoni Associates, Inc. (Pennoni) is pleased to submit this report summarizing the infiltration tests performed as part of the proposed Princeton Forrestal Village – New Residential Buildings located in Princeton, New Jersey. The purpose of our services was to estimate the infiltration rates in the general areas of the proposed Stormwater Management (SWM) facilities. Our services were performed in general accordance with our proposal dated May 25, 2023, revised June 6, 2023.

To assist with the infiltration testing and preparation of this report, Pennoni reviewed the following:

- 4-page drawing set titled "Princeton Forrestal Village – Concept Yield Plan", prepared by Mimno Wasko Architects and Planners, dated 4/17/2023
- Subsurface Investigation Report, titled "Proposed Stormwater Facilities", prepared by Melick – Tully and Associates, P.C., dated 8/8/2014; and
- Geotechnical Investigation Report, titled "Proposed Residential Development", prepared by Melick-Tully and Associates, P.C., dated 8/11/2014.

BACKGROUND

It is our understanding that the project consists of developing three 4-story residential buildings (Buildings A, B, and C) with courtyards, associated automobile parking areas, and stormwater management basins. The project site is located in the western portion of Princeton Forrestal Village in Princeton, NJ. We understand the existing swim school building located in the south-central portion of the project site will be demolished to make way for the new Building C. Buildings A and B will be constructed in the areas of the existing parking lots just east of College Road West. The planning and design of this project are in the preliminary stages and structural details such as column loads, spacing, and finish floor elevations, etc. are not available.

The existing project area is bounded by College Road West to the north and west, Village Boulevard to the south, and an asphalt paved access roadway, Lionsgate Drive, with parking lots followed by Princeton Forrestal Village to the east. The project site generally slopes downward from west to east from an approximate Elev. 128.0 to Elev. 120.0, NAVD88.

FIELD WORK

On July 20 and 26, 2023 six test pits labeled TP-1 through TP-6 were advanced each to a depth of 12 feet below the existing grades. The test pits were performed generally within the proposed footprint of the stormwater basin described above. The approximate test pit locations were established in the field by Pennoni and are presented on the attached Testing Location Sketch, TL-1. The test pits were excavated to determine the soil horizon and if restricting layers such as groundwater table (GWT), seasonal high-water table (SHWT), and/or hardpan were present. Following the conclusion of the test pits and infiltration testing (summarized below), the test pits were backfilled with the excavated soil placed in lifts and tamped with the backhoe bucket.

Test pits were performed by Ambient Excavation using a rubber tire backhoe. Our M. Arkan, PE directed the field work, and N. Fisher observed the test pit excavations and performed the infiltration testing. The test pit logs are attached.

Site conditions on both July 20 and 26, 2023, at the time of the testing, were between 80°F and 90°F, sunny, and no rainfall greater than 0.5 inches was recorded in the 24 hours prior to testing.

SUBSURFACE STRATIGRAPHY

Subsurface stratigraphy encountered within the test pits generally consists of a surficial layer of topsoil underlain by fill or a clayey sand material. TP-6 observed a silty clay underlying the fill. For descriptive purposes the soil layers can be classified as follows:

Stratum	Approximate Thickness (ft)	Description	USCS Classification
T[1]	0.5 – 1.0	TOPSOIL	--
P[2]	0.5 – 1.5	ASPHALT or DENSE GRADED AGGREGATE	--
F[3]	9.0 – 11.5	FILL: Red (2.5YR – 6/6) to brown (5YR -5/8 to 7.5YR – 5/4 to 5/6) to tan (10YR – 6/8 to 2.5Y – 6/8 to 5/3 to 2.5YR – 6/8) F/M/C SAND, trace to and Silt/Clay, trace to little F/C Gravel, little Asphalt Fragments (Dry to moist) Or FILL: Tan (10YR – 6/8) CLAY and F/M SAND, trace Fine Gravel (Moist)	--
1[4]	1.0	Tan (10YR – 7/8) Silty CLAY (Dry)	CL
2[5]	2.0 – 11.5	Brown (2.5YR – 3/6 to 4/6 to 2.5/1 to 7.5YR – 7/8) F/M Sand, trace to and Clay/Silt, trace to some F/C Gravel (Dry to moist)	SM
3[6]	7.5 – 9.5	Brown to red (7.5YR – 5/6 to 10R – 3/6) F/M/C SAND, trace to and CLAY, trace to little F/C Gravel (Dry to moist)	SC
4[7]	9.0	Tan (7.5YR -5/8) F/M SAND, little to and Clay/Silt, trace F/C Gravel, little rock, Micaceous (Moist)	SC

Notes:
[1] Stratum T was not observed in TP-6.
[2] Stratum P was only observed in TP-6.
[3] Stratum F was only observed in TP-4 and TP-6 and was not fully penetrated.

[4] Stratum 1 was only observed in TP-6 and was not fully penetrated.
[5] Stratum 2 was not observed in TP-4 and TP-6 and was not fully penetrated.
[6] Stratum 3 was only observed in TP-2 and TP-3.
[7] Stratum 4 was only observed in TP-1 and was not fully penetrated.

Groundwater was not encountered in the test pits at depths 12 feet below the existing ground surface (Elev. 106.0 to 114.0, NAVD88). These observations are for the times indicated and may not be indicative of seasonal or daily variations in the groundwater levels. Seasonal variations on the order of several feet should be anticipated. Redoximorphic features indicating restrictive features such as the seasonal high-water table (SHWT) were observed within Test Pit 6 at approximate depths ranging from 11 to 12 feet (elevations 108.0 to 109.0, NAVD88) below the existing ground surface.

INFILTRATION TESTING RESULTS

Pennoni performed six in-situ single ring infiltration tests, labelled INF-1 through INF-6, within Test Pits TP-1 through TP-6, respectively. Testing was completed at approximate depths of 5 feet (Elev. 113.0 to 121.0, NAVD88) below the existing ground surface generally within the area of the proposed stormwater basin. Our infiltration testing program was performed using the Single Ring Infiltration test method in general accordance with the New Jersey Stormwater Best Management Practices Manual, Chapter 12.

A pre-soak procedure was performed and consisted of filling the test ring to the top with 3 inches of water and allowing the water to drain completely. If the elapsed time for the water level to drop 1 inch was greater than 60 minutes, timing was stopped. Following the presoak procedure, Observed Field Intake Rates were observed by filling the test ring to top with water and measuring the elapsed time with a stopwatch for the water to drop 1 inch. This process was repeated until at least three observed field intake rates were observed and the difference between the last two measurements were within five tenths of a second. This was considered a stabilized field intake rate. If the elapsed time to drop 1 inch of water was observed to be greater than 1 hour for two consecutive readings, the soil was deemed to have an observed field intake rate less than 1in/hr and the test was ended.

The estimated field infiltration rates were based on the final readings. The following table represents a summary of the field results for the single ring infiltration tests performed:

Infiltration Test/Test Pit No.	*Approximate Surface Elevation (ft, NAVD88)*	*Approximate SHWT Depth (ft)*	*Approximate Testing Depth (ft)*	*Soil Stratum Tested*	*Field Infiltration Rate (in/hr)*
INF-1 / TP-1	113.0	N/A	5.0	4	**0.25**
INF-2 / TP-2	121.0	N/A	5.0	3	**3.27**
INF-3 / TP-3	120.0	N/A	5.0	3	**5.29**
INF-4 / TP-4	115.0	N/A	5.0	F	**5.74**
INF-5 / TP-5	116.0	N/A	5.0	2	**1.02**
INF-6 / TP-6	115.0	11.0	5.0	F	**9.11**

Field infiltration rates were observed to range from approximately 5.74 to 9.11 inches per hour within Stratum F fill, 1.02 inches per hour in Stratum 2, 3.27 to 5.29 inches per hour in Stratum 3, and 0.25 inches per hour in stratum 4.

INF-1 infiltration testing was observed to have two consecutive readings where elapsed time to drop 1 inch of water to be greater than 1 hour and was ended early.

GROUND AND SURFACE WATER MANAGEMENT

The shallow subsurface soils are considered susceptible to instability resulting from moisture and repeated construction traffic. Therefore, precipitation and other water should not be permitted from accumulating on the exposed subgrade. Similarly, construction traffic should be minimized over the exposed subgrade.

The groundwater observations made in the test pits suggest that free standing water is not anticipated in shallow excavations for the revised stormwater basin with a proposed invert elevation of 5 feet below the existing ground surface, (Elev. 113.0 to 121.0, NAVD88). However, if wet conditions and/or seepage are encountered due to perched water, sumps and pumps should be adequate to maintain stable conditions during construction. During construction, surface runoff should be prevented from entering the basin excavations by creating soil berms or diversion swales along the perimeter if the excavations are expected to be open for a long period of time. Where ponding does occur, the water should be pumped immediately, and grades should then be established to prevent further ponding.

LIMITATIONS

This work has been performed in accordance with generally accepted professional practice in the field of geotechnical engineering. This warranty is in lieu of all other warranties either expressed or implied. Our conclusions and recommendations are based on the data revealed by this exploration. We are not responsible for any conclusions or opinions drawn from the data included herein, other than those specifically stated, nor are the recommendations presented in this report intended for direct use as construction specifications. This report is intended for use with regard to the specific project described herein; any changes in loads, structures, or locations should be brought to our attention so that we may determine how they may affect our conclusions. An attempt has been made to provide for normal contingencies, but the possibility remains that unexpected conditions may be present which we are not aware of. If additional or contradictory data are revealed in the future, we should be notified so that modifications to this report can be made, if necessary. If we do not review relevant construction documents and witness the relevant construction operations, then we cannot be responsible for any problems that may result from misinterpretation or misunderstanding of this report or failure to comply with our recommendations.

We trust that the information presented in this report is what you require at this time and we thank you for the opportunity to assist you with this project. If you have any questions, or if you need any further assistance with this project, please contact this office at your earliest convenience.

Sincerely,

PENNONI ASSOCIATES INC.

Nicholas P. Fisher
Graduate Geotechnical Engineer

Murat Arkan, PE
Senior Geotechnical Engineer

Enclosures: *Site Location Sketch (SL-1)*
Testing Location Sketch (TL-1)
Test Pit Logs (TP-1 through TP-6)

Site Location Sketch

Site Location Sketch adapted from Google Earth image dated June, 2022

Pennoni Associates, Inc.
515 Grove Street, Suite B
Haddon Heights, New Jersey 08035

DRAWN BY:	SCALE:	DATE:
NPF	AS SHOWN	8/4/2023
CHECKED BY:	FIGURE No.	
MA	SL-1	
PROJECT No:		
PRFOV23001		

Princeton Forrestal Village - New Residential Buildings

Testing Location Sketch

Testing Location Sketch adapted from Google Earth image dated June, 2022

Pennoni Associates, Inc.
515 Grove Street, Suite B
Haddon Heights, New Jersey 08035

DRAWN BY:	SCALE:	DATE:
NPF	NTS	8/4/23
CHECKED BY:	FIGURE No.	
MA	TL-1	
PROJECT No:		
PRFOV23001		

Princeton Forrestal Village - New Residential Buildings

TEST PIT LOG

Test Pit TP-1

NORTHING 555152.806

EASTING 460413.273

CLIENT M. Capital Partners

PROJECT NAME Princeton Forrestal Village - New Residential Buildings

PROJECT NUMBER PRFOV23001

PROJECT LOCATION 206 Rockingham Row, Princeton Village

DATE STARTED 7/26/23 **COMPLETED** 7/26/23

GROUND ELEVATION 118.0' NAVD88 +/-

EXCAVATION CONTRACTOR Ambient Group, LLC

WATER ENCOUNTERED:

EXCAVATION METHOD CASE 580 Rubber Tire Backhoe

DURING EXCAVATION Not Encountered

OPERATOR / HELPER Mike

AT END OF EXCAVATION Not Encountered

LOGGED BY N. Fisher **CHECKED BY** M. Arkan

AFTER EXCAVATION Not Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0				Depth / Elev.	
			T	TOPSOIL 1.0 / 117.0	
			2	Light brown (7.5YR - 7/8) F/M SAND, little to some Silt, little F/C gravel 3.0 / 115.0	Moist
5			4	Tan (7.5YR - 5/8) F/M SAND and CLAY	Moist
				9.0 Tan (7.5YR - 5/8) F/M SAND, little Clay, trace F/C Gravel, Micaceous	
10				11.0 Tan (7.5YR - 5/8) F/M SAND, some Silt, little black Rock, Micaceous 12.0 / 106.0	
				Test Pit terminated at 12.0 feet.	

NOTES:

Infiltration test INF-1 offset approximately 5 feet from test pit. Single ring installed 5 feet below the ground surface (elevation 113 ft, NAVD88).

TEST PIT LOG

Test Pit TP-2

NORTHING 555243.808

EASTING 460465.253

CLIENT M. Capital Partners

PROJECT NAME Princeton Forrestal Village - New Residential Buildings

PROJECT NUMBER PRFOV23001

PROJECT LOCATION 206 Rockingham Row, Princeton Village

DATE STARTED 7/26/23 **COMPLETED** 7/26/23

GROUND ELEVATION 126.0' NAVD88 +/-

EXCAVATION CONTRACTOR Ambient Group, LLC

WATER ENCOUNTERED:

EXCAVATION METHOD CASE 580 Rubber Tire Backhoe

DURING EXCAVATION Not Encountered

OPERATOR / HELPER Mike

AT END OF EXCAVATION Not Encountered

LOGGED BY N. Fisher **CHECKED BY** M. Arkan

AFTER EXCAVATION Not Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	Depth	DESCRIPTION	Elev.	REMARKS
0			T	0.5	TOPSOIL	125.5	
					Brown to red (7.5YR - 5/6) F/M SAND, trace to some Clay, little F/C Gravel		Moist
				4.0			
5			3		Brown to red (7.5YR - 5/6) F/M SAND, some to and CLAY, trace F/C Gravel		Moist
10				10.0		116.0	
			2		Black to brown (5YR - 5/6 to 2.5YR - 2.5/1) F/M SAND, trace silt		
				12.0		114.0	
					Test Pit terminated at 12.0 feet.		

NOTES:

Infiltration test INF-2 offset approximately 5 feet from test pit. Single ring installed 5 feet below the ground surface (elevation 121 ft, NAVD88).

TEST PIT LOG

Test Pit TP-3

NORTHING 555312.702

EASTING 460397.223

CLIENT M. Capital Partners

PROJECT NAME Princeton Forrestal Village - New Residential Buildings

PROJECT NUMBER PRFOV23001

PROJECT LOCATION 206 Rockingham Row, Princeton Village

DATE STARTED 7/20/23 **COMPLETED** 7/20/23

GROUND ELEVATION 125.0' NAVD88 +/-

EXCAVATION CONTRACTOR Ambient Group, LLC

WATER ENCOUNTERED:

EXCAVATION METHOD CASE 580 Rubber Tire Backhoe

DURING EXCAVATION Not Encountered

OPERATOR / HELPER Mike

AT END OF EXCAVATION Not Encountered

LOGGED BY N. Fisher **CHECKED BY** M. Arkan

AFTER EXCAVATION Not Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	Depth	DESCRIPTION	Elev.	REMARKS
0			T	0.5	TOPSOIL	124.5	Dry
					Brown to red (10R - 3/6) F/M/C SAND, some Clay		
			3	4.0	Brown to red (10R - 3/6) F/M SAND, some Clay		
5				8.0		117.0	Moist
					Brown (2.5YR - 3/6) F/M SAND, little Silt, little F/C Gravel		
10			2				
				12.0		113.0	

Test Pit terminated at 12.0 feet.

NOTES:

Infiltration test INF-3 offset approximately 5 feet from test pit. Single ring installed 5 feet below the ground surface (elevation 120 ft, NAVD88).

TEST PIT LOG

Test Pit TP-4

NORTHING 555092.339

EASTING 460223.545

CLIENT M. Capital Partners

PROJECT NAME Princeton Forrestal Village - New Residential Buildings

PROJECT NUMBER PRFOV23001

PROJECT LOCATION 206 Rockingham Row, Princeton Village

DATE STARTED 7/20/23 **COMPLETED** 7/20/23

GROUND ELEVATION 120.0' NAVD88 +/-

EXCAVATION CONTRACTOR Ambient Group, LLC

WATER ENCOUNTERED:

EXCAVATION METHOD CASE 580 Rubber Tire Backhoe

DURING EXCAVATION Not Encountered

OPERATOR / HELPER Mike

AT END OF EXCAVATION Not Encountered

LOGGED BY N. Fisher **CHECKED BY** M. Arkan

AFTER EXCAVATION Not Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	Depth	DESCRIPTION	Elev.	REMARKS
0			T	0.5	TOPSOIL	119.5	Dry
					FILL: Brown (7.5YR - 5/4) F/M SAND, some Clay, trace F/C Gravel		
				3.0	FILL: Brown (7.5YR - 5/6) F/M/C SAND, trace Silt		Fabric mesh
5				5.0	FILL: Tan (10 YR - 6/8) F/M/C SAND, some to and Silty Clay		
			F	7.0	FILL: Tan (10YR - 6/8) CLAY and F/M SAND, trace fine Gravel		
				8.0	FILL: Light tan (2.5Y - 6/8) F/M SAND and Silty CLAY		Moist
10				10.0	FILL: Light tan (2.5YR - 6/8) F/M SAND, some Clay, little Asphalt Fragments		
				11.0	FILL: Brown (2.5Y - 5/3) SILT, some F/M Sand		
				12.0		108.0	

Test Pit terminated at 12.0 feet.

NOTES:

Infiltration test INF-4 offset approximately 5 feet from test pit. Single ring installed 5 feet below the ground surface (elevation 115 ft, NAVD88).

TEST PIT LOG

Test Pit TP-5

NORTHING 554274.106

EASTING 459939.162

CLIENT M. Capital Partners

PROJECT NAME Princeton Forrestal Village - New Residential Buildings

PROJECT NUMBER PRFOV23001

PROJECT LOCATION 206 Rockingham Row, Princeton Village

DATE STARTED 7/20/23 **COMPLETED** 7/20/23

GROUND ELEVATION 121.0' NAVD88 +/-

EXCAVATION CONTRACTOR Ambient Group, LLC

WATER ENCOUNTERED:

EXCAVATION METHOD CASE 580 Rubber Tire Backhoe

DURING EXCAVATION Not Encountered

OPERATOR / HELPER Mike

AT END OF EXCAVATION Not Encountered

LOGGED BY N. Fisher **CHECKED BY** M. Arkan

AFTER EXCAVATION Not Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0				Depth / Elev.	
			T	0.5 TOPSOIL 120.5	Dry
				Brown (2.5YR - 4/6) F/M SAND, some F/C Gravel, little Clay	
				4.0 Brown (2.5YR - 4/6) F/M SAND, little to and Clay, trace to little F/C Gravel	
5			2		
10					Moist
				12.0 109.0	
				Test Pit terminated at 12.0 feet.	

NOTES:

Infiltration test INF-5 offset approximately 5 feet from test pit. Single ring installed 5 feet below the ground surface (elevation 116 ft, NAVD88).

TEST PIT LOG

Test Pit TP-6

NORTHING 554132.362

EASTING 460002.454

CLIENT M. Capital Partners

PROJECT NAME Princeton Forrestal Village - New Residential Buildings

PROJECT NUMBER PRFOV23001

PROJECT LOCATION 206 Rockingham Row, Princeton Village

DATE STARTED 7/20/23 **COMPLETED** 7/20/23

GROUND ELEVATION 120.0' NAVD88 +/-

EXCAVATION CONTRACTOR Ambient Group, LLC

WATER ENCOUNTERED:

EXCAVATION METHOD CASE 580 Rubber Tire Backhoe

DURING EXCAVATION Not Encountered

OPERATOR / HELPER Mike

AT END OF EXCAVATION Not Encountered

LOGGED BY N. Fisher **CHECKED BY** M. Arkan

AFTER EXCAVATION Not Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION		REMARKS
0				Depth	Elev.	
			P	0.5 ASPHALT DENSE GRADED AGGREGATE		
				2.0	118.0	Dry, fabric mesh
			F	FILL: Red to brown (2.5 YR - 6/6) F/M/C SAND, some Silt, little F/C gravel		
5						
				8.0 FILL: Orange to brown (5 YR - 5/8) F/M SAND, little Silt. little F/C gravel		
10						
				11.0	109.0	Mottling
			1	Tan (10 YR - 7/8) Silty CLAY		
				12.0	108.0	
				Test Pit terminated at 12.0 feet.		

NOTES:

Infiltration test INF-6 offset approximately 5 feet from test pit. Single ring installed 5 feet below the ground surface (elevation 115 ft, NAVD88).

Important Information about This

Geotechnical-Engineering Report

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

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

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

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

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

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

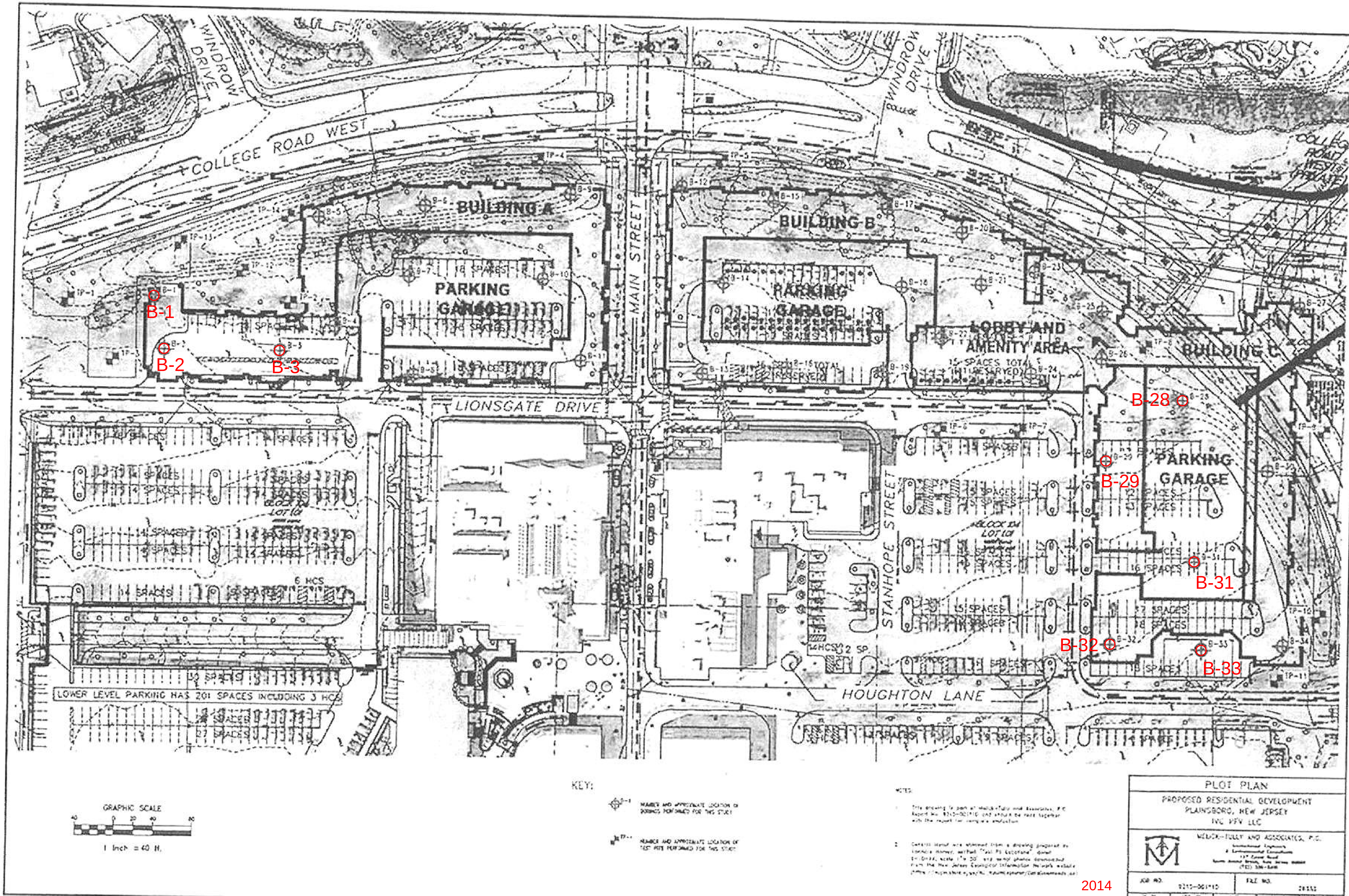
Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org



WINDROW DRIVE
COLLEGE ROAD WEST
MAIN STREET
BUILDING A
PARKING GARAGE
BUILDING B
PARKING GARAGE
LOBBY AND AMENITY AREA
BUILDING C
PARKING GARAGE
LIONSGATE DRIVE
STANHOPE STREET
HOUGHTON LANE
LOWER LEVEL PARKING HAS 201 SPACES INCLUDING 3 HCS
B-1
B-2
B-3
B-28
B-29
B-31
B-32
B-33
KEY:
GRAPHIC SCALE
1 inch = 40 ft.
PLOT PLAN
PROPOSED RESIDENTIAL DEVELOPMENT
PLAINSBORO, NEW JERSEY
IVC PFV LLC
2014

LOG OF BORING

BORING NO. 1

COMPLETION DATE: 7/01/14 | SURFACE ELEVATION: +120 ft (±) | WATER LEVEL: *

JOB NUMBER: 9215-001*1D | READING DATE: 7/01/14

DEPTH (ft.)	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH (ft.)
					TOPSOIL/FILL	
	S1	60			FILL - Yellowish brown fine to medium sand, some clayey silt, some fine to coarse gravel	
	S2	31				
					Dark brown sandy silt (possible original topsoil)	
5	S3	13		SM	Yellowish brown fine to medium sand, little to some clayey silt, little fine to coarse gravel (moist)(medium dense)	5
	S4	16				
	S5	26		SM	Reddish brown fine to medium sand, some clayey silt, little fine to coarse gravel (moist)(medium dense)	
10						10
				SM	Yellowish brown fine sand, some silt (decomposed/weathered sandstone)	
	S6	51			- auger refusal @ 14.5'	
15						15
					Boring completed @ 14.5'	
					*Groundwater not encountered	
20						20
25						25

NOTES FOR COLUMNS:
1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:
TRACE 0 - 10%
LITTLE 10 - 20%
SOME 20 - 35%
AND OVER 35%

Typist/Date: res/mh 7/14

Sheet: 1 of 1 PLATE: 3-1

MELICK-TULLY AND ASSOCIATES, P.C.
Geotechnical Engineers and Environmental Consultants

LOG OF BORING

BORING NO. 2

COMPLETION DATE: 7/01/14
JOB NUMBER: 9215-001*1D

SURFACE ELEVATION: +118 ft (±)

WATER LEVEL: *
READING DATE: 7/01/14

DEPTH (ft.)	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH (ft.)
					3" Asphalt over stone subbase	
	S1	7			POSSIBLE FILL - Dark yellowish brown fine to medium sand, and clayey silt, little fine to coarse gravel (moist)(medium dense)	
	S2	18				
5	S3	12			- geotextile fabric noted in auger cuttings	5
	S4	15		SM	Reddish brown fine to coarse sand, some clayey silt, little fine to coarse gravel (moist)(medium dense)	
	S5	21		SM	Yellowish brown fine to coarse sand, some clayey silt, some fine to coarse gravel (decomposed rock) (moist)(medium dense)	
10						10
					Yellow-brown decomposed/weathered sandstone	
	S6	50/3"			- grading harder	
15	S7	50/2"			- auger refusal @ 15'	15
					Boring completed @ 15.2'	
					*Groundwater not encountered	
20					Note: Geotextile fabric was noted in auger cutting, depth of fabric unknown	20
25						25

NOTES FOR COLUMNS:
1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:
TRACE 0 - 10%
LITTLE 10 - 20%
SOME 20 - 35%
AND OVER 35%

Typist/Date: res/mh 7/14

Sheet: 1 of 1 PLATE: 3-2

MELICK-TULLY AND ASSOCIATES, P.C.
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LOG OF BORING

BORING NO. 3

COMPLETION DATE: 6/30/14 | SURFACE ELEVATION: +119 ft (±) | WATER LEVEL: *

JOB NUMBER. 9215-001*1D | READING DATE: 6/30/14

DEPTH (ft.)	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH (ft.)
					4" Asphalt over stone subbase	
	S1	20		SM	Reddish brown fine to medium sand, some clayey silt, trace fine to coarse gravel (medium dense)	
	S2	20				
5	S3	12				5
	S4	18			- no recovery	
10	S5	24			- no recovery	10
	S6	20		ML	Reddish brown clayey silt, little fine sand (moist)(stiff)	
15	S7	21		GM	Red-brown shaley clayey silt, with rock fragments (moist)(very stiff) (decomposed/weathered shale)	15
	S8	51				
20					Boring completed @ 20'	20
					*Groundwater not encountered	
25						25

NOTES FOR COLUMNS:
1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:
TRACE 0 - 10%
LITTLE 10 - 20%
SOME 20 - 35%
AND OVER 35%

Typist/Date: res/mh 7/14

Sheet: 1 of 1 PLATE: 3-3

MELICK-TULLY AND ASSOCIATES, P.C.
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LOG OF BORING

BORING NO. 28

COMPLETION DATE: 6/27/14
JOB NUMBER: 9215-001*1D

SURFACE ELEVATION: +123.5 ft (±)

WATER LEVEL: 13'
READING DATE: 6/27/14

DEPTH (ft.)	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH (ft.)
	S1	13			FILL/TOPSOIL - Brown slightly organic silt, and fine to medium sand, trace fine gravel (moist)(medium dense)	
	S2	23				
5	S3	18				5
				SM	Red-brown fine to medium sand, some clayey silt, trace fine gravel (moist)(mediium dense)	
	S4	39				
	S5	16		SM	Dark yellow-brown fine to medium sand, little silt (moist)(dense) - grading to fine to medium sand, some clayey silt, trace fine gravel (moist)(medium dense)	
10						10
					Yellow-brown clayey silt, little fine sand (wet)(stiff)	
	S6	10				
15				ML		15
					- grading olive in color	
	S7	10				
20						20
					Boring completed @ 20' Wet @ 13'	
25						25

NOTES FOR COLUMNS:
1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:
TRACE 0 - 10%
LITTLE 10 - 20%
SOME 20 - 35%
AND OVER 35%

Typist/Date: res/mh 7/14

Sheet: 1 of 1 PLATE: 3-28

MELICK-TULLY AND ASSOCIATES, P.C.
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LOG OF BORING

BORING NO. 29

COMPLETION DATE: 6/30/14
JOB NUMBER: 9215-001*1D

SURFACE ELEVATION: +120.5 ft (±)

WATER LEVEL: 13'
READING DATE: 6/30/14

DEPTH (ft.)	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH (ft.)
					4" Asphalt over stone subbase	
	S1	20			FILL - Dark yellow-brown fine to coarse sand, some clayey silt	
	S2	16			Red-brown clayey silt, little fine to medium sand, trace fine gravel (moist)(stiff)	
5						5
					- grading to brown to light olive brown mottled clayey silt, and fine to medium sand (moist)(meidum dense)	
	S3	14		ML		
10						10
					- grading to dark yellow-brown and light brown mottled silt, little fine sand (very moist to wet)(stiff)	
	S4	11				
15						15
	S5	50/5"			Light brown weathered sandstone (weathered sandstone) - sampler refusal	
20						20
					Boring completed @ 18.9' Wet @ 13'	
25						25

NOTES FOR COLUMNS:
1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:
TRACE 0 - 10%
LITTLE 10 - 20%
SOME 20 - 35%
AND OVER 35%

Typist/Date: res/mh 7/14

Sheet: 1 of 1 PLATE: 3-29

MELICK-TULLY AND ASSOCIATES, P.C.
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LOG OF BORING

BORING NO. 30

COMPLETION DATE: 6/30/14
JOB NUMBER: 9215-001*1D

SURFACE ELEVATION: +122.5 ft (±)

WATER LEVEL: *
READING DATE: 6/30/14

DEPTH (ft.)	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH (ft.)
	S1	18			TOPSOIL/FILL - Brown silt, little fine to coarse sand (moist)(loose)	
	S2	16	15.4		PROBABLE FILL - Brown fine to medium sand, and clayey silt, little fine gravel (moist)	
5	S3	15				5
				SM	Reddish brown fine to medium sand, little to some clayey silt (moist)(medium dense)	
	S4	14	14.3			
10						10
	S5	29				
15	S6	23		ML	Yellow-brown clayey silt, trace fine sand (moist)(very stiff)	15
	S7	39		ML	Olive clayey silt, little fine to medium sand (moist)(hard)(decomposed shale)	
20						20
					Boring completed @ 18.9'	
					*Groundwater not encountered	
25						25

NOTES FOR COLUMNS.
1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:
TRACE 0 - 10%
LITTLE 10 - 20%
SOME 20 - 35%
AND OVER 35%

Typist/Date: res/mh 7/14

Sheet: 1 of 1 PLATE: 3-30

MELICK-TULLY AND ASSOCIATES, P.C.
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LOG OF BORING

BORING NO. 31

COMPLETION DATE: 6/27/14 | SURFACE ELEVATION: +118 ft (±) | WATER LEVEL: 13'

JOB NUMBER: 9215-001*1D | READING DATE: 6/27/14

DEPTH (ft.)	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH (ft.)
					5" Asphalt over stone subbase	
	S1	12			Reddish brown fine to medium sand, some clayey silt, little fine gravel (moist)(medium dense)(possible disturbed soils)	
	S2	22		SM	- auger refusal @ 4' (moved 8' east)	
5						5
					Yellow-brown clayey silt, little fine to medium sand (very moist)(medium)	
	S3	6				
10						10
				ML	- (wet)(stiff)	
	S4	11				
15						15
	S5	100/11"			Olive silt, little fine to medium sand, trace rock fragments (decomposed shale)	
20						20
					Boring completed @ 19.4'	
					*Wet @ 13', caved @ 15'	
25						25

NOTES FOR COLUMNS:
1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:
TRACE 0 - 10%
LITTLE 10 - 20%
SOME 20 - 35%
AND OVER 35%

Typist/Date: res/mh 7/14

Sheet: 1 of 1 PLATE: 3-31

MELICK-TULLY AND ASSOCIATES, P.C.
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LOG OF BORING

BORING NO. 32

COMPLETION DATE: 6/27/14
JOB NUMBER: 9215-001*1D

SURFACE ELEVATION: +117 ft (±)

WATER LEVEL: *
READING DATE: 6/27/14

DEPTH (ft.)	SAMPLES	N-VALUE	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION	DEPTH (ft.)
					5" Asphalt	
	S1	22		SM	FILL - Brown clayey silt, some fine to medium sand, trace gravel	
					Red-brown fine to medium sand, little to some clayey silt, trace fine gravel (moist)(medium dense)	
	S2	14	34.4		Brown clayey silt, little fine to medium sand, trace fine gravel (very moist)(stiff)	
5				ML		5
					- grading olive in color (very moist)	
	S3	8			Yellow to olive silt, little fine to medium sand, some shale fragments (moist)(stiff)	
10						10
					- grading to yellow-brown silt, little fine sand (moist)(very stiff)	
	S4	20		ML		
15						15
					- grading to yellow-olive mottled silt, little fine sand, with some shale fragments (moist)(stiff @ 18')	
	S5	14				
20						20
					Boring completed @ 20'	
					*Groundwater not encountered	
25						25

NOTES FOR COLUMNS:
1. SAMPLE AT AVERAGE SAMPLING DEPTH
2. INDICATES THE NUMBER OF BLOWS TO ADVANCE A 2" OD SAMPLER A DISTANCE OF 12 INCHES USING A 140 POUND WEIGHT FALLING 30 INCHES

SOIL DESCRIPTION MODIFIERS:
TRACE 0 - 10%
LITTLE 10 - 20%
SOME 20 - 35%
AND OVER 35%

Typist/Date: res/mh 7/14

Sheet: 1 of 1 PLATE: 3-32

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Appendix G

NJDEP Nonstructural Strategies Points System (NSPS)

Version: January 31, 2006

Note: Input Values in Yellow Cells Only

Project:	PFV RESIDENTIAL
Date:	7/14/2014 rev. 7/18/2024
User:	CEY
Notes:	

Step 1 - Provide Basic Major Development Site Information

A. Specify Total Area in Acres of Development Site Described in Steps 2 and 3 = 66.9 **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		29.8			29.8	147
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		37.1			37.1	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	66.9	0.0	0.0	**Total Area:**	66.9
	HSG Subtotals (%):	0.0%	100.0%	0.0%	0.0%	**Total % Area:**	100.0%

Points Subtotal: **147**

Total Existing Site Points: **147**

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		24.4			24.4		121
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		1.4			1.4		7
13	Directly Connected Impervious		38.4			38.4		0
14	Unconnected Impervious with Small D/S Pervious					0.0		0
15	Unconnected Impervious with Large D/S Pervious		2.7			2.7		11
	HSG Subtotals (Acres):	0.0	66.9	0.0	0.0		**Total Area:**	66.9
	HSG Subtotals (%):	0.0%	100.0%	0.0%	0.0%		**Total % Area:**	100.0%
							Points Subtotal:	**138**

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

Total Directly Connected Impervious Coverage =	57%	% of Site
Total Unconnected Impervious Coverage with Small D/S Pervious =	0%	% of Site
Total Unconnected Impervious Coverage with Large D/S Pervious =	4%	% of Site
Total Site Impervious Coverage =	61%	% of Site
Effective Site Impervious Coverage =	59%	% 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:	Yes	(Yes or No)
Percent of Proposed Lawn Areas to be Graded with Such Equipment:	9%	% of Lawn Areas

Points Subtotal: 3

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: 141

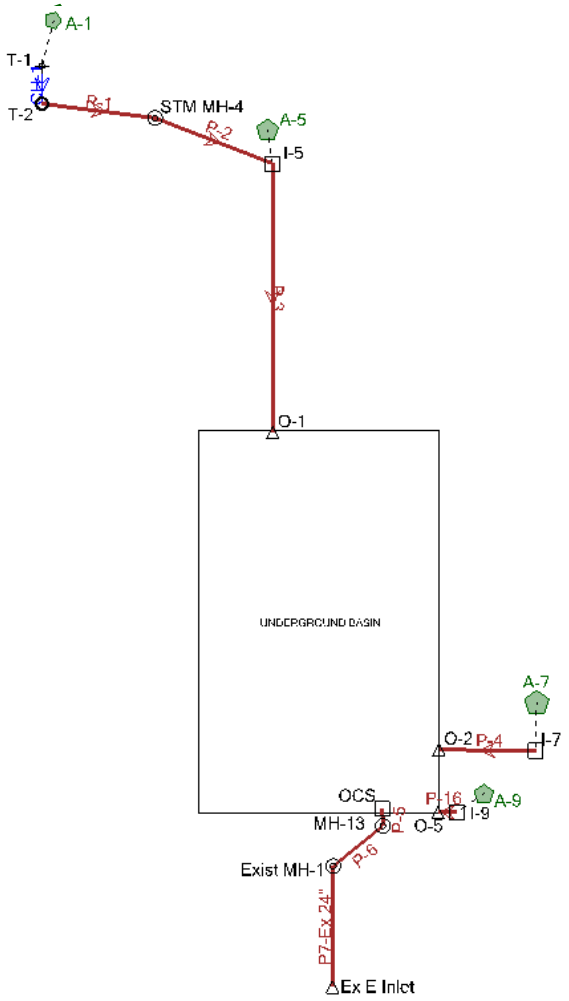
Ratio of Proposed to Existing Site Points: 96%

Required Site Points Ratio: 95%

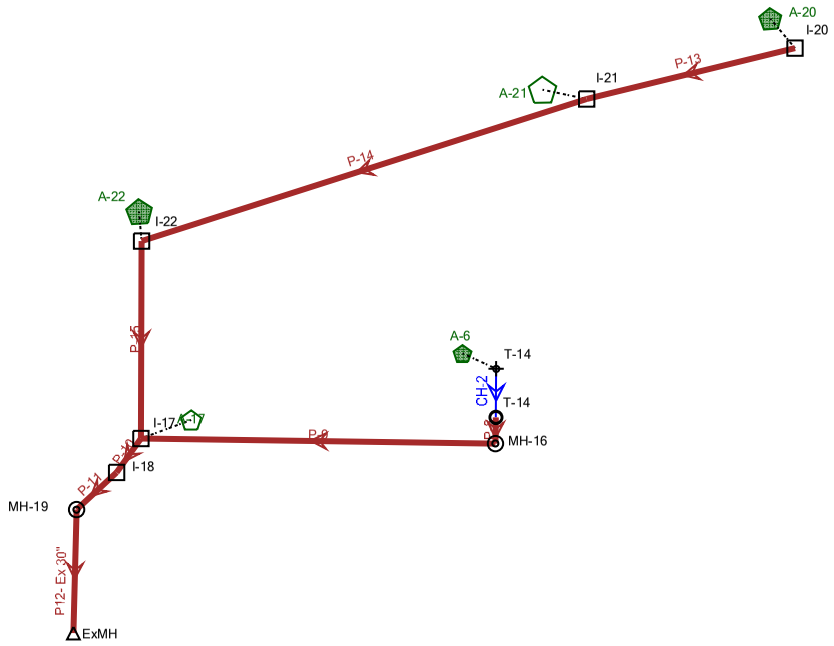
Nonstructural Point System Results: Proposed Nonstructural Measures are Adequate

Appendix H

Scenario: 25 year



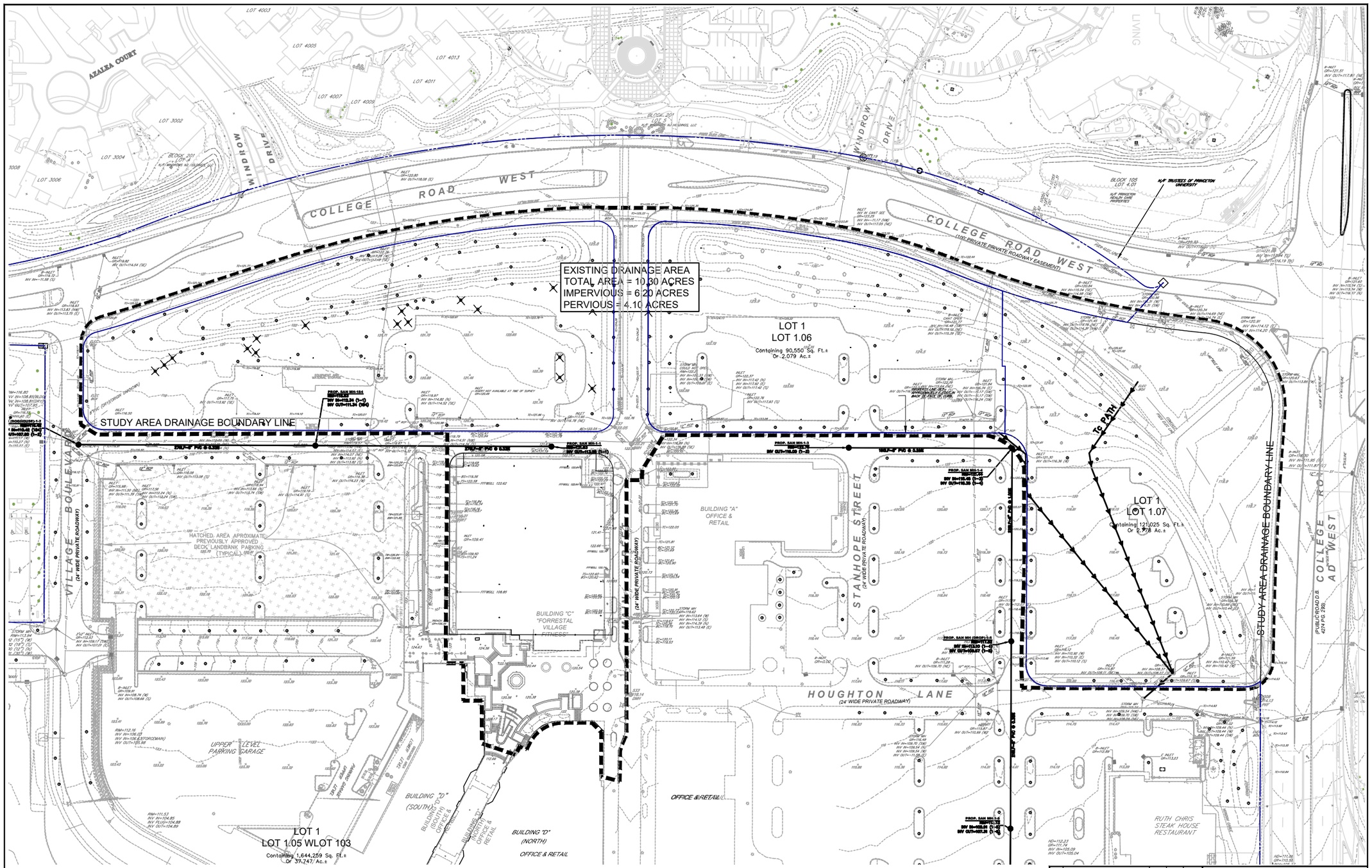
Scenario: 25 year



Conduit FlexTable: Combined Pipe/Node Report

Label	Start Node	Stop Node	Upstream Inlet Area (acres)	System Flow Time (min)	System Intensity (in/h)	Length (Unified) (ft)	Slope (Calc) (ft/ft)	Dia. (in)	Conduit Description	Material	Manning's n	Flow (cfs)	Capacity (Full Flow) (cfs)	V (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
P-1	T-2	STM MH-4	(N/A)	5.10	7.2	63.0	0.005	15.0	Circle - 15.0 in	Concrete	0.015	1.63	3.99	3.09	111.42	111.10	0.33	4.20	113.00	116.55	111.98	111.66
P-2	STM MH-4	I-5	(N/A)	5.44	7.2	70.0	0.005	15.0	Circle - 15.0 in	Concrete	0.015	1.62	3.96	3.06	111.10	110.75	4.20	8.44	116.55	120.44	111.66	111.26
P-3	I-5	O-1	0.170	5.82	7.1	147.0	0.005	15.0	Circle - 15.0 in	Concrete	0.015	2.77	3.95	3.48	109.89	109.16	9.30	9.39	120.44	119.80	110.66	109.83
P-4	I-7	O-2	0.660	5.00	7.2	54.0	0.010	15.0	Circle - 15.0 in	Concrete	0.015	4.54	5.60	5.08	109.70	109.16	4.40	5.39	115.35	115.80	110.56	110.01
P-5	OCS	MH-13	(N/A)	0.00	7.2	8.0	0.021	15.0	Circle - 15.0 in	Concrete	0.015	0.50	8.16	3.68	108.67	108.50	5.46	5.91	115.38	115.66	108.95	108.71
P-6	MH-13	Exist MH-1	(N/A)	0.04	7.6	33.0	0.015	15.0	Circle - 15.0 in	Concrete	0.015	0.50	6.96	3.29	108.50	107.99	5.91	6.00	115.66	115.24	108.78	108.22
P-8	T-14	MH-16	(N/A)	5.11	7.2	15.0	0.005	10.0	Circle - 10.0 in	HDPE (smooth Interior)	0.012	2.41	1.73	4.42	112.07	111.99	0.25	0.97	113.15	113.79	112.90	112.68
P-9	MH-16	I-17	(N/A)	5.17	7.2	187.0	0.004	12.0	Circle - 12.0 in	Concrete	0.015	2.41	4.14	2.73	111.99	111.15	0.80	4.60	113.79	116.75	112.56	112.25
P-10	I-17	I-18	0.160	6.31	7.0	22.0	0.007	24.0	Circle - 24.0 in	Concrete	0.015	16.58	16.72	6.07	110.65	110.49	4.10	4.46	116.75	116.95	112.25	112.06
P-11	I-18	MH-19	(N/A)	6.37	7.0	29.0	0.008	24.0	Circle - 24.0 in	Concrete	0.015	16.55	17.08	6.19	110.49	110.27	4.46	4.34	116.95	116.61	112.06	111.74
P-13	I-20	I-21	0.660	5.00	7.2	114.0	0.010	18.0	Circle - 18.0 in	Concrete	0.015	6.23	9.06	5.53	117.18	116.05	4.06	4.29	122.74	121.84	118.14	116.96
P-14	I-21	I-22	0.250	5.34	7.2	246.0	0.007	24.0	Circle - 24.0 in	Concrete	0.015	7.56	16.96	5.24	115.55	113.71	4.29	3.53	121.84	119.24	116.53	115.02
P-15	I-22	I-17	0.350	6.13	7.1	106.0	0.025	24.0	Circle - 24.0 in	Concrete	0.015	13.28	31.00	9.48	113.71	111.06	3.53	3.69	119.24	116.75	115.02	111.97
P-16	I-9	O-5	1.160	5.00	7.2	8.0	0.024	15.0	Circle - 15.0 in	Concrete	0.015	7.57	8.63	7.93	109.35	109.16	4.42	4.69	115.02	115.10	110.44	110.13
P7-Ex 24"	Exist MH-1	Ex E Inlet	(N/A)	0.20	7.6	66.0	0.013	24.0	Circle - 24.0 in	Concrete	0.015	0.50	22.77	2.95	107.57	106.68	5.67	4.47	115.24	113.15	107.81	106.88
P12- Ex 30"	MH-19	ExMH	(N/A)	6.45	6.9	271.0	0.009	30.0	Circle - 30.0 in	Concrete	0.015	16.51	34.55	6.96	109.87	107.31	4.24	2.61	116.61	112.42	111.24	108.53

Appendix I



GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 feet

REV.	DESCRIPTION	DATE	DFT.BY	CKD.BY

PLANS IN PROGRESS 07/18/24
DATE OF SIGN.

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PRE-DEVELOPED DRAINAGE AREA PLAN
OF
LOT 1.04, BLOCK 104
AT
PRINCETON FORRESTAL VILLAGE
SITUATED IN

PLAINSBORO TWP. MIDDLESEX CO., N.J.
JULY 15, 2024

DRAWN BY DATE	WDV	FIELD BK	ORDER No.	FILE No.	SHEET No.
CHECKED BY DATE	RAP	PAGE	PRF0V23001	207-E-2	CE-11

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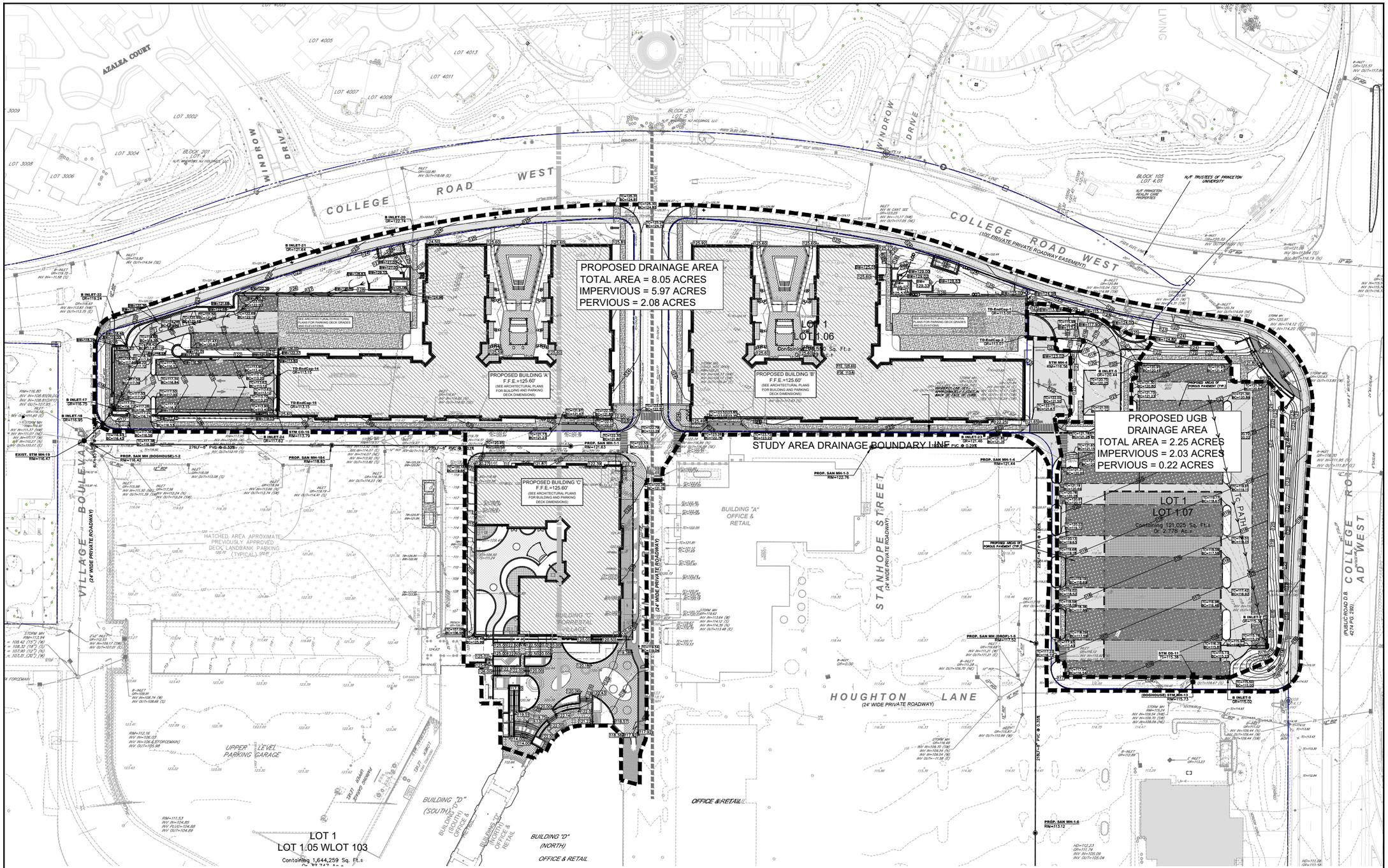

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POST DEVELOPED DISTURBED DRAINAGE AREA PLAN
OF
LOT 1.05, BLOCK 104
AT
PRINCETON FORRESTAL VILLAGE
SITUATED IN
PLAINSBORO TWP. MIDDLESEX CO., N.J.
JULY 18, 2024

DRAWN BY WDV DATE	FIELD BK	ORDER No.	FILE No.	SHEET No.
CHECKED BY RAP DATE	PAGE	PRFDV23001	207-E-2	CS9002

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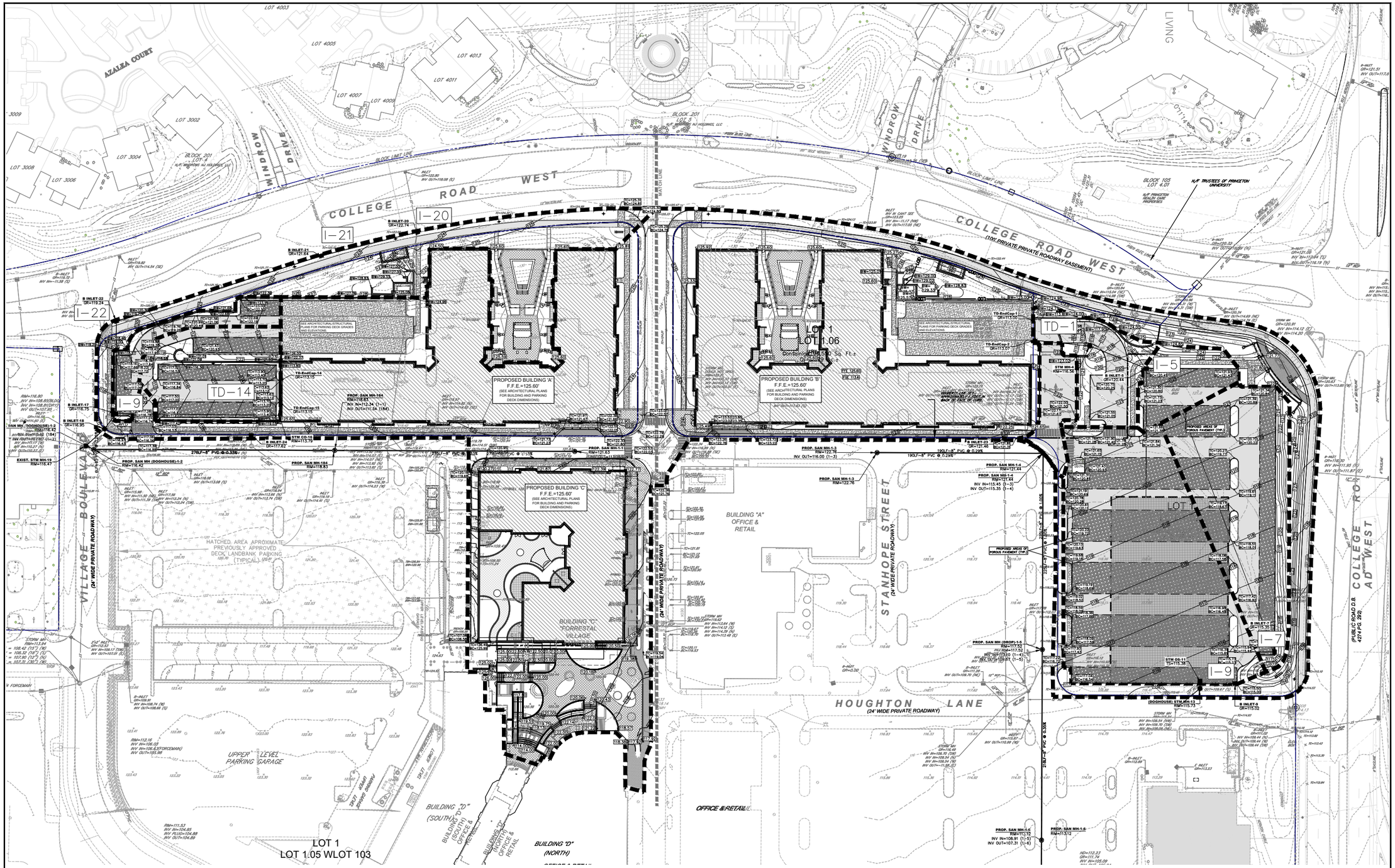

REV.	DESCRIPTION	DATE	DFT.BY	CKD.BY

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RALPH A. PETRELLA
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INLET DRAINAGE AREA PLAN

OF

LOT 1.05, BLOCK 104

AT

PRINCETON FORRESTAL VILLAGE

SITUATED IN

PLAINSBORO TWP. MIDDLESEX CO., N.J.

JULY 15, 2024

DRAWN BY	WDV	FIELD BK	ORDER No.	FILE No.	SHEET No.
DATE					
CHECKED BY	RAP	PAGE	PRFOV23001	207-E-2	CS9003
DATE					

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Appendix J

ii. N.J.A.C. 7:8-5.7(c)2 and N.J.A.C. 7:8-5.7(d)2 both allow an alternative to calculating the current and projected rainfall precipitation depths by using separate rainfall totals for each county. The 24-hour county rainfall amount provided by NRCS is duplicated here and can be found online at:

https://www.nrcs.usda.gov/sites/default/files/2022-09/NJ%2024%20Hour%20Rainfall%20Data.pdf.

Table 5-1: County-Specific, New Jersey 24-Hour Rainfall Frequency Data

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.

b. N.J.A.C.7:8-5.7(c) requires the precipitation depths of the current 2-, 10- and 100-year storm events be determined by multiplying the NOAA rainfall data with the current precipitation adjustment factors in Table 5-5 at N.J.A.C.7:8-5.7(c)2. N.J.A.C.7:8-5.7(d) requires the precipitation depths of the projected 2-, 10- and 100-year storm events be determined by multiplying the NOAA rainfall data with the future precipitation change factors in Table 5-6 at N.J.A.C.7:8-5.7(d). Table 5-5 and Table 5-6 from the Rules are reproduced below.

Current Precipitation Adjustment Factors at N.J.A.C. 7:8-5.7(c) as Table 5-5

County	Current Precipitation Adjustment Factors		
	2-year Design Storm	10-year Design Storm	100-year Design Storm
Atlantic	1.01	1.02	1.03
Bergen	1.01	1.03	1.06
Burlington	0.99	1.01	1.04
Camden	1.03	1.04	1.05
Cape May	1.03	1.03	1.04
Cumberland	1.03	1.03	1.01
Essex	1.01	1.03	1.06
Gloucester	1.05	1.06	1.06
Hudson	1.03	1.05	1.09
Hunterdon	1.02	1.05	1.13
Mercer	1.01	1.02	1.04
Middlesex	1.00	1.01	1.03
Monmouth	1.00	1.01	1.02
Morris	1.01	1.03	1.06
Ocean	1.00	1.01	1.03
Passaic	1.00	1.02	1.05
Salem	1.02	1.03	1.03
Somerset	1.00	1.03	1.09
Sussex	1.03	1.04	1.07
Union	1.01	1.03	1.06
Warren	1.02	1.07	1.15

Future Precipitation Change Factors at N.J.A.C. 7:8-5.7(d) as Table 5-6

County	Future Precipitation Change Factors		
	2-year Design Storm	10-year Design Storm	100-year Design Storm
Atlantic	1.22	1.24	1.39
Bergen	1.20	1.23	1.37
Burlington	1.17	1.18	1.32
Camden	1.18	1.22	1.39
Cape May	1.21	1.24	1.32
Cumberland	1.20	1.21	1.39
Essex	1.19	1.22	1.33
Gloucester	1.19	1.23	1.41
Hudson	1.19	1.19	1.23
Hunterdon	1.19	1.23	1.42
Mercer	1.16	1.17	1.36
Middlesex	1.19	1.21	1.33
Monmouth	1.19	1.19	1.26
Morris	1.23	1.28	1.46
Ocean	1.18	1.19	1.24
Passaic	1.21	1.27	1.50
Salem	1.20	1.23	1.32
Somerset	1.19	1.24	1.48
Sussex	1.24	1.29	1.50
Union	1.20	1.23	1.35
Warren	1.20	1.25	1.37

NOAA Atlas 14, Volume 2, Version 3
Location name: Princeton, New Jersey, USA*
Latitude: 40.3572°, Longitude: -74.6141°
Elevation: 121 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PIPE DESIGN

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.03** (3.65-4.46)	**4.81** (4.36-5.33)	**5.71** (5.15-6.32)	**6.37** (5.74-7.06)	**7.19** (6.44-7.94)	**7.76** (6.94-8.58)	**8.35** (7.42-9.24)	**8.89** (7.85-9.86)	**9.56** (8.36-10.7)	**10.1** (8.75-11.3)
10-min	**3.22** (2.91-3.57)	**3.85** (3.48-4.26)	**4.57** (4.12-5.06)	**5.09** (4.59-5.64)	**5.72** (5.13-6.32)	**6.19** (5.52-6.83)	**6.64** (5.89-7.34)	**7.04** (6.22-7.81)	**7.56** (6.62-8.42)	**7.93** (6.88-8.87)
15-min	**2.68** (2.42-2.98)	**3.22** (2.92-3.57)	**3.86** (3.48-4.27)	**4.30** (3.87-4.76)	**4.84** (4.34-5.34)	**5.22** (4.66-5.77)	**5.59** (4.96-6.19)	**5.93** (5.24-6.57)	**6.34** (5.55-7.07)	**6.64** (5.76-7.42)
30-min	**1.84** (1.66-2.04)	**2.23** (2.01-2.47)	**2.74** (2.47-3.03)	**3.11** (2.80-3.45)	**3.58** (3.21-3.96)	**3.93** (3.51-4.34)	**4.28** (3.80-4.74)	**4.61** (4.07-5.12)	**5.05** (4.42-5.62)	**5.37** (4.66-6.01)
60-min	**1.15** (1.04-1.27)	**1.40** (1.26-1.55)	**1.76** (1.58-1.94)	**2.03** (1.83-2.24)	**2.38** (2.14-2.64)	**2.66** (2.38-2.94)	**2.95** (2.62-3.26)	**3.24** (2.86-3.59)	**3.62** (3.17-4.04)	**3.92** (3.40-4.39)
2-hr	**0.699** (0.629-0.777)	**0.851** (0.768-0.945)	**1.08** (0.973-1.20)	**1.26** (1.13-1.39)	**1.50** (1.34-1.66)	**1.70** (1.51-1.88)	**1.90** (1.68-2.10)	**2.11** (1.85-2.34)	**2.41** (2.08-2.68)	**2.64** (2.26-2.95)
3-hr	**0.514** (0.462-0.574)	**0.627** (0.564-0.700)	**0.796** (0.715-0.889)	**0.928** (0.831-1.03)	**1.11** (0.991-1.24)	**1.26** (1.12-1.40)	**1.42** (1.25-1.58)	**1.58** (1.38-1.76)	**1.81** (1.56-2.03)	**1.99** (1.70-2.24)
6-hr	**0.327** (0.294-0.368)	**0.397** (0.356-0.446)	**0.504** (0.450-0.563)	**0.590** (0.526-0.659)	**0.715** (0.631-0.798)	**0.819** (0.719-0.913)	**0.932** (0.809-1.04)	**1.05** (0.905-1.17)	**1.23** (1.04-1.37)	**1.37** (1.15-1.54)
12-hr	**0.197** (0.176-0.223)	**0.239** (0.213-0.270)	**0.304** (0.271-0.344)	**0.360** (0.319-0.406)	**0.443** (0.389-0.497)	**0.515** (0.449-0.578)	**0.594** (0.512-0.666)	**0.681** (0.579-0.766)	**0.812** (0.676-0.916)	**0.924** (0.756-1.04)
24-hr	**0.113** (0.104-0.124)	**0.137** (0.126-0.151)	**0.176** (0.161-0.193)	**0.209** (0.190-0.229)	**0.258** (0.234-0.283)	**0.301** (0.270-0.329)	**0.349** (0.310-0.381)	**0.402** (0.353-0.440)	**0.482** (0.416-0.529)	**0.550** (0.469-0.606)
2-day	**0.065** (0.060-0.072)	**0.079** (0.072-0.088)	**0.102** (0.093-0.112)	**0.120** (0.109-0.132)	**0.148** (0.133-0.162)	**0.171** (0.153-0.188)	**0.197** (0.175-0.216)	**0.225** (0.198-0.247)	**0.267** (0.231-0.294)	**0.302** (0.258-0.335)
3-day	**0.046** (0.042-0.051)	**0.056** (0.051-0.061)	**0.071** (0.065-0.078)	**0.084** (0.077-0.092)	**0.103** (0.093-0.112)	**0.118** (0.107-0.129)	**0.135** (0.121-0.148)	**0.154** (0.136-0.169)	**0.181** (0.158-0.199)	**0.204** (0.176-0.225)
4-day	**0.036** (0.033-0.040)	**0.044** (0.041-0.048)	**0.056** (0.051-0.061)	**0.066** (0.060-0.072)	**0.080** (0.073-0.087)	**0.092** (0.083-0.100)	**0.105** (0.094-0.114)	**0.118** (0.105-0.129)	**0.138** (0.122-0.151)	**0.155** (0.135-0.170)
7-day	**0.024** (0.022-0.026)	**0.029** (0.027-0.032)	**0.036** (0.034-0.040)	**0.042** (0.039-0.046)	**0.051** (0.047-0.056)	**0.058** (0.053-0.064)	**0.066** (0.060-0.072)	**0.074** (0.066-0.081)	**0.086** (0.076-0.095)	**0.096** (0.084-0.106)
10-day	**0.019** (0.018-0.021)	**0.023** (0.021-0.025)	**0.028** (0.026-0.031)	**0.033** (0.030-0.036)	**0.039** (0.036-0.042)	**0.044** (0.040-0.048)	**0.049** (0.045-0.053)	**0.055** (0.049-0.060)	**0.063** (0.056-0.068)	**0.069** (0.061-0.076)
20-day	**0.013** (0.012-0.014)	**0.015** (0.014-0.016)	**0.018** (0.017-0.020)	**0.021** (0.019-0.022)	**0.024** (0.023-0.026)	**0.027** (0.025-0.029)	**0.029** (0.027-0.031)	**0.032** (0.030-0.034)	**0.036** (0.033-0.038)	**0.039** (0.035-0.042)
30-day	**0.011** (0.010-0.011)	**0.013** (0.012-0.013)	**0.015** (0.014-0.016)	**0.017** (0.016-0.017)	**0.019** (0.018-0.020)	**0.021** (0.019-0.022)	**0.022** (0.021-0.024)	**0.024** (0.022-0.025)	**0.026** (0.024-0.028)	**0.028** (0.026-0.030)
45-day	**0.009** (0.008-0.009)	**0.011** (0.010-0.011)	**0.012** (0.012-0.013)	**0.014** (0.013-0.014)	**0.015** (0.014-0.016)	**0.016** (0.016-0.017)	**0.018** (0.017-0.019)	**0.019** (0.018-0.020)	**0.020** (0.019-0.021)	**0.021** (0.020-0.023)
60-day	**0.008** (0.008-0.008)	**0.009** (0.009-0.010)	**0.011** (0.010-0.011)	**0.012** (0.011-0.012)	**0.013** (0.013-0.014)	**0.014** (0.013-0.015)	**0.015** (0.014-0.016)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)	**0.018** (0.017-0.019)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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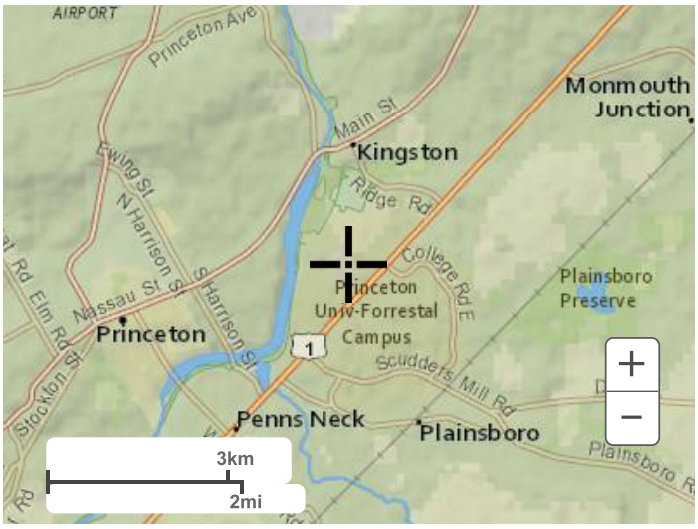
PF graphical



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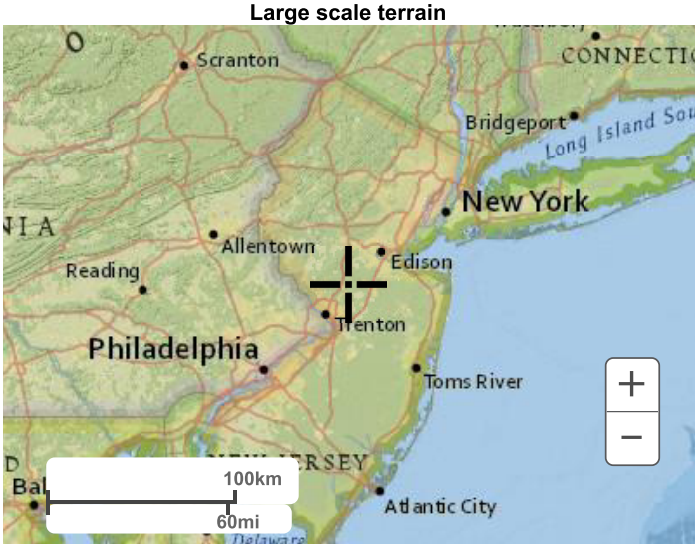
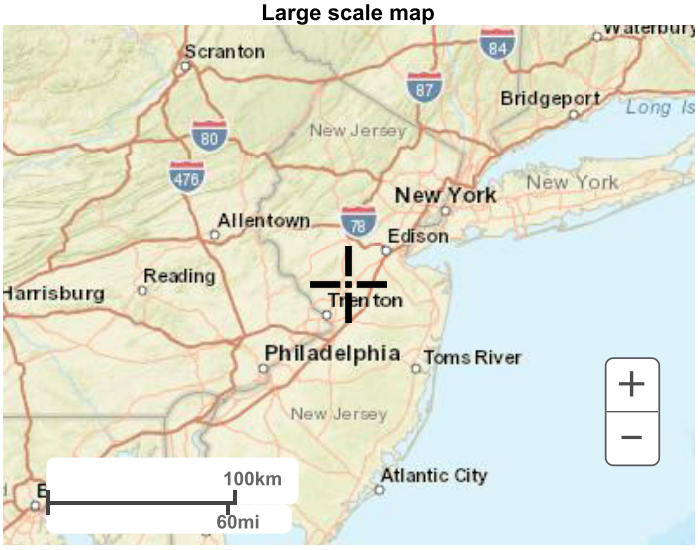
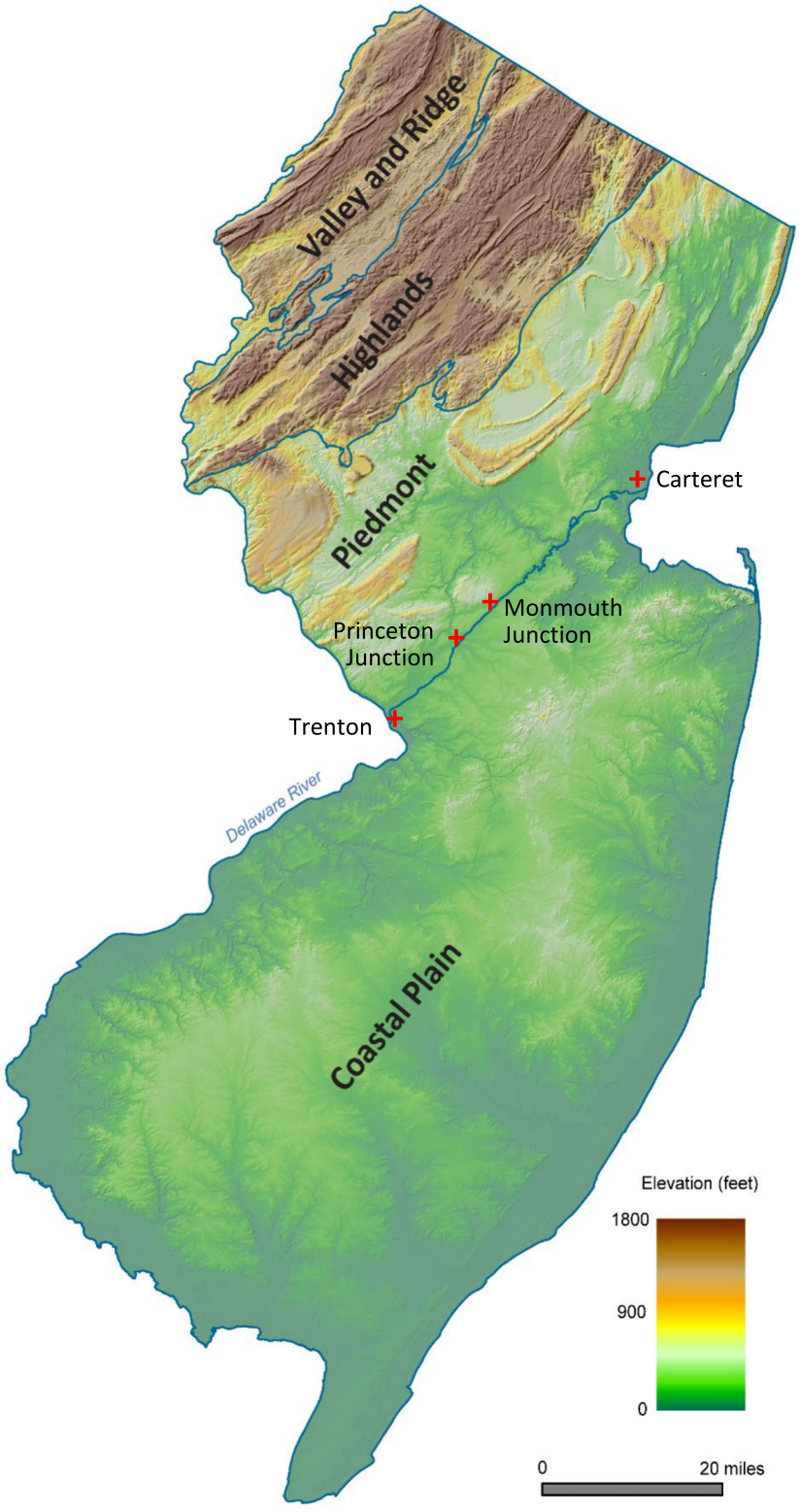


Large scale map



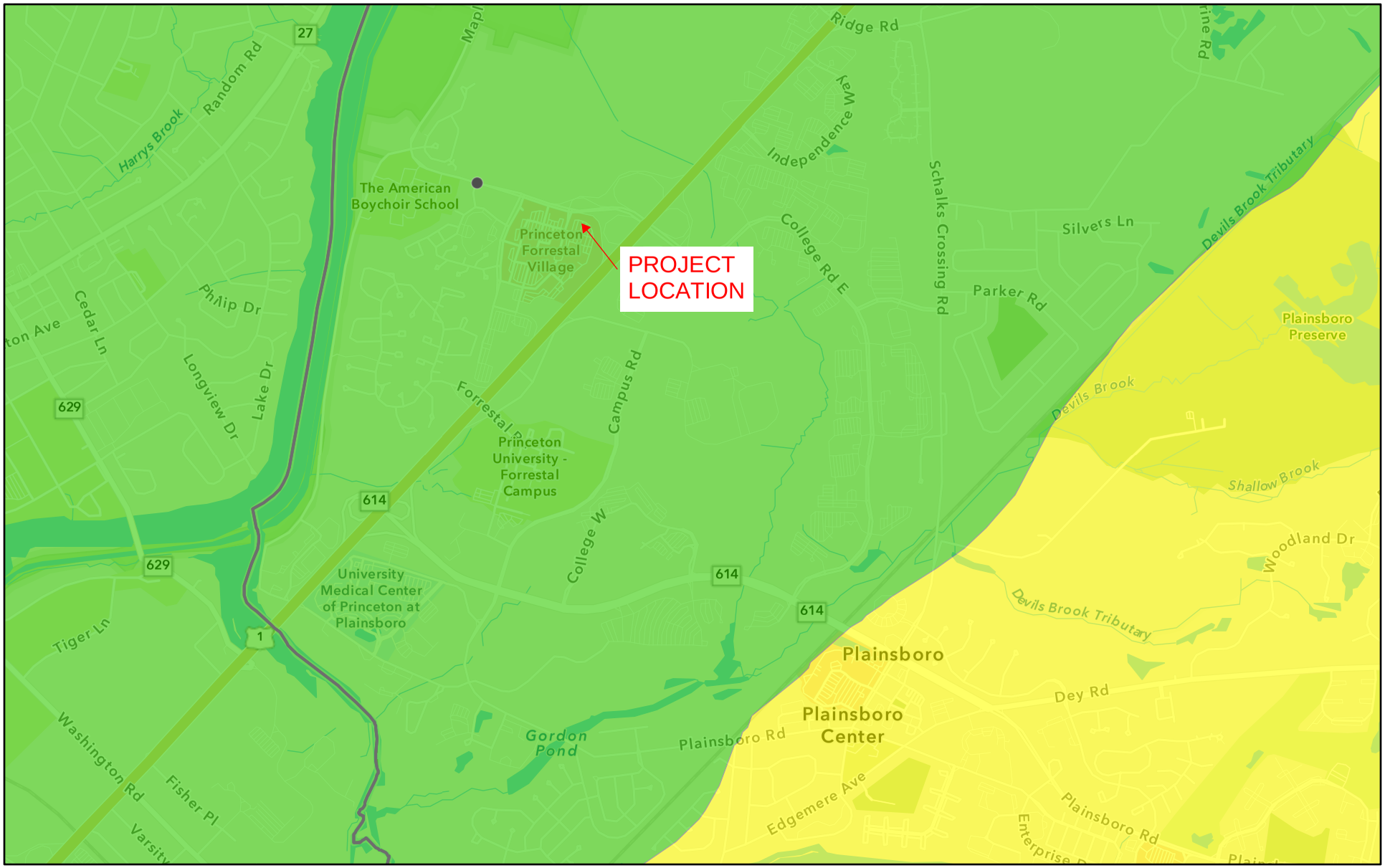
Large scale aerial

Physiographic Provinces of New Jersey.



Imagery modified from New Jersey Geological Survey Information Circular, "Physiographic Provinces of New Jersey," 2006 and used with permission

NJ-GeoWeb



6/11/2024, 3:35:37 PM

County Boundaries

Piedmont

Physiographic Provinces

Coastal Plain

1:36,112

0 0.23 0.45 0.9 mi

0 0.38 0.75 1.5 km

Monmouth County NJ GIS, New Jersey Office of GIS, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US

New Jersey Department of Environmental Protection

Monmouth County NJ GIS, New Jersey Office of GIS, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS | NJDEP | NJ Department of Community Affairs, Local Planning Services

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ENGINEERING REPORT

New Residential Community
Block 104, Lots 1.03, 1.04, & 1.05
(Formerly Block 104, Lots 1.01 and 4)
Plainsboro Township,
Middlesex County, New Jersey

Prepared For:
IVC PFV, LLC.
C/O Lincoln Equities Group
One Meadowlands Plaza, Suite 803
East Rutherford, New Jersey 07073

Richard K. Wizeman
New Jersey Professional Engineer #24171

VNHA #41213-410-21
August 4, 2014
Revised September 24, 2014

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SECTION

APPENDIX

SEE FOLLOWING DRCC SUPPLEMENTAL REPORT

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- Since 1894 -

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associates, pc

DRCC SUPPLEMENTAL REPORT

Harmony School and Eden Institute
At Princeton Forrestal Village
Plainsboro Township
Middlesex County, New Jersey

Prepared For:
Princeton Forrestal Village
Princeton, New Jersey 08540

Richard K. Wizeman
New Jersey Professional Engineer #24171

VNHA #38863-480-21
& VNHA #38888-300-31
May 28, 2009

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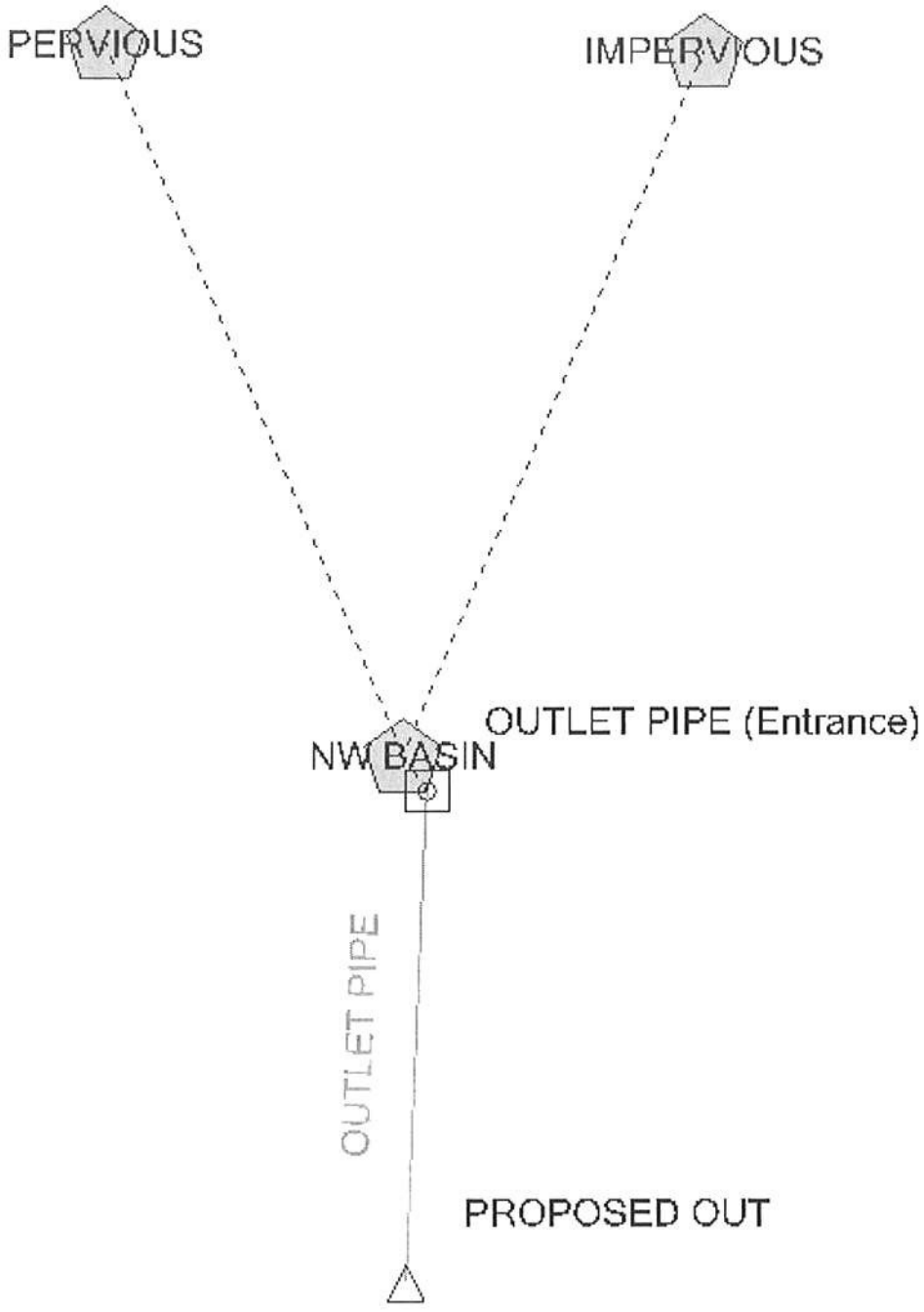
APPENDIX D

PROPOSED HYDROLOGIC ROUTING (2-, 10-, AND 100-YEAR STORM EVENTS)



2, 10, 100-Yr Hydrology

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PFV RESIDENTIAL

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
PERVIOUS	MIDDLESEX:1,2,10,100 - , 2 yrs	2	1.682	13.000	6.42
PERVIOUS	MIDDLESEX:1,2,10,100 - , 10 yrs	10	4.564	12.900	20.66
PERVIOUS	MIDDLESEX:1,2,10,100 - , 100 yrs	100	11.828	12.800	56.65
IMPERVIOUS	MIDDLESEX:1,2,10,100 - , 2 yrs	2	13.870	12.800	61.42
IMPERVIOUS	MIDDLESEX:1,2,10,100 - , 10 yrs	10	21.992	12.800	95.74
IMPERVIOUS	MIDDLESEX:1,2,10,100 - , 100 yrs	100	37.805	12.800	162.15

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
PROPOSED OUT	MIDDLESEX:1,2,10,100 - , 2 yrs	2	15.551	17.000	6.22
PROPOSED OUT	MIDDLESEX:1,2,10,100 - , 10 yrs	10	26.555	15.300	18.77
PROPOSED OUT	MIDDLESEX:1,2,10,100 - , 100 yrs	100	49.632	14.000	74.77

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
NW BASIN (IN)	MIDDLESEX:1,2,10,100 - , 2 yrs	2	15.552	12.800	67.34	(N/A)	(N/A)
NW BASIN (OUT)	MIDDLESEX:1,2,10,100 - , 2 yrs	2	15.551	17.000	6.22	96.75	10.342
NW BASIN (IN)	MIDDLESEX:1,2,10,100 - , 10 yrs	10	26.556	12.800	116.02	(N/A)	(N/A)
NW BASIN (OUT)	MIDDLESEX:1,2,10,100 - , 10 yrs	10	26.555	15.300	18.77	97.66	16.289

PFV RESIDENTIAL

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
NW BASIN (IN)	MIDDLESEX:1, 2,10,100 - , 100 yrs	100	49.633	12.800	218.80	(N/A)	(N/A)
NW BASIN (OUT)	MIDDLESEX:1, 2,10,100 - , 100 yrs	100	49.632	14.000	74.77	99.13	26.320

PFV RESIDENTIAL

Subsection: Time of Concentration Calculations
Label: IMPERVIOUS

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	1.220 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	1.220 hours

==== User Defined

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

PFV RESIDENTIAL

Subsection: Time of Concentration Calculations
Label: PERVIOUS

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Time of Concentration Results

Segment #1: User Defined Tc	
Time of Concentration	1.220 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	1.220 hours

PFV RESIDENTIAL

Subsection: Time of Concentration Calculations
Label: PERVIOUS

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

==== User Defined

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

PFV RESIDENTIAL

Subsection: Runoff CN-Area
Label: IMPERVIOUS

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
2-YR WSEL POND (FROM E&K REPORT)	98.000	8.000	0.0	0.0	98.000
IMPERVIOUS	98.000	40.400	0.0	0.0	98.000
IMPERVIOUS (RAMPS&Rte.1 FROM E&K)	98.000	5.870	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	54.270	(N/A)	(N/A)	98.000

PFV RESIDENTIAL

Subsection: Runoff CN-Area
Label: PERVIOUS

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
LAWN - B	58.000	16.640	0.0	0.0	58.000
LAWN -C	71.000	16.640	0.0	0.0	71.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	33.280	(N/A)	(N/A)	64.500

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table)
Label: IMPERVIOUS

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Storm Event	TypeIII 24hr (3.3 in)
Return Event	2 years
Duration	72.000 hours
Depth	3.3 in
Time of Concentration (Composite)	1.220 hours
Area (User Defined)	54.270 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1.400	0.00	0.00	0.01	0.01	0.02
1.900	0.04	0.06	0.08	0.11	0.14
2.400	0.17	0.21	0.24	0.28	0.32
2.900	0.37	0.41	0.45	0.50	0.54
3.400	0.58	0.63	0.68	0.72	0.77
3.900	0.81	0.86	0.90	0.95	0.99
4.400	1.04	1.08	1.13	1.17	1.22
4.900	1.26	1.31	1.35	1.40	1.44
5.400	1.48	1.53	1.57	1.61	1.66
5.900	1.70	1.74	1.78	1.83	1.87
6.400	1.91	1.96	2.01	2.07	2.13
6.900	2.19	2.26	2.34	2.41	2.49
7.400	2.57	2.66	2.74	2.83	2.92
7.900	3.01	3.10	3.20	3.29	3.39
8.400	3.49	3.60	3.72	3.85	3.99
8.900	4.14	4.29	4.46	4.64	4.82
9.400	5.00	5.19	5.39	5.59	5.79
9.900	5.99	6.20	6.41	6.62	6.84
10.400	7.07	7.32	7.58	7.86	8.16
10.900	8.47	8.82	9.18	9.57	10.01
11.400	10.50	11.10	11.88	12.84	14.47
11.900	16.65	20.19	25.18	31.03	38.69
12.400	46.12	53.17	57.86	61.31	61.42
12.900	60.03	57.11	52.52	47.61	42.46
13.400	37.78	33.39	29.94	26.78	24.11
13.900	21.88	19.85	18.22	16.76	15.46
14.400	14.40	13.42	12.59	11.86	11.19
14.900	10.63	10.12	9.66	9.25	8.87
15.400	8.53	8.21	7.90	7.60	7.32
15.900	7.04	6.79	6.54	6.32	6.10
16.400	5.89	5.70	5.51	5.34	5.17
16.900	5.02	4.88	4.74	4.62	4.50

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table)
Label: IMPERVIOUS

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
17.400	4.39	4.28	4.17	4.07	3.97
17.900	3.87	3.78	3.68	3.59	3.50
18.400	3.41	3.33	3.25	3.17	3.11
18.900	3.05	2.99	2.94	2.90	2.85
19.400	2.82	2.78	2.74	2.71	2.68
19.900	2.65	2.61	2.58	2.56	2.53
20.400	2.50	2.47	2.45	2.42	2.39
20.900	2.37	2.35	2.32	2.30	2.28
21.400	2.26	2.24	2.21	2.19	2.17
21.900	2.15	2.13	2.11	2.09	2.07
22.400	2.05	2.03	2.01	1.99	1.97
22.900	1.95	1.93	1.91	1.89	1.87
23.400	1.85	1.83	1.81	1.79	1.77
23.900	1.75	1.72	1.69	1.64	1.57
24.400	1.48	1.36	1.22	1.07	0.92
24.900	0.78	0.65	0.53	0.43	0.35
25.400	0.29	0.23	0.19	0.15	0.13
25.900	0.10	0.08	0.07	0.06	0.05
26.400	0.04	0.03	0.02	0.02	0.02
26.900	0.01	0.01	0.01	0.01	0.00
27.400	0.00	0.00	0.00	0.00	(N/A)

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table)
Label: IMPERVIOUS

Return Event: 10 years
Storm Event: TypeIII 24hr (5.1 in)

Storm Event	TypeIII 24hr (5.1 in)
Return Event	10 years
Duration	72.000 hours
Depth	5.1 in
Time of Concentration (Composite)	1.220 hours
Area (User Defined)	54.270 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.900	0.00	0.00	0.01	0.02	0.04
1.400	0.06	0.10	0.15	0.20	0.26
1.900	0.33	0.40	0.48	0.56	0.63
2.400	0.71	0.79	0.86	0.94	1.02
2.900	1.09	1.17	1.25	1.32	1.40
3.400	1.47	1.55	1.62	1.70	1.77
3.900	1.85	1.92	1.99	2.06	2.13
4.400	2.20	2.27	2.34	2.41	2.47
4.900	2.54	2.61	2.67	2.74	2.80
5.400	2.87	2.93	2.99	3.05	3.11
5.900	3.18	3.24	3.30	3.36	3.42
6.400	3.49	3.56	3.63	3.72	3.81
6.900	3.91	4.01	4.12	4.24	4.36
7.400	4.49	4.62	4.75	4.89	5.03
7.900	5.17	5.31	5.45	5.60	5.75
8.400	5.91	6.08	6.26	6.46	6.67
8.900	6.90	7.15	7.40	7.68	7.96
9.400	8.25	8.54	8.84	9.15	9.46
9.900	9.77	10.09	10.41	10.74	11.08
10.400	11.42	11.80	12.20	12.63	13.09
10.900	13.58	14.11	14.67	15.27	15.96
11.400	16.70	17.64	18.85	20.34	22.88
11.900	26.29	31.80	39.56	48.66	60.57
12.400	72.11	83.04	90.30	95.61	95.74
12.900	93.53	88.93	81.76	74.08	66.06
13.400	58.76	51.92	46.55	41.63	37.47
13.900	33.99	30.83	28.29	26.01	24.01
14.400	22.35	20.82	19.54	18.40	17.35
14.900	16.49	15.69	14.98	14.35	13.75
15.400	13.23	12.72	12.24	11.79	11.34
15.900	10.92	10.52	10.14	9.79	9.45
16.400	9.13	8.83	8.54	8.27	8.01

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table)
Label: IMPERVIOUS

Return Event: 10 years
Storm Event: TypeIII 24hr (5.1 in)

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
16.900	7.78	7.56	7.35	7.16	6.97
17.400	6.80	6.63	6.46	6.31	6.15
17.900	6.00	5.85	5.70	5.56	5.42
18.400	5.28	5.15	5.03	4.92	4.82
18.900	4.72	4.64	4.56	4.49	4.42
19.400	4.36	4.30	4.25	4.20	4.15
19.900	4.10	4.05	4.00	3.96	3.91
20.400	3.87	3.83	3.79	3.75	3.71
20.900	3.67	3.63	3.60	3.56	3.53
21.400	3.50	3.46	3.43	3.40	3.37
21.900	3.33	3.30	3.27	3.24	3.21
22.400	3.17	3.14	3.11	3.08	3.05
22.900	3.02	2.99	2.95	2.92	2.89
23.400	2.86	2.83	2.80	2.77	2.73
23.900	2.70	2.66	2.61	2.54	2.43
24.400	2.30	2.10	1.89	1.66	1.43
24.900	1.20	1.00	0.82	0.66	0.55
25.400	0.44	0.36	0.30	0.24	0.20
25.900	0.16	0.13	0.11	0.09	0.07
26.400	0.06	0.05	0.04	0.03	0.02
26.900	0.02	0.01	0.01	0.01	0.01
27.400	0.00	0.00	0.00	0.00	0.00

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table)
Label: IMPERVIOUS

Return Event: 100 years
Storm Event: TypeIII 24hr (8.6 in)

Storm Event	TypeIII 24hr (8.6 in)
Return Event	100 years
Duration	72.000 hours
Depth	8.6 in
Time of Concentration (Composite)	1.220 hours
Area (User Defined)	54.270 acres

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
0.500	0.00	0.00	0.01	0.03	0.06
1.000	0.11	0.19	0.29	0.41	0.56
1.500	0.71	0.88	1.06	1.24	1.41
2.000	1.58	1.74	1.90	2.05	2.20
2.500	2.34	2.48	2.61	2.74	2.87
3.000	3.00	3.12	3.25	3.37	3.49
3.500	3.61	3.73	3.85	3.96	4.08
4.000	4.19	4.30	4.41	4.52	4.62
4.500	4.73	4.83	4.94	5.04	5.14
5.000	5.23	5.33	5.43	5.52	5.62
5.500	5.71	5.81	5.90	5.99	6.08
6.000	6.17	6.26	6.35	6.45	6.55
6.500	6.66	6.78	6.91	7.06	7.22
7.000	7.39	7.57	7.77	7.97	8.18
7.500	8.40	8.62	8.84	9.07	9.30
8.000	9.54	9.77	10.01	10.26	10.53
8.500	10.81	11.11	11.45	11.80	12.19
9.000	12.60	13.03	13.49	13.96	14.44
9.500	14.94	15.44	15.96	16.48	17.00
10.000	17.53	18.07	18.61	19.18	19.76
10.500	20.39	21.06	21.78	22.56	23.37
11.000	24.26	25.20	26.21	27.37	28.62
11.500	30.20	32.25	34.76	39.07	44.83
12.000	54.17	67.31	82.71	102.84	122.35
12.500	140.80	153.05	161.99	162.15	158.37
13.000	150.55	138.39	125.37	111.78	99.41
13.500	87.82	78.73	70.40	63.35	57.46
14.000	52.11	47.83	43.97	40.57	37.77
14.500	35.18	33.01	31.08	29.31	27.86
15.000	26.50	25.30	24.23	23.23	22.34
15.500	21.49	20.67	19.90	19.15	18.43
16.000	17.76	17.12	16.53	15.96	15.42

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 100 years
Label: IMPERVIOUS Storm Event: TypeIII 24hr (8.6 in)

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
16.500	14.91	14.41	13.96	13.53	13.13
17.000	12.76	12.41	12.08	11.77	11.47
17.500	11.19	10.91	10.65	10.38	10.13
18.000	9.88	9.63	9.38	9.15	8.92
18.500	8.70	8.49	8.30	8.13	7.97
19.000	7.83	7.70	7.57	7.46	7.36
19.500	7.26	7.17	7.08	7.00	6.92
20.000	6.84	6.76	6.68	6.61	6.53
20.500	6.46	6.39	6.33	6.26	6.20
21.000	6.13	6.07	6.02	5.96	5.90
21.500	5.85	5.79	5.74	5.68	5.63
22.000	5.57	5.52	5.47	5.41	5.36
22.500	5.31	5.25	5.20	5.15	5.09
23.000	5.04	4.99	4.93	4.88	4.83
23.500	4.77	4.72	4.67	4.62	4.56
24.000	4.50	4.41	4.29	4.10	3.88
24.500	3.55	3.19	2.80	2.41	2.03
25.000	1.69	1.39	1.12	0.92	0.75
25.500	0.61	0.50	0.41	0.33	0.27
26.000	0.22	0.18	0.14	0.12	0.10
26.500	0.08	0.06	0.05	0.04	0.03
27.000	0.02	0.02	0.01	0.01	0.01
27.500	0.01	0.00	0.00	0.00	(N/A)

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table)
Label: PERVIOUS

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Storm Event	TypeIII 24hr (3.3 in)
Return Event	2 years
Duration	72.000 hours
Depth	3.3 in
Time of Concentration (Composite)	1.220 hours
Area (User Defined)	33.280 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.700	0.00	0.01	0.06	0.19	0.50
12.200	0.91	1.70	2.57	3.59	4.52
12.700	5.37	5.92	6.27	6.42	6.27
13.200	6.04	5.66	5.26	4.86	4.52
13.700	4.20	3.93	3.69	3.47	3.29
14.200	3.12	2.96	2.83	2.71	2.60
14.700	2.50	2.41	2.33	2.25	2.18
15.200	2.12	2.06	2.01	1.95	1.90
15.700	1.85	1.80	1.74	1.69	1.64
16.200	1.60	1.55	1.50	1.46	1.42
16.700	1.38	1.34	1.31	1.27	1.24
17.200	1.21	1.19	1.16	1.14	1.11
17.700	1.09	1.06	1.04	1.02	0.99
18.200	0.97	0.95	0.93	0.90	0.89
18.700	0.87	0.85	0.84	0.82	0.81
19.200	0.80	0.79	0.78	0.77	0.76
19.700	0.75	0.75	0.74	0.73	0.72
20.200	0.72	0.71	0.70	0.70	0.69
20.700	0.68	0.68	0.67	0.66	0.66
21.200	0.65	0.65	0.64	0.64	0.63
21.700	0.63	0.62	0.62	0.61	0.61
22.200	0.60	0.60	0.59	0.59	0.58
22.700	0.58	0.57	0.56	0.56	0.55
23.200	0.55	0.54	0.54	0.53	0.53
23.700	0.52	0.52	0.51	0.50	0.49
24.200	0.48	0.46	0.44	0.40	0.36
24.700	0.31	0.27	0.23	0.19	0.16
25.200	0.13	0.10	0.08	0.07	0.06
25.700	0.05	0.04	0.03	0.02	0.02
26.200	0.02	0.01	0.01	0.01	0.01
26.700	0.01	0.00	0.00	0.00	0.00
27.200	0.00	0.00	0.00	(N/A)	(N/A)

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table)
Label: PERVIOUS

Return Event: 10 years
Storm Event: TypeIII 24hr (5.1 in)

Storm Event	TypeIII 24hr (5.1 in)
Return Event	10 years
Duration	72.000 hours
Depth	5.1 in
Time of Concentration (Composite)	1.220 hours
Area (User Defined)	33.280 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.600	0.00	0.00	0.01	0.01	0.03
11.100	0.05	0.09	0.14	0.21	0.32
11.600	0.47	0.66	1.03	1.56	2.51
12.100	4.04	5.91	8.73	11.65	14.72
12.600	17.20	19.31	20.29	20.66	20.41
13.100	19.37	18.12	16.59	15.12	13.69
13.600	12.52	11.45	10.53	9.74	9.03
14.100	8.44	7.90	7.43	7.02	6.65
14.600	6.32	6.03	5.76	5.54	5.32
15.100	5.13	4.96	4.79	4.64	4.50
15.600	4.36	4.22	4.09	3.96	3.83
16.100	3.71	3.59	3.48	3.37	3.27
16.600	3.17	3.07	2.99	2.90	2.83
17.100	2.76	2.69	2.63	2.56	2.51
17.600	2.45	2.39	2.34	2.28	2.23
18.100	2.18	2.12	2.07	2.02	1.98
18.600	1.93	1.89	1.85	1.82	1.79
19.100	1.76	1.74	1.71	1.69	1.67
19.600	1.65	1.63	1.61	1.60	1.58
20.100	1.56	1.55	1.53	1.51	1.50
20.600	1.48	1.47	1.46	1.44	1.43
21.100	1.42	1.40	1.39	1.38	1.37
21.600	1.36	1.34	1.33	1.32	1.31
22.100	1.30	1.28	1.27	1.26	1.25
22.600	1.24	1.23	1.21	1.20	1.19
23.100	1.18	1.17	1.16	1.14	1.13
23.600	1.12	1.11	1.10	1.08	1.07
24.100	1.05	1.02	0.98	0.92	0.84
24.600	0.76	0.67	0.57	0.48	0.40
25.100	0.33	0.27	0.22	0.18	0.15
25.600	0.12	0.10	0.08	0.06	0.05
26.100	0.04	0.03	0.03	0.02	0.02

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 10 years
Label: PERVIOUS Storm Event: TypeIII 24hr (5.1 in)

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
26.600	0.01	0.01	0.01	0.01	0.01
27.100	0.00	0.00	0.00	0.00	0.00
27.600	0.00	(N/A)	(N/A)	(N/A)	(N/A)

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table)
Label: PERVIOUS

Return Event: 100 years
Storm Event: TypeIII 24hr (8.6 in)

Storm Event	TypeIII 24hr (8.6 in)
Return Event	100 years
Duration	72.000 hours
Depth	8.6 in
Time of Concentration (Composite)	1.220 hours
Area (User Defined)	33.280 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
8.600	0.00	0.00	0.00	0.01	0.02
9.100	0.03	0.06	0.10	0.15	0.21
9.600	0.28	0.37	0.46	0.57	0.69
10.100	0.82	0.96	1.12	1.28	1.46
10.600	1.65	1.87	2.10	2.34	2.62
11.100	2.91	3.23	3.60	4.00	4.49
11.600	5.12	5.88	7.18	8.97	11.99
12.100	16.48	21.86	29.45	37.08	44.76
12.600	50.50	55.16	56.65	56.59	54.93
13.100	51.37	47.36	42.84	38.61	34.57
13.600	31.34	28.37	25.84	23.70	21.76
14.100	20.18	18.75	17.48	16.42	15.43
14.600	14.60	13.85	13.16	12.58	12.04
15.100	11.56	11.13	10.72	10.36	10.00
15.600	9.66	9.34	9.02	8.71	8.41
16.100	8.13	7.86	7.60	7.35	7.12
16.600	6.89	6.69	6.49	6.30	6.13
17.100	5.97	5.82	5.68	5.54	5.41
17.600	5.28	5.15	5.03	4.91	4.79
18.100	4.68	4.56	4.45	4.34	4.24
18.600	4.14	4.05	3.97	3.89	3.82
19.100	3.76	3.71	3.65	3.61	3.56
19.600	3.52	3.48	3.44	3.40	3.36
20.100	3.32	3.29	3.25	3.22	3.18
20.600	3.15	3.12	3.09	3.06	3.03
21.100	3.00	2.97	2.95	2.92	2.89
21.600	2.87	2.84	2.81	2.79	2.76
22.100	2.74	2.71	2.69	2.66	2.63
22.600	2.61	2.58	2.56	2.53	2.51
23.100	2.48	2.46	2.43	2.40	2.38
23.600	2.35	2.33	2.30	2.28	2.24
24.100	2.20	2.14	2.05	1.94	1.77

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table)
Label: PERVIOUS

Return Event: 100 years
Storm Event: TypeIII 24hr (8.6 in)

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
24.600	1.59	1.40	1.20	1.01	0.85
25.100	0.69	0.56	0.46	0.37	0.31
25.600	0.25	0.20	0.17	0.14	0.11
26.100	0.09	0.07	0.06	0.05	0.04
26.600	0.03	0.02	0.02	0.02	0.01
27.100	0.01	0.01	0.01	0.00	0.00
27.600	0.00	0.00	(N/A)	(N/A)	(N/A)

PFV RESIDENTIAL

Subsection: Time vs. Volume
Label: NW BASIN

Return Event: 100 years
Storm Event: TypeIII 24hr (8.6 in)

Time vs. Volume (ac-ft)

Output Time increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.001
1.000	0.001	0.002	0.004	0.006	0.008
1.500	0.011	0.016	0.021	0.027	0.035
2.000	0.043	0.052	0.062	0.074	0.085
2.500	0.099	0.111	0.126	0.141	0.156
3.000	0.174	0.190	0.208	0.227	0.245
3.500	0.265	0.286	0.306	0.329	0.353
4.000	0.374	0.398	0.423	0.449	0.473
4.500	0.499	0.527	0.555	0.582	0.610
5.000	0.640	0.672	0.701	0.731	0.763
5.500	0.796	0.830	0.861	0.894	0.928
6.000	0.964	1.001	1.035	1.071	1.107
6.500	1.146	1.186	1.224	1.263	1.304
7.000	1.347	1.392	1.437	1.482	1.529
7.500	1.578	1.631	1.685	1.737	1.792
8.000	1.850	1.911	1.973	2.034	2.098
8.500	2.165	2.235	2.306	2.378	2.454
9.000	2.535	2.619	2.703	2.793	2.888
9.500	2.987	3.088	3.195	3.309	3.424
10.000	3.544	3.672	3.804	3.939	4.083
10.500	4.233	4.385	4.548	4.719	4.894
11.000	5.082	5.277	5.482	5.702	5.930
11.500	6.176	6.439	6.726	7.049	7.426
12.000	7.883	8.463	9.201	10.133	11.282
12.500	12.635	14.146	15.757	17.397	18.989
13.000	20.488	21.845	23.028	24.011	24.776
13.500	25.344	25.751	26.030	26.205	26.296
14.000	26.320	26.289	26.217	26.110	25.978
14.500	25.826	25.660	25.486	25.307	25.125
15.000	24.945	24.768	24.596	24.429	24.266
15.500	24.108	23.954	23.805	23.660	23.516
16.000	23.374	23.235	23.098	22.963	22.828
16.500	22.692	22.554	22.414	22.273	22.131
17.000	21.988	21.845	21.702	21.558	21.415
17.500	21.273	21.131	20.990	20.849	20.709
18.000	20.569	20.431	20.293	20.155	20.019
18.500	19.883	19.748	19.615	19.482	19.351
19.000	19.221	19.093	18.967	18.842	18.719
19.500	18.599	18.479	18.362	18.247	18.133
20.000	18.021	17.911	17.803	17.696	17.591

PFV RESIDENTIAL

Subsection: Time vs. Volume
Label: NW BASIN

Return Event: 100 years
Storm Event: TypeIII 24hr (8.6 in)

Time vs. Volume (ac-ft)

Output Time increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
20.500	17.487	17.385	17.284	17.185	17.088
21.000	16.992	16.897	16.804	16.712	16.622
21.500	16.533	16.445	16.359	16.274	16.190
22.000	16.107	16.025	15.944	15.865	15.786
22.500	15.709	15.633	15.557	15.483	15.409
23.000	15.336	15.264	15.193	15.123	15.054
23.500	14.985	14.917	14.850	14.784	14.718
24.000	14.653	14.588	14.523	14.457	14.391
24.500	14.322	14.250	14.175	14.097	14.016
25.000	13.931	13.844	13.756	13.666	13.576
25.500	13.485	13.394	13.304	13.214	13.125
26.000	13.037	12.950	12.864	12.779	12.695
26.500	12.612	12.530	12.450	12.370	12.292
27.000	12.215	12.139	12.064	11.990	11.917
27.500	11.846	11.775	11.706	11.637	11.569
28.000	11.503	11.437	11.372	11.308	11.245
28.500	11.183	11.122	11.062	11.002	10.943
29.000	10.884	10.826	10.769	10.713	10.658
29.500	10.603	10.549	10.496	10.444	10.391
30.000	10.339	10.288	10.237	10.187	10.137
30.500	10.088	10.040	9.992	9.944	9.897
31.000	9.851	9.805	9.759	9.713	9.668
31.500	9.623	9.578	9.534	9.490	9.446
32.000	9.403	9.360	9.317	9.274	9.232
32.500	9.190	9.148	9.106	9.064	9.022
33.000	8.981	8.939	8.898	8.856	8.815
33.500	8.774	8.734	8.693	8.653	8.612
34.000	8.572	8.532	8.491	8.451	8.410
34.500	8.370	8.330	8.291	8.251	8.211
35.000	8.172	8.133	8.094	8.055	8.016
35.500	7.977	7.938	7.899	7.860	7.822
36.000	7.783	7.745	7.706	7.668	7.630
36.500	7.592	7.554	7.517	7.479	7.442
37.000	7.405	7.367	7.330	7.292	7.255
37.500	7.218	7.181	7.144	7.107	7.071
38.000	7.034	6.998	6.962	6.926	6.890
38.500	6.854	6.818	6.782	6.746	6.710
39.000	6.674	6.639	6.603	6.568	6.533
39.500	6.497	6.462	6.428	6.393	6.358
40.000	6.324	6.289	6.255	6.221	6.186
40.500	6.151	6.117	6.083	6.049	6.014

PFV RESIDENTIAL

Subsection: Time vs. Volume
Label: NW BASIN

Return Event: 100 years
Storm Event: TypeIII 24hr (8.6 in)

Time vs. Volume (ac-ft)

Output Time increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
41.000	5.981	5.947	5.913	5.880	5.846
41.500	5.813	5.780	5.747	5.715	5.682
42.000	5.649	5.615	5.582	5.548	5.515
42.500	5.483	5.450	5.418	5.386	5.354
43.000	5.322	5.291	5.259	5.228	5.197
43.500	5.166	5.134	5.102	5.070	5.038
44.000	5.007	4.975	4.944	4.913	4.882
44.500	4.852	4.822	4.791	4.761	4.732
45.000	4.702	4.673	4.642	4.612	4.581
45.500	4.551	4.520	4.490	4.461	4.431
46.000	4.402	4.373	4.344	4.315	4.286
46.500	4.258	4.230	4.202	4.173	4.143
47.000	4.114	4.085	4.056	4.028	3.999
47.500	3.971	3.943	3.915	3.888	3.861
48.000	3.833	3.806	3.780	3.753	3.725
48.500	3.697	3.669	3.642	3.614	3.587
49.000	3.560	3.533	3.507	3.481	3.454
49.500	3.428	3.403	3.377	3.352	3.326
50.000	3.299	3.272	3.246	3.220	3.194
50.500	3.168	3.143	3.118	3.093	3.068
51.000	3.043	3.019	2.995	2.971	2.946
51.500	2.920	2.895	2.870	2.845	2.821
52.000	2.797	2.772	2.749	2.725	2.701
52.500	2.678	2.655	2.632	2.609	2.585
53.000	2.561	2.538	2.514	2.491	2.467
53.500	2.444	2.422	2.399	2.377	2.355
54.000	2.333	2.311	2.289	2.268	2.245
54.500	2.222	2.200	2.177	2.155	2.134
55.000	2.112	2.091	2.069	2.048	2.028
55.500	2.007	1.987	1.966	1.945	1.924
56.000	1.902	1.881	1.860	1.840	1.819
56.500	1.799	1.779	1.759	1.739	1.720
57.000	1.701	1.682	1.662	1.641	1.621
57.500	1.601	1.582	1.562	1.543	1.524
58.000	1.506	1.487	1.469	1.451	1.433
58.500	1.415	1.396	1.377	1.358	1.339
59.000	1.321	1.303	1.285	1.268	1.251
59.500	1.234	1.217	1.201	1.183	1.165
60.000	1.147	1.130	1.113	1.096	1.079
60.500	1.063	1.047	1.031	1.015	1.000
61.000	0.983	0.966	0.950	0.934	0.918

PFV RESIDENTIAL

Subsection: Time vs. Volume
Label: NW BASIN

Return Event: 100 years
Storm Event: TypeIII 24hr (8.6 in)

Time vs. Volume (ac-ft)

Output Time increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
61.500	0.902	0.887	0.872	0.857	0.843
62.000	0.828	0.813	0.797	0.782	0.767
62.500	0.752	0.737	0.723	0.710	0.696
63.000	0.683	0.669	0.654	0.640	0.626
63.500	0.612	0.599	0.586	0.573	0.561
64.000	0.549	0.536	0.522	0.509	0.496
64.500	0.484	0.472	0.461	0.449	0.438
65.000	0.425	0.413	0.401	0.390	0.379
65.500	0.368	0.358	0.348	0.336	0.325
66.000	0.315	0.304	0.295	0.285	0.276
66.500	0.265	0.256	0.246	0.237	0.229
67.000	0.220	0.211	0.202	0.194	0.186
67.500	0.178	0.170	0.162	0.154	0.147
68.000	0.140	0.133	0.125	0.118	0.112
68.500	0.106	0.100	0.093	0.087	0.081
69.000	0.076	0.071	0.065	0.060	0.056
69.500	0.051	0.046	0.042	0.038	0.035
70.000	0.031	0.027	0.024	0.021	0.018
70.500	0.016	0.013	0.011	0.009	0.007
71.000	0.006	0.005	0.004	0.003	0.003
71.500	0.002	0.002	0.002	0.002	0.001
72.000	0.001	(N/A)	(N/A)	(N/A)	(N/A)

PFV RESIDENTIAL

Subsection: Outlet Input Data
Label: OS1

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Requested Pond Water Surface Elevations	
Minimum (Headwater)	92.16 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	100.70 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Rectangular Weir	4	Forward	2	96.57	100.70
Inlet Box	3	Forward	2	98.62	100.70
Rectangular Weir	1	Forward	2	92.56	100.70
Culvert-Circular	2	Forward	TW	92.16	100.70
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: 1 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	92.56 ft
Weir Length	0.25 ft
Weir Coefficient	2.60 (ft^0.5)/s

PFV RESIDENTIAL

Subsection: Outlet Input Data
Label: OS1

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Structure ID: 2 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	36.0 in
Length	385.00 ft
Length (Computed Barrel)	385.07 ft
Slope (Computed)	0.019 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.007
Kr	0.100
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0018
M	2.0000
C	0.0292
Y	0.7400
T1 ratio (HW/D)	1.053
T2 ratio (HW/D)	1.198
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	95.32 ft	T1 Flow	42.85 ft³/s
T2 Elevation	95.75 ft	T2 Flow	48.97 ft³/s

PFV RESIDENTIAL

Subsection: Outlet Input Data
Label: OS1

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Structure ID: 3 Structure Type: Inlet Box	
Number of Openings	1
Elevation	98.62 ft
Orifice Area	60.0 ft²
Orifice Coefficient	0.600
Weir Length	32.00 ft
Weir Coefficient	2.60 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: 4 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	96.57 ft
Weir Length	4.00 ft
Weir Coefficient	2.60 (ft^0.5)/s

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	40
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

PFV RESIDENTIAL

Subsection: Composite Rating Curve
Label: OS1

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
92.16	0.00	(N/A)	0.00
92.26	0.00	(N/A)	0.00
92.36	0.00	(N/A)	0.00
92.46	0.00	(N/A)	0.00
92.56	0.00	(N/A)	0.00
92.66	0.02	(N/A)	0.00
92.76	0.06	(N/A)	0.00
92.86	0.11	(N/A)	0.00
92.96	0.16	(N/A)	0.00
93.06	0.23	(N/A)	0.00
93.16	0.30	(N/A)	0.00
93.26	0.38	(N/A)	0.00
93.36	0.47	(N/A)	0.00
93.46	0.55	(N/A)	0.00
93.56	0.65	(N/A)	0.00
93.66	0.75	(N/A)	0.00
93.76	0.85	(N/A)	0.00
93.86	0.96	(N/A)	0.00
93.96	1.07	(N/A)	0.00
94.06	1.19	(N/A)	0.00
94.16	1.31	(N/A)	0.00
94.26	1.43	(N/A)	0.00
94.36	1.55	(N/A)	0.00
94.46	1.68	(N/A)	0.00
94.56	1.82	(N/A)	0.00
94.66	1.95	(N/A)	0.00
94.76	2.09	(N/A)	0.00
94.86	2.23	(N/A)	0.00
94.96	2.38	(N/A)	0.00
95.06	2.53	(N/A)	0.00
95.16	2.68	(N/A)	0.00
95.26	2.83	(N/A)	0.00
95.36	2.99	(N/A)	0.00
95.46	3.15	(N/A)	0.00
95.56	3.31	(N/A)	0.00
95.66	3.48	(N/A)	0.00
95.76	3.64	(N/A)	0.00
95.86	3.82	(N/A)	0.00
95.96	3.99	(N/A)	0.00
96.06	4.16	(N/A)	0.00
96.16	4.34	(N/A)	0.00
96.26	4.52	(N/A)	0.00
96.36	4.71	(N/A)	0.00

PFV RESIDENTIAL

Subsection: Composite Rating Curve
Label: OS1

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
96.46	4.89	(N/A)	0.00
96.56	5.08	(N/A)	0.00
96.57	5.10	(N/A)	0.00
96.66	5.54	(N/A)	0.00
96.76	6.30	(N/A)	0.00
96.86	7.23	(N/A)	0.00
96.96	8.30	(N/A)	0.00
97.06	9.51	(N/A)	0.00
97.16	10.82	(N/A)	0.00
97.26	12.24	(N/A)	0.00
97.36	13.75	(N/A)	0.00
97.46	15.34	(N/A)	0.00
97.56	17.02	(N/A)	0.00
97.66	18.76	(N/A)	0.00
97.76	20.59	(N/A)	0.00
97.86	22.48	(N/A)	0.00
97.96	24.44	(N/A)	0.00
98.06	26.47	(N/A)	0.00
98.16	28.57	(N/A)	0.00
98.26	30.72	(N/A)	0.00
98.36	32.94	(N/A)	0.00
98.46	35.22	(N/A)	0.00
98.56	37.53	(N/A)	0.00
98.62	38.94	(N/A)	0.00
98.66	40.57	(N/A)	0.00
98.76	46.53	(N/A)	0.00
98.86	54.17	(N/A)	0.00
98.96	62.75	(N/A)	0.00
99.06	70.30	(N/A)	0.00
99.16	76.96	(N/A)	0.00
99.26	82.68	(N/A)	0.00
99.36	87.45	(N/A)	0.00
99.46	91.12	(N/A)	0.00
99.56	93.70	(N/A)	0.00
99.66	95.25	(N/A)	0.00
99.76	96.20	(N/A)	0.00
99.86	97.08	(N/A)	0.00
99.96	97.97	(N/A)	0.00
100.06	98.84	(N/A)	0.00
100.16	99.69	(N/A)	0.00
100.26	100.42	(N/A)	0.00
100.36	100.80	(N/A)	0.00
100.46	101.18	(N/A)	0.00

PFV RESIDENTIAL

Subsection: Composite Rating Curve — Return Event: 2 years

Label: OS1 — Storm Event: TypeIII 24hr (3.3 in)

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
100.56	101.56	(N/A)	0.00
100.66	101.94	(N/A)	0.00
100.70	102.10	(N/A)	0.00

Contributing Structures
(no Q: 4,3,1,2)
(no Q: 4,3,1,2)
(no Q: 4,3,1,2)
(no Q: 4,3,1,2)
(no Q: 4,3,1,2)
1,2 (no Q: 4,3)
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1,2 (no Q: 4,3)

PFV RESIDENTIAL

Subsection: Composite Rating Curve
Label: OS1

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Composite Outflow Summary

Contributing Structures
1,2 (no Q: 4,3)
1,2 (no Q: 4,3)
1,2 (no Q: 4,3)
1,2 (no Q: 4,3)
1,2 (no Q: 4,3)
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4,1,2 (no Q: 3)
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4,3,1,2
3,2 (no Q: 4,1)
3,2 (no Q: 4,1)
3,2 (no Q: 4,1)
3,2 (no Q: 4,1)

PFV RESIDENTIAL

Subsection: Composite Rating Curve
Label: OS1

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Composite Outflow Summary

Contributing Structures
3,2 (no Q: 4,1)
3,2 (no Q: 4,1)
3,2 (no Q: 4,1)
3,2 (no Q: 4,1)
3,2 (no Q: 4,1)
3,2 (no Q: 4,1)
3,2 (no Q: 4,1)

PFV RESIDENTIAL

Subsection: Elevation-Volume-Flow Table (Pond)
Label: NW BASIN

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	92.16 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.100 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
92.16	0.00	0.000	0.000	0.00	0.00	0.00
92.26	0.00	0.000	0.000	0.00	0.00	0.00
92.36	0.00	0.000	0.002	0.00	0.00	0.03
92.46	0.00	0.000	0.004	0.00	0.00	0.09
92.56	0.00	0.001	0.006	0.00	0.00	0.20
92.66	0.02	0.002	0.010	0.00	0.02	0.41
92.76	0.06	0.003	0.014	0.00	0.06	0.74
92.86	0.11	0.004	0.019	0.00	0.11	1.19
92.96	0.16	0.007	0.025	0.00	0.16	1.78
93.06	0.23	0.010	0.040	0.00	0.23	2.59
93.16	0.30	0.015	0.067	0.00	0.30	3.94
93.26	0.38	0.023	0.100	0.00	0.38	6.03
93.36	0.47	0.035	0.140	0.00	0.47	9.01
93.46	0.55	0.052	0.187	0.00	0.55	13.05
93.56	0.65	0.073	0.241	0.00	0.65	18.30
93.66	0.75	0.100	0.301	0.00	0.75	24.94
93.76	0.85	0.133	0.368	0.00	0.85	33.12
93.86	0.96	0.174	0.441	0.00	0.96	43.00
93.96	1.07	0.222	0.522	0.00	1.07	54.75
94.06	1.19	0.279	0.642	0.00	1.19	68.76
94.16	1.31	0.351	0.801	0.00	1.31	86.31
94.26	1.43	0.440	0.977	0.00	1.43	107.91
94.36	1.55	0.547	1.171	0.00	1.55	133.99
94.46	1.68	0.675	1.382	0.00	1.68	164.96
94.56	1.82	0.824	1.610	0.00	1.82	201.27
94.66	1.95	0.997	1.856	0.00	1.95	243.31
94.76	2.09	1.196	2.120	0.00	2.09	291.53
94.86	2.23	1.422	2.401	0.00	2.23	346.34
94.96	2.38	1.677	2.699	0.00	2.38	408.16

PFV RESIDENTIAL

Subsection: Elevation-Volume-Flow Table (Pond)
Label: NW BASIN

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
95.06	2.53	1.961	2.962	0.00	2.53	477.04
95.16	2.68	2.269	3.201	0.00	2.68	551.75
95.26	2.83	2.601	3.449	0.00	2.83	632.35
95.36	2.99	2.959	3.706	0.00	2.99	719.07
95.46	3.15	3.343	3.973	0.00	3.15	812.13
95.56	3.31	3.754	4.248	0.00	3.31	911.74
95.66	3.48	4.193	4.533	0.00	3.48	1,018.14
95.76	3.64	4.661	4.827	0.00	3.64	1,131.55
95.86	3.82	5.159	5.131	0.00	3.82	1,252.19
95.96	3.99	5.687	5.443	0.00	3.99	1,380.29
96.06	4.16	6.243	5.625	0.00	4.16	1,515.05
96.16	4.34	6.810	5.716	0.00	4.34	1,652.45
96.26	4.52	7.387	5.808	0.00	4.52	1,792.07
96.36	4.71	7.972	5.900	0.00	4.71	1,933.91
96.46	4.89	8.567	5.993	0.00	4.89	2,077.99
96.56	5.08	9.171	6.087	0.00	5.08	2,224.34
96.57	5.10	9.231	6.096	0.00	5.10	2,239.10
96.66	5.54	9.784	6.181	0.00	5.54	2,373.25
96.76	6.30	10.407	6.276	0.00	6.30	2,524.74
96.86	7.23	11.039	6.372	0.00	7.23	2,678.72
96.96	8.30	11.681	6.469	0.00	8.30	2,835.18
97.06	9.51	12.332	6.522	0.00	9.51	2,993.80
97.16	10.82	12.985	6.546	0.00	10.82	3,153.23
97.26	12.24	13.641	6.570	0.00	12.24	3,313.35
97.36	13.75	14.299	6.593	0.00	13.75	3,474.13
97.46	15.34	14.960	6.617	0.00	15.34	3,635.58
97.56	17.02	15.623	6.641	0.00	17.02	3,797.68
97.66	18.76	16.288	6.665	0.00	18.76	3,960.43
97.76	20.59	16.956	6.689	0.00	20.59	4,123.84
97.86	22.48	17.626	6.713	0.00	22.48	4,287.90
97.96	24.44	18.298	6.737	0.00	24.44	4,452.60
98.06	26.47	18.973	6.761	0.00	26.47	4,617.96
98.16	28.57	19.650	6.784	0.00	28.57	4,783.95
98.26	30.72	20.330	6.807	0.00	30.72	4,950.53
98.36	32.94	21.012	6.830	0.00	32.94	5,117.75
98.46	35.22	21.696	6.853	0.00	35.22	5,285.59
98.56	37.53	22.382	6.876	0.00	37.53	5,454.02
98.62	38.94	22.795	6.890	0.00	38.94	5,555.37
98.66	40.57	23.071	6.899	0.00	40.57	5,623.74
98.76	46.53	23.762	6.923	0.00	46.53	5,796.95
98.86	54.17	24.455	6.946	0.00	54.17	5,972.40
98.96	62.75	25.151	6.969	0.00	62.75	6,149.35
99.06	70.30	25.849	6.994	0.00	70.30	6,325.85

PFV RESIDENTIAL

Subsection: Elevation-Volume-Flow Table (Pond)
Label: NW BASIN

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
99.16	76.96	26.550	7.020	0.00	76.96	6,502.08
99.26	82.68	27.253	7.045	0.00	82.68	6,677.98
99.36	87.45	27.959	7.071	0.00	87.45	6,853.56
99.46	91.12	28.667	7.097	0.00	91.12	7,028.66
99.56	93.70	29.378	7.123	0.00	93.70	7,203.28
99.66	95.25	30.092	7.148	0.00	95.25	7,377.51
99.76	96.20	30.808	7.174	0.00	96.20	7,551.77
99.86	97.08	31.527	7.200	0.00	97.08	7,726.58
99.96	97.97	32.248	7.226	0.00	97.97	7,902.02
100.06	98.84	32.972	7.258	0.00	98.84	8,078.12
100.16	99.69	33.700	7.293	0.00	99.69	8,255.04
100.26	100.42	34.431	7.328	0.00	100.42	8,432.68
100.36	100.80	35.165	7.364	0.00	100.80	8,610.83
100.46	101.18	35.904	7.399	0.00	101.18	8,789.84
100.56	101.56	36.645	7.435	0.00	101.56	8,969.71
100.66	101.94	37.390	7.470	0.00	101.94	9,150.43
100.70	102.10	37.690	7.484	0.00	102.10	9,222.97

PFV RESIDENTIAL

Subsection: Elevation-Volume-Flow Table (Pond)
Label: NW BASIN

Return Event: 10 years
Storm Event: TypeIII 24hr (5.1 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	92.16 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.100 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
92.16	0.00	0.000	0.000	0.00	0.00	0.00
92.26	0.00	0.000	0.000	0.00	0.00	0.00
92.36	0.00	0.000	0.002	0.00	0.00	0.03
92.46	0.00	0.000	0.004	0.00	0.00	0.09
92.56	0.00	0.001	0.006	0.00	0.00	0.20
92.66	0.02	0.002	0.010	0.00	0.02	0.41
92.76	0.06	0.003	0.014	0.00	0.06	0.74
92.86	0.11	0.004	0.019	0.00	0.11	1.19
92.96	0.16	0.007	0.025	0.00	0.16	1.78
93.06	0.23	0.010	0.040	0.00	0.23	2.59
93.16	0.30	0.015	0.067	0.00	0.30	3.94
93.26	0.38	0.023	0.100	0.00	0.38	6.03
93.36	0.47	0.035	0.140	0.00	0.47	9.01
93.46	0.55	0.052	0.187	0.00	0.55	13.05
93.56	0.65	0.073	0.241	0.00	0.65	18.30
93.66	0.75	0.100	0.301	0.00	0.75	24.94
93.76	0.85	0.133	0.368	0.00	0.85	33.12
93.86	0.96	0.174	0.441	0.00	0.96	43.00
93.96	1.07	0.222	0.522	0.00	1.07	54.75
94.06	1.19	0.279	0.642	0.00	1.19	68.76
94.16	1.31	0.351	0.801	0.00	1.31	86.31
94.26	1.43	0.440	0.977	0.00	1.43	107.91
94.36	1.55	0.547	1.171	0.00	1.55	133.99
94.46	1.68	0.675	1.382	0.00	1.68	164.96
94.56	1.82	0.824	1.610	0.00	1.82	201.27
94.66	1.95	0.997	1.856	0.00	1.95	243.31
94.76	2.09	1.196	2.120	0.00	2.09	291.53
94.86	2.23	1.422	2.401	0.00	2.23	346.34
94.96	2.38	1.677	2.699	0.00	2.38	408.16

PFV RESIDENTIAL

Subsection: Elevation-Volume-Flow Table (Pond)
Label: NW BASIN

Return Event: 10 years
Storm Event: TypeIII 24hr (5.1 in)

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
95.06	2.53	1.961	2.962	0.00	2.53	477.04
95.16	2.68	2.269	3.201	0.00	2.68	551.75
95.26	2.83	2.601	3.449	0.00	2.83	632.35
95.36	2.99	2.959	3.706	0.00	2.99	719.07
95.46	3.15	3.343	3.973	0.00	3.15	812.13
95.56	3.31	3.754	4.248	0.00	3.31	911.74
95.66	3.48	4.193	4.533	0.00	3.48	1,018.14
95.76	3.64	4.661	4.827	0.00	3.64	1,131.55
95.86	3.82	5.159	5.131	0.00	3.82	1,252.19
95.96	3.99	5.687	5.443	0.00	3.99	1,380.29
96.06	4.16	6.243	5.625	0.00	4.16	1,515.05
96.16	4.34	6.810	5.716	0.00	4.34	1,652.45
96.26	4.52	7.387	5.808	0.00	4.52	1,792.07
96.36	4.71	7.972	5.900	0.00	4.71	1,933.91
96.46	4.89	8.567	5.993	0.00	4.89	2,077.99
96.56	5.08	9.171	6.087	0.00	5.08	2,224.34
96.57	5.10	9.231	6.096	0.00	5.10	2,239.10
96.66	5.54	9.784	6.181	0.00	5.54	2,373.25
96.76	6.30	10.407	6.276	0.00	6.30	2,524.74
96.86	7.23	11.039	6.372	0.00	7.23	2,678.72
96.96	8.30	11.681	6.469	0.00	8.30	2,835.18
97.06	9.51	12.332	6.522	0.00	9.51	2,993.80
97.16	10.82	12.985	6.546	0.00	10.82	3,153.23
97.26	12.24	13.641	6.570	0.00	12.24	3,313.35
97.36	13.75	14.299	6.593	0.00	13.75	3,474.13
97.46	15.34	14.960	6.617	0.00	15.34	3,635.58
97.56	17.02	15.623	6.641	0.00	17.02	3,797.68
97.66	18.76	16.288	6.665	0.00	18.76	3,960.43
97.76	20.59	16.956	6.689	0.00	20.59	4,123.84
97.86	22.48	17.626	6.713	0.00	22.48	4,287.90
97.96	24.44	18.298	6.737	0.00	24.44	4,452.60
98.06	26.47	18.973	6.761	0.00	26.47	4,617.96
98.16	28.57	19.650	6.784	0.00	28.57	4,783.95
98.26	30.72	20.330	6.807	0.00	30.72	4,950.53
98.36	32.94	21.012	6.830	0.00	32.94	5,117.75
98.46	35.22	21.696	6.853	0.00	35.22	5,285.59
98.56	37.53	22.382	6.876	0.00	37.53	5,454.02
98.62	38.94	22.795	6.890	0.00	38.94	5,555.37
98.66	40.54	23.071	6.899	0.00	40.54	5,623.72
98.76	46.53	23.762	6.923	0.00	46.53	5,796.95
98.86	54.17	24.455	6.946	0.00	54.17	5,972.40
98.96	62.75	25.151	6.969	0.00	62.75	6,149.35
99.06	70.30	25.849	6.994	0.00	70.30	6,325.85

PFV RESIDENTIAL

Subsection: Elevation-Volume-Flow Table (Pond)
Label: NW BASIN

Return Event: 10 years
Storm Event: TypeIII 24hr (5.1 in)

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
99.16	76.96	26.550	7.020	0.00	76.96	6,502.08
99.26	82.68	27.253	7.045	0.00	82.68	6,677.98
99.36	87.45	27.959	7.071	0.00	87.45	6,853.56
99.46	91.12	28.667	7.097	0.00	91.12	7,028.66
99.56	93.70	29.378	7.123	0.00	93.70	7,203.28
99.66	95.25	30.092	7.148	0.00	95.25	7,377.51
99.76	96.20	30.808	7.174	0.00	96.20	7,551.77
99.86	97.08	31.527	7.200	0.00	97.08	7,726.58
99.96	97.97	32.248	7.226	0.00	97.97	7,902.02
100.06	98.84	32.972	7.258	0.00	98.84	8,078.12
100.16	99.69	33.700	7.293	0.00	99.69	8,255.04
100.26	100.42	34.431	7.328	0.00	100.42	8,432.68
100.36	100.80	35.165	7.364	0.00	100.80	8,610.83
100.46	101.18	35.904	7.399	0.00	101.18	8,789.84
100.56	101.56	36.645	7.435	0.00	101.56	8,969.71
100.66	101.94	37.390	7.470	0.00	101.94	9,150.43
100.70	102.10	37.690	7.484	0.00	102.10	9,222.97

PFV RESIDENTIAL

Subsection: Elevation-Volume-Flow Table (Pond)
Label: NW BASIN

Return Event: 100 years
Storm Event: TypeIII 24hr (8.6 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	92.16 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.100 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
92.16	0.00	0.000	0.000	0.00	0.00	0.00
92.26	0.00	0.000	0.000	0.00	0.00	0.00
92.36	0.00	0.000	0.002	0.00	0.00	0.03
92.46	0.00	0.000	0.004	0.00	0.00	0.09
92.56	0.00	0.001	0.006	0.00	0.00	0.20
92.66	0.02	0.002	0.010	0.00	0.02	0.41
92.76	0.06	0.003	0.014	0.00	0.06	0.74
92.86	0.11	0.004	0.019	0.00	0.11	1.19
92.96	0.16	0.007	0.025	0.00	0.16	1.78
93.06	0.23	0.010	0.040	0.00	0.23	2.59
93.16	0.30	0.015	0.067	0.00	0.30	3.94
93.26	0.38	0.023	0.100	0.00	0.38	6.03
93.36	0.47	0.035	0.140	0.00	0.47	9.01
93.46	0.55	0.052	0.187	0.00	0.55	13.05
93.56	0.65	0.073	0.241	0.00	0.65	18.30
93.66	0.75	0.100	0.301	0.00	0.75	24.94
93.76	0.85	0.133	0.368	0.00	0.85	33.12
93.86	0.96	0.174	0.441	0.00	0.96	43.00
93.96	1.07	0.222	0.522	0.00	1.07	54.75
94.06	1.19	0.279	0.642	0.00	1.19	68.76
94.16	1.31	0.351	0.801	0.00	1.31	86.31
94.26	1.43	0.440	0.977	0.00	1.43	107.91
94.36	1.55	0.547	1.171	0.00	1.55	133.99
94.46	1.68	0.675	1.382	0.00	1.68	164.96
94.56	1.82	0.824	1.610	0.00	1.82	201.27
94.66	1.95	0.997	1.856	0.00	1.95	243.31
94.76	2.09	1.196	2.120	0.00	2.09	291.53
94.86	2.23	1.422	2.401	0.00	2.23	346.34
94.96	2.38	1.677	2.699	0.00	2.38	408.16

PFV RESIDENTIAL

Subsection: Elevation-Volume-Flow Table (Pond)
Label: NW BASIN

Return Event: 100 years
Storm Event: TypeIII 24hr (8.6 in)

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
95.06	2.53	1.961	2.962	0.00	2.53	477.04
95.16	2.68	2.269	3.201	0.00	2.68	551.75
95.26	2.83	2.601	3.449	0.00	2.83	632.35
95.36	2.99	2.959	3.706	0.00	2.99	719.07
95.46	3.15	3.343	3.973	0.00	3.15	812.13
95.56	3.31	3.754	4.248	0.00	3.31	911.74
95.66	3.48	4.193	4.533	0.00	3.48	1,018.14
95.76	3.64	4.661	4.827	0.00	3.64	1,131.55
95.86	3.82	5.159	5.131	0.00	3.82	1,252.19
95.96	3.99	5.687	5.443	0.00	3.99	1,380.29
96.06	4.16	6.243	5.625	0.00	4.16	1,515.05
96.16	4.34	6.810	5.716	0.00	4.34	1,652.45
96.26	4.52	7.387	5.808	0.00	4.52	1,792.07
96.36	4.71	7.972	5.900	0.00	4.71	1,933.91
96.46	4.89	8.567	5.993	0.00	4.89	2,077.99
96.56	5.08	9.171	6.087	0.00	5.08	2,224.34
96.57	5.10	9.231	6.096	0.00	5.10	2,239.10
96.66	5.54	9.784	6.181	0.00	5.54	2,373.25
96.76	6.30	10.407	6.276	0.00	6.30	2,524.74
96.86	7.23	11.039	6.372	0.00	7.23	2,678.72
96.96	8.30	11.681	6.469	0.00	8.30	2,835.18
97.06	9.51	12.332	6.522	0.00	9.51	2,993.80
97.16	10.82	12.985	6.546	0.00	10.82	3,153.23
97.26	12.24	13.641	6.570	0.00	12.24	3,313.35
97.36	13.75	14.299	6.593	0.00	13.75	3,474.13
97.46	15.34	14.960	6.617	0.00	15.34	3,635.58
97.56	17.02	15.623	6.641	0.00	17.02	3,797.68
97.66	18.76	16.288	6.665	0.00	18.76	3,960.43
97.76	20.59	16.956	6.689	0.00	20.59	4,123.84
97.86	22.48	17.626	6.713	0.00	22.48	4,287.90
97.96	24.44	18.298	6.737	0.00	24.44	4,452.60
98.06	26.47	18.973	6.761	0.00	26.47	4,617.96
98.16	28.57	19.650	6.784	0.00	28.57	4,783.95
98.26	30.72	20.330	6.807	0.00	30.72	4,950.53
98.36	32.94	21.012	6.830	0.00	32.94	5,117.75
98.46	35.22	21.696	6.853	0.00	35.22	5,285.59
98.56	37.53	22.382	6.876	0.00	37.53	5,454.02
98.62	38.94	22.795	6.890	0.00	38.94	5,555.37
98.66	40.54	23.071	6.899	0.00	40.54	5,623.72
98.76	46.53	23.762	6.923	0.00	46.53	5,796.95
98.86	54.17	24.455	6.946	0.00	54.17	5,972.40
98.96	62.75	25.151	6.969	0.00	62.75	6,149.35
99.06	70.30	25.849	6.994	0.00	70.30	6,325.85

PFV RESIDENTIAL

Subsection: Elevation-Volume-Flow Table (Pond)
Label: NW BASIN

Return Event: 100 years
Storm Event: TypeIII 24hr (8.6 in)

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
99.16	76.96	26.550	7.020	0.00	76.96	6,502.08
99.26	82.68	27.253	7.045	0.00	82.68	6,677.98
99.36	87.45	27.959	7.071	0.00	87.45	6,853.56
99.46	91.12	28.667	7.097	0.00	91.12	7,028.66
99.56	93.70	29.378	7.123	0.00	93.70	7,203.28
99.66	95.25	30.092	7.148	0.00	95.25	7,377.51
99.76	96.20	30.808	7.174	0.00	96.20	7,551.77
99.86	97.08	31.527	7.200	0.00	97.08	7,726.58
99.96	97.97	32.248	7.226	0.00	97.97	7,902.02
100.06	98.84	32.972	7.258	0.00	98.84	8,078.12
100.16	99.69	33.700	7.293	0.00	99.69	8,255.04
100.26	100.42	34.431	7.328	0.00	100.42	8,432.68
100.36	100.80	35.165	7.364	0.00	100.80	8,610.83
100.46	101.18	35.904	7.399	0.00	101.18	8,789.84
100.56	101.56	36.645	7.435	0.00	101.56	8,969.71
100.66	101.94	37.390	7.470	0.00	101.94	9,150.43
100.70	102.10	37.690	7.484	0.00	102.10	9,222.97

Subsection: Level Pool Pond Routing Summary
Label: NW BASIN (IN)

Return Event: 2 years
Storm Event: TypeIII 24hr (3.3 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	92.16 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.100 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	67.34 ft³/s	Time to Peak (Flow, In)	12.800 hours
Flow (Peak Outlet)	6.22 ft³/s	Time to Peak (Flow, Outlet)	17.000 hours

Elevation (Water Surface, Peak)	96.75 ft
Volume (Peak)	10.342 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	15.552 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	15.551 ac-ft
Volume (Retained)	0.001 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

PFV RESIDENTIAL

Subsection: Level Pool Pond Routing Summary
Label: NW BASIN (IN)

Return Event: 10 years
Storm Event: TypeIII 24hr (5.1 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	92.16 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.100 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	116.02 ft³/s	Time to Peak (Flow, In)	12.800 hours
Flow (Peak Outlet)	18.77 ft³/s	Time to Peak (Flow, Outlet)	15.300 hours

Elevation (Water Surface, Peak)	97.66 ft
Volume (Peak)	16.289 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	26.556 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	26.555 ac-ft
Volume (Retained)	0.001 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Subsection: Level Pool Pond Routing Summary
Label: NW BASIN (IN)

Return Event: 100 years
Storm Event: TypeIII 24hr (8.6 in)

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	92.16 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.100 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	218.80 ft³/s	Time to Peak (Flow, In)	12.800 hours
Flow (Peak Outlet)	74.77 ft³/s	Time to Peak (Flow, Outlet)	14.000 hours

Elevation (Water Surface, Peak)	99.13 ft
Volume (Peak)	26.320 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	49.633 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	49.632 ac-ft
Volume (Retained)	0.001 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

PFV RESIDENTIAL

Subsection: Pond Routed Hydrograph (total out)
Label: NW BASIN (OUT)

Return Event: 100 years
Storm Event: TypeIII 24hr (8.6 in)

Peak Discharge	74.77 ft³/s
Time to Peak	14.000 hours
Hydrograph Volume	49.632 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.900	0.00	0.01	0.04	0.09	0.14
1.400	0.20	0.26	0.31	0.36	0.41
1.900	0.46	0.51	0.56	0.60	0.65
2.400	0.70	0.75	0.79	0.83	0.88
2.900	0.92	0.96	1.00	1.04	1.09
3.400	1.12	1.16	1.20	1.24	1.27
3.900	1.31	1.34	1.37	1.41	1.44
4.400	1.47	1.50	1.53	1.56	1.59
4.900	1.62	1.65	1.68	1.71	1.74
5.400	1.77	1.79	1.82	1.85	1.87
5.900	1.90	1.93	1.96	1.98	2.01
6.400	2.03	2.06	2.09	2.11	2.14
6.900	2.16	2.19	2.22	2.24	2.27
7.400	2.30	2.33	2.35	2.38	2.41
7.900	2.44	2.47	2.50	2.53	2.56
8.400	2.60	2.63	2.66	2.70	2.73
8.900	2.77	2.80	2.84	2.88	2.92
9.400	2.96	3.00	3.05	3.09	3.14
9.900	3.19	3.23	3.28	3.33	3.38
10.400	3.44	3.49	3.55	3.60	3.66
10.900	3.73	3.79	3.86	3.92	3.99
11.400	4.07	4.14	4.23	4.32	4.42
11.900	4.54	4.68	4.86	5.09	5.97
12.400	7.64	10.12	13.40	17.37	21.84
12.900	26.52	31.23	35.72	40.30	49.27
13.400	58.13	64.84	69.23	72.02	73.68
13.900	74.55	74.77	74.48	73.79	72.78
14.400	71.52	70.04	68.25	66.37	64.44
14.900	62.43	60.21	58.02	55.90	53.87
15.400	52.08	50.34	48.65	47.01	45.65
15.900	44.40	43.18	41.97	40.78	39.92
16.400	39.13	38.59	38.12	37.64	37.16
16.900	36.69	36.20	35.72	35.24	34.76
17.400	34.28	33.81	33.34	32.87	32.41
17.900	31.95	31.50	31.05	30.60	30.17
18.400	29.74	29.31	28.88	28.46	28.05
18.900	27.65	27.24	26.85	26.46	26.08

PFV RESIDENTIAL

Subsection: Pond Routed Hydrograph (total out)
Label: NW BASIN (OUT)

Return Event: 100 years
Storm Event: TypeIII 24hr (8.6 in)

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
19.400	25.71	25.34	24.98	24.63	24.29
19.900	23.96	23.63	23.31	23.00	22.69
20.400	22.39	22.09	21.80	21.52	21.24
20.900	20.96	20.69	20.43	20.17	19.92
21.400	19.68	19.43	19.19	18.96	18.73
21.900	18.51	18.29	18.08	17.86	17.66
22.400	17.45	17.25	17.05	16.85	16.67
22.900	16.48	16.30	16.11	15.93	15.76
23.400	15.58	15.41	15.24	15.08	14.92
23.900	14.76	14.60	14.45	14.29	14.13
24.400	13.97	13.81	13.64	13.47	13.29
24.900	13.10	12.91	12.71	12.50	12.30
25.400	12.10	11.90	11.71	11.51	11.32
25.900	11.12	10.93	10.75	10.58	10.41
26.400	10.24	10.07	9.91	9.75	9.59
26.900	9.44	9.30	9.16	9.02	8.88
27.400	8.74	8.61	8.48	8.35	8.23
27.900	8.12	8.01	7.90	7.79	7.68
28.400	7.58	7.47	7.37	7.27	7.18
28.900	7.09	7.01	6.92	6.84	6.75
29.400	6.67	6.59	6.51	6.43	6.35
29.900	6.28	6.22	6.16	6.09	6.03
30.400	5.97	5.91	5.85	5.80	5.74
30.900	5.68	5.62	5.57	5.52	5.49
31.400	5.45	5.41	5.38	5.34	5.31
31.900	5.27	5.24	5.20	5.17	5.13
32.400	5.10	5.09	5.07	5.06	5.05
32.900	5.03	5.02	5.01	4.99	4.98
33.400	4.97	4.95	4.94	4.93	4.92
33.900	4.90	4.89	4.88	4.86	4.85
34.400	4.84	4.83	4.82	4.80	4.79
34.900	4.78	4.77	4.76	4.74	4.73
35.400	4.72	4.71	4.70	4.68	4.67
35.900	4.66	4.65	4.64	4.62	4.61
36.400	4.60	4.59	4.58	4.56	4.55
36.900	4.54	4.53	4.52	4.51	4.49
37.400	4.48	4.47	4.46	4.45	4.44
37.900	4.43	4.41	4.40	4.39	4.38
38.400	4.37	4.36	4.35	4.33	4.32
38.900	4.31	4.30	4.29	4.28	4.27
39.400	4.26	4.25	4.23	4.22	4.21
39.900	4.20	4.19	4.18	4.17	4.16

PFV RESIDENTIAL

Subsection: Pond Routed Hydrograph (total out)
Label: NW BASIN (OUT)

Return Event: 100 years
Storm Event: TypeIII 24hr (8.6 in)

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
40.400	4.15	4.14	4.12	4.11	4.10
40.900	4.09	4.08	4.07	4.06	4.05
41.400	4.04	4.03	4.02	4.01	4.00
41.900	3.99	3.98	3.96	3.95	3.94
42.400	3.93	3.92	3.91	3.90	3.89
42.900	3.88	3.87	3.86	3.85	3.84
43.400	3.83	3.82	3.81	3.80	3.79
43.900	3.77	3.76	3.75	3.74	3.73
44.400	3.72	3.71	3.70	3.69	3.68
44.900	3.67	3.66	3.65	3.64	3.63
45.400	3.61	3.60	3.59	3.58	3.57
45.900	3.56	3.55	3.54	3.53	3.52
46.400	3.51	3.50	3.49	3.48	3.47
46.900	3.46	3.45	3.44	3.43	3.42
47.400	3.41	3.39	3.38	3.37	3.36
47.900	3.35	3.34	3.33	3.32	3.31
48.400	3.30	3.29	3.28	3.27	3.26
48.900	3.25	3.24	3.23	3.22	3.21
49.400	3.20	3.19	3.18	3.17	3.16
49.900	3.15	3.13	3.12	3.11	3.10
50.400	3.09	3.08	3.07	3.06	3.05
50.900	3.04	3.03	3.02	3.01	3.00
51.400	2.99	2.97	2.96	2.95	2.94
51.900	2.93	2.92	2.91	2.90	2.89
52.400	2.88	2.87	2.86	2.85	2.84
52.900	2.83	2.82	2.80	2.79	2.78
53.400	2.77	2.76	2.75	2.74	2.73
53.900	2.72	2.71	2.70	2.69	2.68
54.400	2.67	2.66	2.65	2.63	2.62
54.900	2.61	2.60	2.59	2.58	2.57
55.400	2.56	2.55	2.54	2.53	2.52
55.900	2.51	2.50	2.49	2.48	2.47
56.400	2.46	2.44	2.43	2.42	2.41
56.900	2.40	2.39	2.38	2.37	2.36
57.400	2.35	2.34	2.33	2.32	2.31
57.900	2.29	2.28	2.27	2.26	2.25
58.400	2.24	2.23	2.22	2.21	2.20
58.900	2.18	2.17	2.16	2.15	2.14
59.400	2.13	2.12	2.11	2.10	2.08
59.900	2.07	2.06	2.05	2.04	2.02
60.400	2.01	2.00	1.99	1.98	1.97
60.900	1.96	1.94	1.93	1.92	1.91

PFV RESIDENTIAL

Subsection: Pond Routed Hydrograph (total out)
Label: NW BASIN (OUT)

Return Event: 100 years
Storm Event: TypeIII 24hr (8.6 in)

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
61.400	1.89	1.88	1.87	1.86	1.84
61.900	1.83	1.82	1.81	1.79	1.78
62.400	1.77	1.76	1.74	1.73	1.72
62.900	1.71	1.69	1.68	1.67	1.65
63.400	1.64	1.62	1.61	1.60	1.58
63.900	1.57	1.56	1.54	1.53	1.51
64.400	1.50	1.48	1.47	1.46	1.44
64.900	1.43	1.41	1.40	1.38	1.36
65.400	1.35	1.33	1.32	1.30	1.28
65.900	1.27	1.25	1.23	1.22	1.20
66.400	1.18	1.16	1.14	1.13	1.11
66.900	1.09	1.07	1.05	1.03	1.01
67.400	0.99	0.97	0.95	0.93	0.91
67.900	0.89	0.87	0.85	0.83	0.81
68.400	0.79	0.77	0.75	0.73	0.71
68.900	0.68	0.66	0.64	0.62	0.60
69.400	0.57	0.55	0.53	0.51	0.48
69.900	0.46	0.43	0.41	0.39	0.36
70.400	0.33	0.31	0.28	0.25	0.22
70.900	0.18	0.15	0.12	0.10	0.08
71.400	0.06	0.05	0.03	0.03	0.02
71.900	0.02	0.01	(N/A)	(N/A)	(N/A)

Summary for Hydrograph Addition at 'NW BASIN'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	IMPERVIOUS
<Catchment to Outflow Node>	PERVIOUS

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	IMPERVIOUS	37.805	12.800	162.15
Flow (From)	PERVIOUS	11.828	12.800	56.65
Flow (In)	NW BASIN	49.633	12.800	218.80

Northwestern Bsn - WQ

APPROVED 2014
NORTHWESTERN BASIN WQ

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21.7 hrs (10% of peak) − 3.45 hrs (peak) = 18.25 hrs (detention time)

∴ approx 51% TSS per BMP Manual

PFV RESIDENTIAL

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
IMPERVIOUS	NJWQ	1	4.679	1.800	43.34
PERVIOUS	NJWQ	1	0.008	2.450	0.08

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
PROPOSED OUT	NJWQ	1	4.685	3.450	3.41

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
NW BASIN (IN)	NJWQ	1	4.686	1.800	43.35	(N/A)	(N/A)
NW BASIN (OUT)	NJWQ	1	4.685	3.450	3.41	95.62	4.012

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table)
Label: IMPERVIOUS

Return Event: 1 years
Storm Event: NJWQ

Storm Event	NJWQ
Return Event	1 years
Duration	48.000 hours
Depth	1.3 in
Time of Concentration (Composite)	1.220 hours
Area (User Defined)	54.270 acres

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
0.300	0.00	0.01	0.03	0.05	0.08
0.550	0.17	0.26	0.35	0.61	0.86
0.800	1.12	1.79	2.60	3.42	4.76
1.050	6.67	8.58	10.76	13.87	16.98
1.300	20.09	23.72	27.37	31.02	33.92
1.550	36.53	39.14	40.95	41.85	42.74
1.800	43.34	42.83	42.32	41.80	40.28
2.050	38.71	37.14	35.15	33.00	30.85
2.300	28.76	26.74	24.73	22.79	21.12
2.550	19.45	17.79	16.40	15.03	13.66
2.800	12.47	11.36	10.25	9.27	8.45
3.050	7.63	6.84	6.24	5.64	5.04
3.300	4.60	4.17	3.74	3.40	3.09
3.550	2.78	2.51	2.29	2.07	1.86
3.800	1.70	1.54	1.37	1.25	1.14
4.050	1.02	0.93	0.84	0.76	0.69
4.300	0.63	0.57	0.51	0.46	0.42
4.550	0.37	0.33	0.30	0.26	0.22
4.800	0.19	0.16	0.13	0.11	0.09
5.050	0.07	0.06	0.05	0.04	0.03
5.300	0.03	0.02	0.02	0.01	0.01
5.550	0.01	0.01	0.00	0.00	0.00
5.800	0.00	0.00	(N/A)	(N/A)	(N/A)

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table)
Label: PERVIOUS

Return Event: 1 years
Storm Event: NJWQ

Storm Event	NJWQ
Return Event	1 years
Duration	48.000 hours
Depth	1.3 in
Time of Concentration (Composite)	1.220 hours
Area (User Defined)	33.280 acres

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
1.500	0.00	0.00	0.00	0.00	0.01
1.750	0.01	0.01	0.02	0.02	0.03
2.000	0.03	0.04	0.05	0.06	0.06
2.250	0.07	0.07	0.07	0.08	0.08
2.500	0.08	0.08	0.08	0.07	0.07
2.750	0.07	0.06	0.06	0.05	0.05
3.000	0.04	0.04	0.04	0.03	0.03
3.250	0.03	0.02	0.02	0.02	0.02
3.500	0.02	0.01	0.01	0.01	0.01
3.750	0.01	0.01	0.01	0.01	0.01
4.000	0.01	0.01	0.00	0.00	0.00
4.250	0.00	0.00	0.00	0.00	0.00
4.500	0.00	0.00	0.00	0.00	0.00
4.750	0.00	0.00	0.00	0.00	(N/A)

PFV RESIDENTIAL

Subsection: Time vs. Volume
Label: NW BASIN

Return Event: 1 years
Storm Event: NJWQ

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.001	0.001	0.002	0.003	0.005
0.750	0.007	0.010	0.015	0.023	0.033
1.000	0.048	0.069	0.098	0.135	0.181
1.250	0.240	0.311	0.396	0.495	0.609
1.500	0.736	0.875	1.024	1.182	1.342
1.750	1.507	1.679	1.844	2.011	2.173
2.000	2.333	2.484	2.631	2.766	2.897
2.250	3.017	3.126	3.229	3.325	3.409
2.500	3.485	3.556	3.620	3.678	3.731
2.750	3.777	3.817	3.852	3.882	3.909
3.000	3.931	3.951	3.967	3.980	3.990
3.250	3.999	4.005	4.009	4.011	4.012 ← Peak @ 3.45 hrs
3.500	4.011	4.009	4.006	4.002	3.997
3.750	3.991	3.984	3.977	3.969	3.961
4.000	3.952	3.942	3.932	3.922	3.911
4.250	3.901	3.890	3.878	3.867	3.855
4.500	3.843	3.831	3.819	3.807	3.795
4.750	3.782	3.770	3.757	3.744	3.731
5.000	3.717	3.703	3.690	3.676	3.662
5.250	3.649	3.635	3.622	3.608	3.595
5.500	3.581	3.568	3.554	3.541	3.528
5.750	3.514	3.501	3.488	3.475	3.462
6.000	3.449	3.436	3.423	3.410	3.397
6.250	3.384	3.372	3.359	3.346	3.333
6.500	3.320	3.306	3.293	3.280	3.267
6.750	3.253	3.240	3.227	3.214	3.201
7.000	3.189	3.176	3.163	3.150	3.138
7.250	3.125	3.112	3.100	3.087	3.075
7.500	3.063	3.050	3.038	3.026	3.014
7.750	3.001	2.989	2.977	2.965	2.953
8.000	2.940	2.928	2.915	2.902	2.890
8.250	2.877	2.865	2.852	2.840	2.828
8.500	2.816	2.803	2.791	2.779	2.767
8.750	2.755	2.743	2.731	2.720	2.708
9.000	2.696	2.685	2.673	2.661	2.650
9.250	2.638	2.627	2.616	2.604	2.592
9.500	2.580	2.568	2.556	2.544	2.532
9.750	2.521	2.509	2.497	2.486	2.474
10.000	2.462	2.451	2.439	2.428	2.417

PFV RESIDENTIAL

Subsection: Time vs. Volume
Label: NW BASIN

Return Event: 1 years
Storm Event: NJWQ

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
10.250	2.405	2.394	2.383	2.372	2.361
10.500	2.350	2.339	2.328	2.317	2.306
10.750	2.295	2.285	2.274	2.263	2.251
11.000	2.240	2.229	2.217	2.206	2.195
11.250	2.184	2.173	2.162	2.151	2.140
11.500	2.129	2.118	2.107	2.097	2.086
11.750	2.075	2.065	2.054	2.044	2.033
12.000	2.023	2.013	2.003	1.992	1.982
12.250	1.972	1.962	1.951	1.940	1.930
12.500	1.919	1.908	1.898	1.887	1.877
12.750	1.866	1.856	1.845	1.835	1.825
13.000	1.815	1.805	1.795	1.784	1.774
13.250	1.765	1.755	1.745	1.735	1.726
13.500	1.716	1.706	1.697	1.687	1.678
13.750	1.668	1.658	1.647	1.637	1.627
14.000	1.617	1.607	1.597	1.587	1.577
14.250	1.568	1.558	1.548	1.539	1.529
14.500	1.520	1.511	1.502	1.492	1.483
14.750	1.474	1.465	1.456	1.447	1.438
15.000	1.430	1.421	1.411	1.401	1.392
15.250	1.382	1.373	1.363	1.354	1.345
15.500	1.335	1.326	1.317	1.308	1.299
15.750	1.290	1.282	1.273	1.264	1.256
16.000	1.247	1.239	1.230	1.222	1.214
16.250	1.205	1.197	1.188	1.179	1.170
16.500	1.161	1.152	1.143	1.135	1.126
16.750	1.117	1.109	1.100	1.092	1.084
17.000	1.076	1.067	1.059	1.051	1.043
17.250	1.035	1.027	1.020	1.012	1.004
17.500	0.997	0.988	0.980	0.971	0.963
17.750	0.955	0.946	0.938	0.930	0.922
18.000	0.914	0.906	0.899	0.891	0.883
18.250	0.876	0.869	0.861	0.854	0.847
18.500	0.839	0.832	0.825	0.817	0.809
18.750	0.802	0.794	0.786	0.778	0.771
19.000	0.763	0.756	0.749	0.742	0.734
19.250	0.727	0.720	0.713	0.707	0.700
19.500	0.693	0.687	0.680	0.673	0.666
19.750	0.659	0.651	0.644	0.637	0.630
20.000	0.623	0.616	0.609	0.603	0.596
20.250	0.590	0.583	0.577	0.571	0.565

PFV RESIDENTIAL

Subsection: Time vs. Volume
Label: NW BASIN

Return Event: 1 years
Storm Event: NJWQ

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
20.500	0.558	0.552	0.546	0.539	0.533
20.750	0.526	0.519	0.513	0.506	0.500
21.000	0.494	0.488	0.481	0.475	0.470
21.250	0.464	0.458	0.453	0.447	0.442
21.500	0.435	0.429	0.423	0.417	0.411
21.750	0.405	0.399	0.393	0.388	0.382
22.000	0.377	0.371	0.366	0.361	0.356
22.250	0.351	0.345	0.339	0.334	0.328
22.500	0.323	0.317	0.312	0.307	0.302
22.750	0.297	0.293	0.288	0.283	0.279
23.000	0.274	0.268	0.263	0.258	0.253
23.250	0.249	0.244	0.240	0.235	0.231
23.500	0.227	0.223	0.218	0.214	0.209
23.750	0.205	0.200	0.196	0.192	0.188
24.000	0.184	0.180	0.176	0.172	0.168
24.250	0.164	0.160	0.156	0.152	0.149
24.500	0.145	0.142	0.138	0.135	0.131
24.750	0.128	0.124	0.120	0.117	0.114
25.000	0.110	0.107	0.104	0.102	0.098
25.250	0.095	0.092	0.089	0.086	0.083
25.500	0.080	0.078	0.075	0.073	0.070
25.750	0.067	0.064	0.062	0.059	0.057
26.000	0.055	0.053	0.050	0.048	0.046
26.250	0.043	0.041	0.039	0.037	0.036
26.500	0.034	0.032	0.030	0.028	0.026
26.750	0.025	0.024	0.022	0.020	0.019
27.000	0.017	0.016	0.015	0.014	0.012
27.250	0.011	0.010	0.010	0.009	0.008
27.500	0.007	0.006	0.006	0.005	0.005
27.750	0.004	0.004	0.004	0.003	0.003
28.000	0.003	0.002	0.002	0.002	0.002
28.250	0.002	0.002	0.002	0.002	0.001
28.500	0.001	0.001	0.001	0.001	0.001
28.750	0.001	0.001	0.001	0.001	0.001
29.000	0.001	0.001	0.001	0.001	0.001
29.250	0.001	0.001	0.001	0.001	0.001
29.500	0.001	0.001	0.001	0.001	0.001
29.750	0.001	0.001	0.001	0.001	0.001
30.000	0.001	0.001	0.001	0.001	0.001
30.250	0.001	0.001	0.001	0.001	0.001
30.500	0.001	0.001	0.001	0.001	0.001

← 10% of peak @ 21.7 hrs

PFV RESIDENTIAL

Subsection: Time vs. Volume
Label: NW BASIN

Return Event: 1 years
Storm Event: NJWQ

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
30.750	0.001	0.001	0.001	0.001	0.001
31.000	0.001	0.001	0.001	0.001	0.001
31.250	0.001	0.001	0.001	0.001	0.001
31.500	0.001	0.001	0.001	0.001	0.001
31.750	0.001	0.001	0.001	0.001	0.001
32.000	0.001	0.001	0.001	0.001	0.001
32.250	0.001	0.001	0.001	0.001	0.001
32.500	0.001	0.001	0.001	0.001	0.001
32.750	0.001	0.001	0.001	0.001	0.001
33.000	0.001	0.001	0.001	0.001	0.001
33.250	0.001	0.001	0.001	0.001	0.001
33.500	0.001	0.001	0.001	0.001	0.001
33.750	0.001	0.001	0.001	0.001	0.001
34.000	0.001	0.001	0.001	0.001	0.001
34.250	0.001	0.001	0.001	0.001	0.001
34.500	0.001	0.001	0.001	0.001	0.001
34.750	0.001	0.001	0.001	0.001	0.001
35.000	0.001	0.001	0.001	0.001	0.001
35.250	0.001	0.001	0.001	0.001	0.001
35.500	0.001	0.001	0.001	0.001	0.001
35.750	0.001	0.001	0.001	0.001	0.001
36.000	0.001	0.001	0.001	0.001	0.001
36.250	0.001	0.001	0.001	0.001	0.001
36.500	0.001	0.001	0.001	0.001	0.001
36.750	0.001	0.001	0.001	0.001	0.001
37.000	0.001	0.001	0.001	0.001	0.001
37.250	0.001	0.001	0.001	0.001	0.001
37.500	0.001	0.001	0.001	0.001	0.001
37.750	0.001	0.001	0.001	0.001	0.001
38.000	0.001	0.001	0.001	0.001	0.001
38.250	0.001	0.001	0.001	0.001	0.001
38.500	0.001	0.001	0.001	0.001	0.001
38.750	0.001	0.001	0.001	0.001	0.001
39.000	0.001	0.001	0.001	0.001	0.001
39.250	0.001	0.001	0.001	0.001	0.001
39.500	0.001	0.001	0.001	0.001	0.001
39.750	0.001	0.001	0.001	0.001	0.001
40.000	0.001	0.001	0.001	0.001	0.001
40.250	0.001	0.001	0.001	0.001	0.001
40.500	0.001	0.001	0.001	0.001	0.001
40.750	0.001	0.001	0.001	0.001	0.001

PFV RESIDENTIAL

Subsection: Time vs. Volume
Label: NW BASIN

Return Event: 1 years
Storm Event: NJWQ

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
41.000	0.001	0.001	0.001	0.001	0.001
41.250	0.001	0.001	0.001	0.001	0.001
41.500	0.001	0.001	0.001	0.001	0.001
41.750	0.001	0.001	0.001	0.001	0.001
42.000	0.001	0.001	0.001	0.001	0.001
42.250	0.001	0.001	0.001	0.001	0.001
42.500	0.001	0.001	0.001	0.001	0.001
42.750	0.001	0.001	0.001	0.001	0.001
43.000	0.001	0.001	0.001	0.001	0.001
43.250	0.001	0.001	0.001	0.001	0.001
43.500	0.001	0.001	0.001	0.001	0.001
43.750	0.001	0.001	0.001	0.001	0.001
44.000	0.001	0.001	0.001	0.001	0.001
44.250	0.001	0.001	0.001	0.001	0.001
44.500	0.001	0.001	0.001	0.001	0.001
44.750	0.001	0.001	0.001	0.001	0.001
45.000	0.001	0.001	0.001	0.001	0.001
45.250	0.001	0.001	0.001	0.001	0.001
45.500	0.001	0.001	0.001	0.001	0.001
45.750	0.001	0.001	0.001	0.001	0.001
46.000	0.001	0.001	0.001	0.001	0.001
46.250	0.001	0.001	0.001	0.001	0.001
46.500	0.001	0.001	0.001	0.001	0.001
46.750	0.001	0.001	0.001	0.001	0.001
47.000	0.001	0.001	0.001	0.001	0.001
47.250	0.001	0.001	0.001	0.001	0.001
47.500	0.001	0.001	0.001	0.001	0.001
47.750	0.001	0.001	0.001	0.001	0.001
48.000	0.001	(N/A)	(N/A)	(N/A)	(N/A)

PFV RESIDENTIAL

Subsection: Outlet Input Data
Label: OS1

Return Event: 1 years
Storm Event: NJWQ

Requested Pond Water Surface Elevations	
Minimum (Headwater)	92.16 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	100.70 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Rectangular Weir	4	Forward	2	96.57	100.70
Inlet Box	3	Forward	2	98.62	100.70
Rectangular Weir	1	Forward	2	92.56	100.70
Culvert-Circular	2	Forward	TW	92.16	100.70
Tailwater Settings	Tailwater			(N/A)	(N/A)

PFV RESIDENTIAL

Subsection: Outlet Input Data
Label: OS1

Return Event: 1 years
Storm Event: NJWQ

Structure ID: 1 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	92.56 ft
Weir Length	0.25 ft
Weir Coefficient	2.60 (ft^0.5)/s

PFV RESIDENTIAL

Subsection: Outlet Input Data
Label: OS1

Return Event: 1 years
Storm Event: NJWQ

Structure ID: 2 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	36.0 in
Length	385.00 ft
Length (Computed Barrel)	385.07 ft
Slope (Computed)	0.019 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.007
Kr	0.100
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0018
M	2.0000
C	0.0292
Y	0.7400
T1 ratio (HW/D)	1.053
T2 ratio (HW/D)	1.198
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	95.32 ft	T1 Flow	42.85 ft^3/s
T2 Elevation	95.75 ft	T2 Flow	48.97 ft^3/s

PFV RESIDENTIAL

Subsection: Outlet Input Data
Label: OS1

Return Event: 1 years
Storm Event: NJWQ

Structure ID: 3 Structure Type: Inlet Box	
Number of Openings	1
Elevation	98.62 ft
Orifice Area	60.0 ft²
Orifice Coefficient	0.600
Weir Length	32.00 ft
Weir Coefficient	2.60 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: 4 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	96.57 ft
Weir Length	4.00 ft
Weir Coefficient	2.60 (ft^0.5)/s

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	40
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

PFV RESIDENTIAL

Subsection: Composite Rating Curve
Label: OS1

Return Event: 1 years
Storm Event: NJWQ

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
92.16	0.00	(N/A)	0.00
92.26	0.00	(N/A)	0.00
92.36	0.00	(N/A)	0.00
92.46	0.00	(N/A)	0.00
92.56	0.00	(N/A)	0.00
92.66	0.02	(N/A)	0.00
92.76	0.06	(N/A)	0.00
92.86	0.11	(N/A)	0.00
92.96	0.16	(N/A)	0.00
93.06	0.23	(N/A)	0.00
93.16	0.30	(N/A)	0.00
93.26	0.38	(N/A)	0.00
93.36	0.47	(N/A)	0.00
93.46	0.55	(N/A)	0.00
93.56	0.65	(N/A)	0.00
93.66	0.75	(N/A)	0.00
93.76	0.85	(N/A)	0.00
93.86	0.96	(N/A)	0.00
93.96	1.07	(N/A)	0.00
94.06	1.19	(N/A)	0.00
94.16	1.31	(N/A)	0.00
94.26	1.43	(N/A)	0.00
94.36	1.55	(N/A)	0.00
94.46	1.68	(N/A)	0.00
94.56	1.82	(N/A)	0.00
94.66	1.95	(N/A)	0.00
94.76	2.09	(N/A)	0.00
94.86	2.23	(N/A)	0.00
94.96	2.38	(N/A)	0.00
95.06	2.53	(N/A)	0.00
95.16	2.68	(N/A)	0.00
95.26	2.83	(N/A)	0.00
95.36	2.99	(N/A)	0.00
95.46	3.15	(N/A)	0.00
95.56	3.31	(N/A)	0.00
95.66	3.48	(N/A)	0.00
95.76	3.64	(N/A)	0.00
95.86	3.82	(N/A)	0.00
95.96	3.99	(N/A)	0.00
96.06	4.16	(N/A)	0.00
96.16	4.34	(N/A)	0.00
96.26	4.52	(N/A)	0.00
96.36	4.71	(N/A)	0.00

PFV RESIDENTIAL

Subsection: Composite Rating Curve
Label: OS1

Return Event: 1 years
Storm Event: NJWQ

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
96.46	4.89	(N/A)	0.00
96.56	5.08	(N/A)	0.00
96.57	5.10	(N/A)	0.00
96.66	5.54	(N/A)	0.00
96.76	6.30	(N/A)	0.00
96.86	7.23	(N/A)	0.00
96.96	8.30	(N/A)	0.00
97.06	9.51	(N/A)	0.00
97.16	10.82	(N/A)	0.00
97.26	12.24	(N/A)	0.00
97.36	13.75	(N/A)	0.00
97.46	15.34	(N/A)	0.00
97.56	17.02	(N/A)	0.00
97.66	18.76	(N/A)	0.00
97.76	20.59	(N/A)	0.00
97.86	22.48	(N/A)	0.00
97.96	24.44	(N/A)	0.00
98.06	26.47	(N/A)	0.00
98.16	28.57	(N/A)	0.00
98.26	30.72	(N/A)	0.00
98.36	32.94	(N/A)	0.00
98.46	35.22	(N/A)	0.00
98.56	37.53	(N/A)	0.00
98.62	38.94	(N/A)	0.00
98.66	40.54	(N/A)	0.00
98.76	46.53	(N/A)	0.00
98.86	54.17	(N/A)	0.00
98.96	62.75	(N/A)	0.00
99.06	70.30	(N/A)	0.00
99.16	76.96	(N/A)	0.00
99.26	82.68	(N/A)	0.00
99.36	87.45	(N/A)	0.00
99.46	91.12	(N/A)	0.00
99.56	93.70	(N/A)	0.00
99.66	95.25	(N/A)	0.00
99.76	96.20	(N/A)	0.00
99.86	97.08	(N/A)	0.00
99.96	97.97	(N/A)	0.00
100.06	98.84	(N/A)	0.00
100.16	99.69	(N/A)	0.00
100.26	100.42	(N/A)	0.00
100.36	100.80	(N/A)	0.00
100.46	101.18	(N/A)	0.00

PFV RESIDENTIAL

Subsection: Composite Rating Curve | Return Event: 1 years
Label: OS1 | Storm Event: NJWQ

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
100.56	101.56	(N/A)	0.00
100.66	101.94	(N/A)	0.00
100.70	102.10	(N/A)	0.00

Contributing Structures
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Composite Outflow Summary

Contributing Structures
1,2 (no Q: 4,3)
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3,2 (no Q: 4,1)
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3,2 (no Q: 4,1)

PFV RESIDENTIAL

Subsection: Composite Rating Curve
Label: OS1

Return Event: 1 years
Storm Event: NJWQ

Composite Outflow Summary

Contributing Structures
3,2 (no Q: 4,1)
3,2 (no Q: 4,1)
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3,2 (no Q: 4,1)

PFV RESIDENTIAL

Subsection: Elevation-Volume-Flow Table (Pond)
Label: NW BASIN

Return Event: 1 years
Storm Event: NJWQ

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	92.16 ft
Volume (Initial)	0.000 ac-ft
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 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
92.16	0.00	0.000	0.000	0.00	0.00	0.00
92.26	0.00	0.000	0.000	0.00	0.00	0.01
92.36	0.00	0.000	0.002	0.00	0.00	0.05
92.46	0.00	0.000	0.004	0.00	0.00	0.17
92.56	0.00	0.001	0.006	0.00	0.00	0.40
92.66	0.02	0.002	0.010	0.00	0.02	0.81
92.76	0.06	0.003	0.014	0.00	0.06	1.42
92.86	0.11	0.004	0.019	0.00	0.11	2.27
92.96	0.16	0.007	0.025	0.00	0.16	3.39
93.06	0.23	0.010	0.040	0.00	0.23	4.94
93.16	0.30	0.015	0.067	0.00	0.30	7.58
93.26	0.38	0.023	0.100	0.00	0.38	11.68
93.36	0.47	0.035	0.140	0.00	0.47	17.56
93.46	0.55	0.052	0.187	0.00	0.55	25.54
93.56	0.65	0.073	0.241	0.00	0.65	35.96
93.66	0.75	0.100	0.301	0.00	0.75	49.13
93.76	0.85	0.133	0.368	0.00	0.85	65.38
93.86	0.96	0.174	0.441	0.00	0.96	85.03
93.96	1.07	0.222	0.522	0.00	1.07	108.42
94.06	1.19	0.279	0.642	0.00	1.19	136.33
94.16	1.31	0.351	0.801	0.00	1.31	171.31
94.26	1.43	0.440	0.977	0.00	1.43	214.39
94.36	1.55	0.547	1.171	0.00	1.55	266.42
94.46	1.68	0.675	1.382	0.00	1.68	328.24
94.56	1.82	0.824	1.610	0.00	1.82	400.71
94.66	1.95	0.997	1.856	0.00	1.95	484.67
94.76	2.09	1.196	2.120	0.00	2.09	580.96
94.86	2.23	1.422	2.401	0.00	2.23	690.44
94.96	2.38	1.677	2.699	0.00	2.38	813.94

PFV RESIDENTIAL

Subsection: Elevation-Volume-Flow Table (Pond)
Label: NW BASIN

Return Event: 1 years
Storm Event: NJWQ

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
95.06	2.53	1.961	2.962	0.00	2.53	951.55
95.16	2.68	2.269	3.201	0.00	2.68	1,100.82
95.26	2.83	2.601	3.449	0.00	2.83	1,261.88
95.36	2.99	2.959	3.706	0.00	2.99	1,435.15
95.46	3.15	3.343	3.973	0.00	3.15	1,621.10
95.56	3.31	3.754	4.248	0.00	3.31	1,820.17
95.66	3.48	4.193	4.533	0.00	3.48	2,032.80
95.76	3.64	4.661	4.827	0.00	3.64	2,259.45
95.86	3.82	5.159	5.131	0.00	3.82	2,500.56
95.96	3.99	5.687	5.443	0.00	3.99	2,756.58
96.06	4.16	6.243	5.625	0.00	4.16	3,025.94
96.16	4.34	6.810	5.716	0.00	4.34	3,300.56
96.26	4.52	7.387	5.808	0.00	4.52	3,579.61
96.36	4.71	7.972	5.900	0.00	4.71	3,863.11
96.46	4.89	8.567	5.993	0.00	4.89	4,151.09
96.56	5.08	9.171	6.087	0.00	5.08	4,443.61
96.57	5.10	9.231	6.096	0.00	5.10	4,473.11
96.66	5.54	9.784	6.181	0.00	5.54	4,740.95
96.76	6.30	10.407	6.276	0.00	6.30	5,043.18
96.86	7.23	11.039	6.372	0.00	7.23	5,350.22
96.96	8.30	11.681	6.469	0.00	8.30	5,662.05
97.06	9.51	12.332	6.522	0.00	9.51	5,978.08
97.16	10.82	12.985	6.546	0.00	10.82	6,295.64
97.26	12.24	13.641	6.570	0.00	12.24	6,614.46
97.36	13.75	14.299	6.593	0.00	13.75	6,934.52
97.46	15.34	14.960	6.617	0.00	15.34	7,255.81
97.56	17.02	15.623	6.641	0.00	17.02	7,578.34
97.66	18.76	16.288	6.665	0.00	18.76	7,902.10
97.76	20.59	16.956	6.689	0.00	20.59	8,227.09
97.86	22.48	17.626	6.713	0.00	22.48	8,553.32
97.96	24.44	18.298	6.737	0.00	24.44	8,880.76
98.06	26.47	18.973	6.761	0.00	26.47	9,209.45
98.16	28.57	19.650	6.784	0.00	28.57	9,539.32
98.26	30.72	20.330	6.807	0.00	30.72	9,870.34
98.36	32.94	21.012	6.830	0.00	32.94	10,202.56
98.46	35.22	21.696	6.853	0.00	35.22	10,535.96
98.56	37.53	22.382	6.876	0.00	37.53	10,870.52
98.62	38.94	22.795	6.890	0.00	38.94	11,071.81
98.66	40.54	23.071	6.899	0.00	40.54	11,206.89
98.76	46.53	23.762	6.923	0.00	46.53	11,547.37
98.86	54.17	24.455	6.946	0.00	54.17	11,890.63
98.96	62.75	25.151	6.969	0.00	62.75	12,235.96
99.06	70.30	25.849	6.994	0.00	70.30	12,581.40

PFV RESIDENTIAL

Subsection: Elevation-Volume-Flow Table (Pond)
Label: NW BASIN

Return Event: 1 years
Storm Event: NJWQ

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
99.16	76.96	26.550	7.020	0.00	76.96	12,927.19
99.26	82.68	27.253	7.045	0.00	82.68	13,273.28
99.36	87.45	27.959	7.071	0.00	87.45	13,619.66
99.46	91.12	28.667	7.097	0.00	91.12	13,966.19
99.56	93.70	29.378	7.123	0.00	93.70	14,312.87
99.66	95.25	30.092	7.148	0.00	95.25	14,659.77
99.76	96.20	30.808	7.174	0.00	96.20	15,007.33
99.86	97.08	31.527	7.200	0.00	97.08	15,356.08
99.96	97.97	32.248	7.226	0.00	97.97	15,706.08
100.06	98.84	32.972	7.258	0.00	98.84	16,057.41
100.16	99.69	33.700	7.293	0.00	99.69	16,410.39
100.26	100.42	34.431	7.328	0.00	100.42	16,764.94
100.36	100.80	35.165	7.364	0.00	100.80	17,120.86
100.46	101.18	35.904	7.399	0.00	101.18	17,478.50
100.56	101.56	36.645	7.435	0.00	101.56	17,837.85
100.66	101.94	37.390	7.470	0.00	101.94	18,198.92
100.70	102.10	37.690	7.484	0.00	102.10	18,343.84

PFV RESIDENTIAL

Subsection: Pond Routed Hydrograph (total out)
Label: NW BASIN (OUT)

Return Event: 1 years
Storm Event: NJWQ

Peak Discharge	3.41 ft³/s
Time to Peak	3.450 hours
Hydrograph Volume	4.685 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.500	0.00	0.01	0.03	0.06	0.11
0.750	0.17	0.24	0.30	0.38	0.45
1.000	0.54	0.64	0.74	0.86	0.98
1.250	1.11	1.24	1.37	1.50	1.62
1.500	1.74	1.86	1.97	2.08	2.19
1.750	2.29	2.38	2.47	2.55	2.63
2.000	2.71	2.78	2.85	2.91	2.96
2.250	3.02	3.06	3.11	3.15	3.18
2.500	3.21	3.24	3.26	3.28	3.30
2.750	3.32	3.34	3.35	3.36	3.37
3.000	3.38	3.39	3.39	3.40	3.40
3.250	3.41	3.41	3.41	3.41	3.41
3.500	3.41	3.41	3.41	3.41	3.40
3.750	3.40	3.40	3.40	3.39	3.39
4.000	3.39	3.38	3.38	3.38	3.37
4.250	3.37	3.36	3.36	3.36	3.35
4.500	3.35	3.34	3.34	3.33	3.33
4.750	3.32	3.32	3.31	3.31	3.30
5.000	3.30	3.29	3.29	3.28	3.28
5.250	3.27	3.27	3.26	3.26	3.25
5.500	3.25	3.24	3.24	3.23	3.23
5.750	3.22	3.22	3.21	3.21	3.20
6.000	3.19	3.19	3.18	3.18	3.17
6.250	3.17	3.16	3.16	3.15	3.15
6.500	3.14	3.14	3.13	3.13	3.12
6.750	3.12	3.11	3.11	3.10	3.09
7.000	3.09	3.08	3.08	3.07	3.07
7.250	3.06	3.06	3.05	3.05	3.04
7.500	3.04	3.03	3.03	3.02	3.01
7.750	3.01	3.00	3.00	2.99	2.99
8.000	2.98	2.98	2.97	2.97	2.96
8.250	2.96	2.95	2.95	2.94	2.93
8.500	2.93	2.92	2.92	2.91	2.91
8.750	2.90	2.90	2.89	2.89	2.88
9.000	2.88	2.87	2.87	2.86	2.86
9.250	2.85	2.84	2.84	2.83	2.83
9.500	2.82	2.82	2.81	2.81	2.80

PFV RESIDENTIAL

Subsection: Pond Routed Hydrograph (total out)
Label: NW BASIN (OUT)

Return Event: 1 years
Storm Event: NJWQ

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
9.750	2.80	2.79	2.79	2.78	2.78
10.000	2.77	2.76	2.76	2.75	2.75
10.250	2.74	2.74	2.73	2.73	2.72
10.500	2.72	2.71	2.71	2.70	2.70
10.750	2.69	2.69	2.68	2.68	2.67
11.000	2.66	2.66	2.65	2.65	2.64
11.250	2.64	2.63	2.63	2.62	2.62
11.500	2.61	2.61	2.60	2.60	2.59
11.750	2.58	2.58	2.57	2.57	2.56
12.000	2.56	2.55	2.55	2.54	2.54
12.250	2.53	2.53	2.52	2.52	2.51
12.500	2.51	2.50	2.50	2.49	2.48
12.750	2.48	2.47	2.47	2.46	2.46
13.000	2.45	2.45	2.44	2.44	2.43
13.250	2.43	2.42	2.42	2.41	2.41
13.500	2.40	2.40	2.39	2.39	2.38
13.750	2.37	2.37	2.36	2.36	2.35
14.000	2.35	2.34	2.34	2.33	2.32
14.250	2.32	2.31	2.31	2.30	2.30
14.500	2.29	2.29	2.28	2.28	2.27
14.750	2.27	2.26	2.25	2.25	2.24
15.000	2.24	2.23	2.23	2.22	2.22
15.250	2.21	2.20	2.20	2.19	2.19
15.500	2.18	2.18	2.17	2.17	2.16
15.750	2.15	2.15	2.14	2.14	2.13
16.000	2.13	2.12	2.12	2.11	2.10
16.250	2.10	2.09	2.09	2.08	2.08
16.500	2.07	2.06	2.06	2.05	2.05
16.750	2.04	2.03	2.03	2.02	2.02
17.000	2.01	2.00	2.00	1.99	1.99
17.250	1.98	1.98	1.97	1.96	1.96
17.500	1.95	1.95	1.94	1.93	1.93
17.750	1.92	1.92	1.91	1.90	1.90
18.000	1.89	1.88	1.88	1.87	1.87
18.250	1.86	1.85	1.85	1.84	1.84
18.500	1.83	1.82	1.82	1.81	1.81
18.750	1.80	1.79	1.79	1.78	1.77
19.000	1.77	1.76	1.75	1.75	1.74
19.250	1.73	1.73	1.72	1.72	1.71
19.500	1.70	1.70	1.69	1.68	1.68
19.750	1.67	1.66	1.66	1.65	1.64
20.000	1.63	1.63	1.62	1.61	1.61

PFV RESIDENTIAL

Subsection: Pond Routed Hydrograph (total out)
Label: NW BASIN (OUT)

Return Event: 1 years
Storm Event: NJWQ

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
20.250	1.60	1.59	1.59	1.58	1.57
20.500	1.57	1.56	1.55	1.55	1.54
20.750	1.53	1.52	1.52	1.51	1.50
21.000	1.50	1.49	1.48	1.47	1.47
21.250	1.46	1.45	1.45	1.44	1.43
21.500	1.42	1.42	1.41	1.40	1.39
21.750	1.38	1.38	1.37	1.36	1.35
22.000	1.35	1.34	1.33	1.32	1.31
22.250	1.31	1.30	1.29	1.28	1.27
22.500	1.26	1.26	1.25	1.24	1.23
22.750	1.22	1.21	1.20	1.20	1.19
23.000	1.18	1.17	1.16	1.15	1.14
23.250	1.13	1.12	1.11	1.10	1.09
23.500	1.09	1.08	1.07	1.06	1.05
23.750	1.04	1.03	1.02	1.01	1.00
24.000	0.99	0.98	0.97	0.96	0.95
24.250	0.94	0.93	0.92	0.91	0.90
24.500	0.89	0.88	0.87	0.86	0.85
24.750	0.84	0.83	0.82	0.81	0.80
25.000	0.79	0.78	0.77	0.76	0.74
25.250	0.73	0.72	0.71	0.70	0.69
25.500	0.68	0.67	0.66	0.65	0.64
25.750	0.63	0.61	0.60	0.59	0.58
26.000	0.57	0.56	0.55	0.54	0.52
26.250	0.51	0.50	0.49	0.48	0.47
26.500	0.46	0.44	0.43	0.42	0.40
26.750	0.39	0.38	0.37	0.35	0.34
27.000	0.33	0.31	0.30	0.29	0.27
27.250	0.26	0.24	0.23	0.21	0.19
27.500	0.17	0.16	0.14	0.13	0.11
27.750	0.10	0.09	0.08	0.07	0.06
28.000	0.06	0.05	0.04	0.04	0.03
28.250	0.03	0.03	0.02	0.02	0.02
28.500	0.02	0.01	0.01	0.01	0.01
28.750	0.01	0.01	0.01	0.01	0.01
29.000	0.01	0.00	0.00	0.00	0.00
29.250	0.00	0.00	0.00	0.00	0.00
29.500	0.00	0.00	0.00	0.00	0.00
29.750	0.00	0.00	(N/A)	(N/A)	(N/A)

Summary for Hydrograph Addition at 'NW BASIN'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	IMPERVIOUS
<Catchment to Outflow Node>	PERVIOUS

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	IMPERVIOUS	4.679	1.800	43.34
Flow (From)	PERVIOUS	0.008	2.450	0.08
Flow (In)	NW BASIN	4.686	1.800	43.35

PFV RESIDENTIAL

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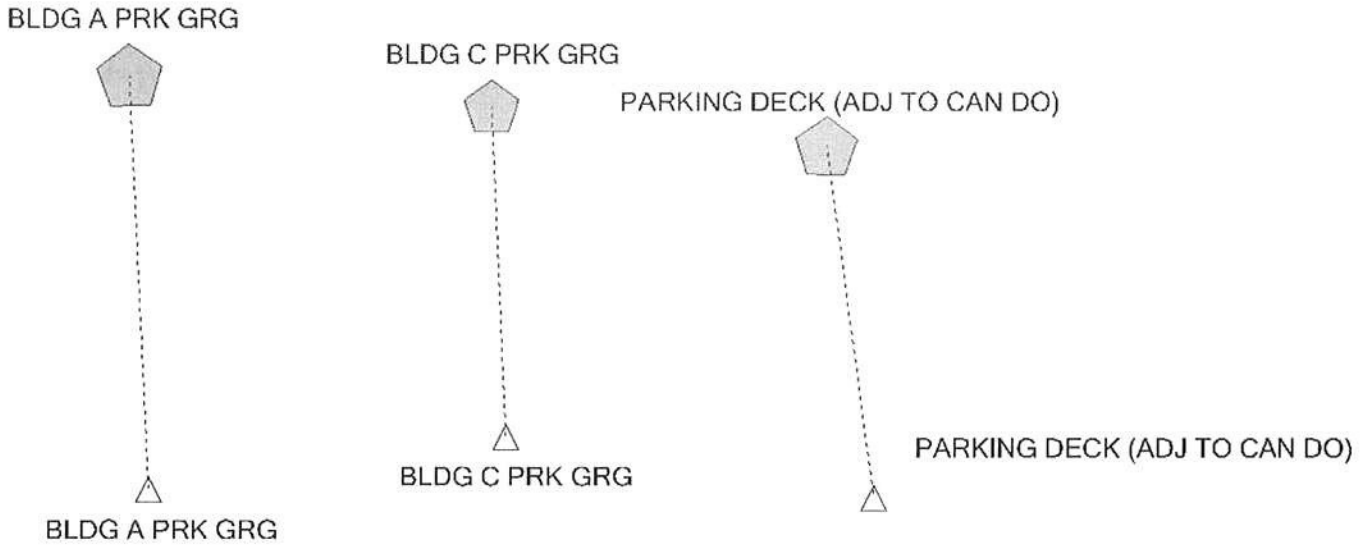

↑

Bldg B is the same size as Bldg A

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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
BLDG A PRK GRG	NJWQ	1	0.052	1.100	1.74
BLDG C PRK GRG	NJWQ	1	0.061	1.100	2.03
PARKING DECK (ADJ TO CAN DO)	NJWQ	1	0.114	1.100	3.78

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
BLDG A PRK GRG	NJWQ	1	0.052	1.100	1.74
BLDG C PRK GRG	NJWQ	1	0.061	1.100	2.03
PARKING DECK (ADJ TO CAN DO)	NJWQ	1	0.114	1.100	3.78

WQ flow for MTD

Subsection: Time of Concentration Calculations
Label: BLDG A PRK GRG

Return Event: 1 years
Storm Event: NJWQ

Time of Concentration Results

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

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

PFV RESIDENTIAL

Subsection: Time of Concentration Calculations
Label: BLDG A PRK GRG

Return Event: 1 years
Storm Event: NJWQ

==== User Defined

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

PFV RESIDENTIAL

Subsection: Time of Concentration Calculations
Label: BLDG C PRK GRG

Return Event: 1 years
Storm Event: NJWQ

Time of Concentration Results

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

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

PFV RESIDENTIAL

Subsection: Time of Concentration Calculations
Label: BLDG C PRK GRG

Return Event: 1 years
Storm Event: NJWQ

==== User Defined

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

PFV RESIDENTIAL

Subsection: Time of Concentration Calculations
Label: PARKING DECK (ADJ TO CAN DO)

Return Event: 1 years
Storm Event: NJWQ

Time of Concentration Results

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

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

PFV RESIDENTIAL

Subsection: Time of Concentration Calculations
Label: PARKING DECK (ADJ TO CAN DO)

Return Event: 1 years
Storm Event: NJWQ

==== User Defined

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

PFV RESIDENTIAL

Subsection: Runoff CN-Area
Label: BLDG A PRK GRG

Return Event: 1 years
Storm Event: NJWQ

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
IMPERVIOUS	98.000	0.600	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.600	(N/A)	(N/A)	98.000

PFV RESIDENTIAL

Subsection: Runoff CN-Area
Label: BLDG C PRK GRG

Return Event: 1 years
Storm Event: NJWQ

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
VEHICULAR PAVEMENT	98.000	0.700	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.700	(N/A)	(N/A)	98.000

PFV RESIDENTIAL

Subsection: Runoff CN-Area
Label: PARKING DECK (ADJ TO CAN DO)

Return Event: 1 years
Storm Event: NJWQ

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
IMPERVIOUS	98.000	1.300	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	1.300	(N/A)	(N/A)	98.000

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table)
Label: BLDG A PRK GRG

Return Event: 1 years
Storm Event: NJWQ

Storm Event	NJWQ
Return Event	1 years
Duration	72.000 hours
Depth	1.3 in
Time of Concentration (Composite)	0.100 hours
Area (User Defined)	0.600 acres

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
0.300	0.00	0.01	0.05	0.10	0.14
0.800	0.20	0.42	1.28	1.74	0.86
1.300	0.41	0.25	0.23	0.19	0.18
1.800	0.15	0.07	0.06	0.01	0.00
2.300	0.00	(N/A)	(N/A)	(N/A)	(N/A)

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table)
Label: BLDG C PRK GRG

Return Event: 1 years
Storm Event: NJWQ

Storm Event	NJWQ
Return Event	1 years
Duration	72.000 hours
Depth	1.3 in
Time of Concentration (Composite)	0.100 hours
Area (User Defined)	0.700 acres

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
0.300	0.00	0.02	0.06	0.11	0.16
0.800	0.23	0.49	1.49	2.03	1.00
1.300	0.48	0.30	0.27	0.22	0.21
1.800	0.17	0.08	0.07	0.02	0.00
2.300	0.00	(N/A)	(N/A)	(N/A)	(N/A)

PFV RESIDENTIAL

Subsection: Unit Hydrograph (Hydrograph Table)
Label: PARKING DECK (ADJ TO CAN DO)

Return Event: 1 years
Storm Event: NJWQ

Storm Event	NJWQ
Return Event	1 years
Duration	72.000 hours
Depth	1.3 in
Time of Concentration (Composite)	0.100 hours
Area (User Defined)	1.300 acres

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
0.300	0.00	0.03	0.11	0.21	0.30
0.800	0.42	0.91	2.77	3.78	1.85
1.300	0.90	0.55	0.51	0.41	0.39
1.800	0.32	0.15	0.12	0.03	0.00
2.300	0.00	(N/A)	(N/A)	(N/A)	(N/A)

PFV RESIDENTIAL

Subsection: Addition Summary
Label: BLDG A PRK GRG

Return Event: 1 years
Storm Event: NJWQ

Summary for Hydrograph Addition at 'BLDG A PRK GRG'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	BLDG A PRK GRG

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	BLDG A PRK GRG	0.052	1.100	1.74
Flow (In)	BLDG A PRK GRG	0.052	1.100	1.74

Summary for Hydrograph Addition at 'BLDG C PRK GRG'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	BLDG C PRK GRG

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	BLDG C PRK GRG	0.061	1.100	2.03
Flow (In)	BLDG C PRK GRG	0.061	1.100	2.03

Summary for Hydrograph Addition at 'PARKING DECK (ADJ TO CAN DO)'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	PARKING DECK (ADJ TO CAN DO)

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	PARKING DECK (ADJ TO CAN DO)	0.114	1.100	3.78
Flow (In)	PARKING DECK (ADJ TO CAN DO)	0.114	1.100	3.78

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Table 1
Design Flow Capacities
Standard Jellyfish Filter Manhole Configurations

Manhole Diameter (ft / m)[1]	Model No.	Hi-Flo Cartridges[2] 54 in / 1372 mm	Draindown Cartridges[2] 54 in / 1372 mm	Design Treatment Flow Rate (gpm / cfs)	Design Treatment Flow Rate (L / S)	
4 / 1.2	**JF4-2-1**	**2**	**1**	**200 / 0.45**	**12.6**	
6 / 1.8	**JF6-3-1**	**3**	**1**	**280 / 0.62**	**17.7**	
	JF6-4-1	4	1	360 / 0.80	22.7	
	JF6-5-1	5	1	440 / 0.98	27.8	
	JF6-6-1	6	1	520 / 1.16	32.8	
8 / 2.4	**JF8-6-2**	**6**	**2**	**560 / 1.25**	**35.3**	
	JF8-7-2	7	2	640 / 1.43	40.4	
	JF8-8-2	8	2	720 / 1.60	45.0	
	JF8-9-2	9	2	800 / 1.78	50.5	MTD for Bldgs A + B Garage
	JF8-10-2	10	2	880 / 1.96	55.5	←
10 / 3.0	**JF10-11-3**	**11**	**3**	**1000 / 2.23**	**63.1**	← MTD for Bldg C Garage
	JF10-12-3	12	3	1080 / 2.41	68.1	
	JF10-12-4	12	4	1120 / 2.50	70.7	
	JF10-13-4	13	4	1200 / 2.67	75.7	
	JF10-14-4	14	4	1280 / 2.85	80.8	
	JF10-15-4	15	4	1360 / 3.03	85.8	
	JF10-16-4	16	4	1440 / 3.21	90.8	
	JF10-17-4	17	4	1520 / 3.39	95.9	
	JF10-18-4	18	4	1600 / 3.56	100.9	
	JF10-19-4	19	4	1680 / 3.74	106	
	JF12-17-4					
12 / 3.6	**JF12-20-5**	**20**	**5**	**1800 / 4.01**	**113.6**	← MTD for Parking Deck
	JF12-21-5	21	5	1880 / 4.19	118.6	
	JF12-22-5	22	5	1960 / 4.37	123.7	
	JF12-23-5	23	5	2040 / 4.54	128.7	
	JF12-24-5	24	5	2120 / 4.72	133.8	
	JF12-25-5	25	5	2200 / 4.90	138.8	
	JF12-26-5	26	5	2280 / 5.08	143.8	
	JF12-27-5	27	5	2360 / 5.26	148.9	

[1] Smaller and larger systems may be custom designed
[2] Shorter length cartridge configurations are available

ACO StormBrixx®

Geocellular Stormwater Storage Product Maintenance

Prevention
Inspection
Maintenance
Cleaning

ACO StormBrixx® SD and HD

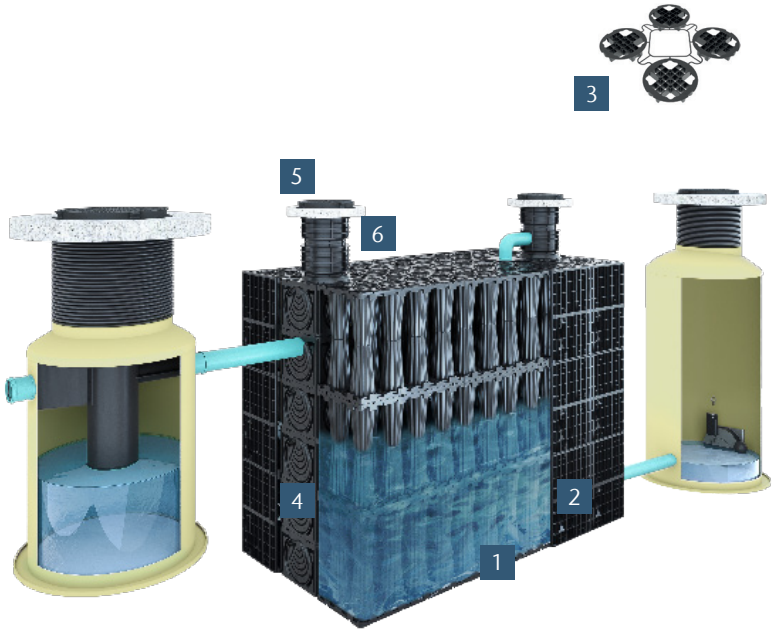
ACO StormBrixx® is a unique and patented geocellular stormwater management system for detention and infiltration usage.

Its versatile design allows the system to be used in configurations and applications across all construction environments as a standalone solution or as part of an integrated LID (Low Impact Development) or BMP (Best Management Practices). Systems may or may not include pre-treatment to remove sediment and/or contaminants prior to entering the storage area. Those without pre-treatment require greater attention to system functionality and may require additional maintenance.

In order to sustain proper system functionality, ACO offers the following general maintenance guidelines for the StormBrixx® product.

Contents

System Components



1. StormBrixx Tank Bodies*
2. Side Panel*
3. Top Cover*
4. Remote Access Unit*
5. Remote Access Cover - Ductile Iron
6. Extension Shaft*

* Image shown represents a StormBrixx® SD system. The Remote Access Unit may be swapped out with the Remote Access Plate. ACO offers vented and non-vented Remote Access Covers.

1 Prevention Measures

1.1 PRIOR TO & DURING CONSTRUCTION

Siltation Prevention of the Stormwater System
Conform to all local, state, and federal regulations for sediment and erosion control during construction.

Install site erosion and sediment BMP's (Best Management Practices) required to prevent siltation of the stormwater system.

Inspect and maintain erosion and sediment BMP's during construction.

1.2 POST CONSTRUCTION

Prior to Commissioning the ACO StormBrixx® System
Remove and properly dispose of construction erosion and sediment BMP's per all local, state, and federal regulations.

Care should be taken during removal of the BMP devices to prevent collected sediment or debris falling into the stormwater system.

Flush the ACO StormBrixx® system to remove any sediment or construction debris immediately after the BMP's removal. Follow the maintenance procedure outlined.

The prevention measures we recommend will increase the efficiency of the installed tank and the life of the entire system.

StormBrixx® is built to be used in areas in which protecting the environment is important. The prevention measures allow for the system as well as the locale it is installed to be sustainable.

StormBrixx® provides top of the line stormwater management solutions for detention, retention, reuse, and infiltration systems. The long term environmental focuses of StormBrixx® through LID, SuDS, MS4, and BMP will benefit the installer, the land owner, and the nearby environment.

Prevention measure

2 Inspections

Follow all local, state, and federal regulations regarding stormwater BMP inspection requirements. The results of the visual inspection, notes and repairs can be recorded in an operating logbook as a recommended best practice. These records will allow decisions to be made about the necessary frequency of future inspection and maintenance measures.

ACO makes the following recommendations:

2.1 VISUAL INSPECTION

Year One
During the first service year a visual inspection should be completed during and after each major rainfall event, in addition to every 6 month period to monitor and establish what sediment and debris buildup occurs.

Each ACO StormBrixx® system is unique to the application and multiple criteria can affect maintenance frequency as such:

- System Design: pre-treatment/no-treatment, inlet protection, stand-alone device.
- Surface area collecting from: hardscape, gravel, soil, or any other surface.
- Adjacent Area: soil runoff, gravel, trash.

2.2 ANNUAL INSPECTION

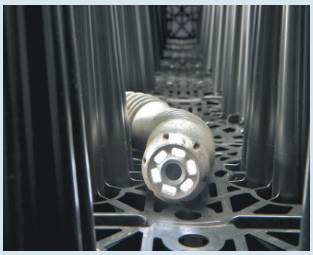
Year Two
Establish an annual inspection frequency based on the information collected during the first year. At a minimum an inspection should be performed at 6 month intervals.

2.3 ITEMS TO INSPECT

Components
- ACO StormBrixx® Remote Access Units/ Plates and inspection ports.
- Inlet and Outlet points.
- Discharge area.

2.4 IDENTIFY AND REPORT

Maintenance required if:
- Sediment and debris accumulation 6” or more.
- System backing up.
- Make operating logbook notes if needed.



Inspection camera

3 Maintenance Procedure

3.1 SURFACE ACCESS

Regulations
Conform to all local, state, and federal regulations.

Access Cover
Locate access cover(s) at the surface connected to the tank.

3.2 SAFETY

Access Cover
Once located, safely open lid and remove.

3.3 SYSTEM INSPECTION

System Debris
Perform an inspection of the tank to locate any debris. This can be done visually, with or without an inspection camera.

3.4 STANDING WATER

Remove Water
If the tank has standing water in it, you will need to vacuum the water first before visually inspecting the tank.

3.5 HIGH PRESSURE

System Clearing
Use the high pressure jet nozzle/wand to loosen and suspend any solid debris that has built up.

Access to high pressure water and vacuum will be needed to clear the tank of any built up debris.

A minimum water pressure of 2,500 PSI is recommended. The maximum pressure depends on the geotextile fabric chosen. Please check with fabric manufacturer for max PSI.

To ensure correct insertion angle of the high pressure jet nozzle, we recommend using a pipe elbow.

Alternatively, a nearby fire hydrant can be used to suspend debris within the StormBrixx® system before vacuuming up the water.

Vacuum removal of debris

Wand used to loosen debris

3 Maintenance Procedure

3.6 WATER LEVEL

Optimal Water Depth
Once the water level has reached 12" or more, shut off and remove high pressure jet nozzle/wand.

3.7 VACUUM HOSE

Remote Access Unit/Plate
Insert vacuum hose via the remote access unit/plate and begin removing all debris that is now suspended in water. Do this until all water has been removed.

3.8 REPEAT

Water and Debris
Not all water and debris may be removed in the first round, you may need to add and remove more water.

3.9 FINAL INSPECTION

Cleared Tank
Once all debris has been removed, inspect tank again to make sure everything has been cleared.

3.10 REMOVE EQUIPMENT

Replace Cover
Once the tank is clear of debris and water, remove all equipment and place the cover back on the tank. Secure cover accordingly.

Final inspection

Camera view of clean tank

For further information on ACO products, please visit the ACO USA website. This allows access to technical data, videos, images, specifications, and installation instructions.

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