

Storm Drainage Report Prepared For Block 516.01, Lot 1.01 Franklin Township Somerset County, New Jersey

October 16, 2019

Prepared For Pillar of Fire 10 Chapel Drive Zarephath, NJ 08890

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1.0 Introduction

This report outlines the results of a hydrologic and hydraulic storm water runoff analysis conducted by Van Cleef Engineering Associates (VCEA) with regard to the proposed construction on Lot 1.01 within Block 516.01 as designated by the Franklin Township Tax Maps. The total area of the lot is 144.8045 acres. The area of disturbance corresponding to this project is 4.25 acres.

This report has been prepared to summarize stormwater analysis design objectives, methodologies and calculations for the conveyance of stormwater runoff from the project area under pre and post-development conditions.

2.0 Site Description

2.1 Existing Conditions

The lot currently contains 6 athletic fields, a cemetery and 18 buildings of various sizes including a school along with appurtenant sidewalks, driveways and parking lots. The total existing impervious coverage is approximately 11.03 acres. The open space consists of grass cover in good condition as well as landscaping around the buildings. The site features a collection of state open waters, wetlands and a detention basin that discharges to the north. Currently, the area to be developed features a swale that collects runoff via overland flow and conveys it to the aforementioned basin. This area is treated as one drainage area 3.05 acres in size with a common point of analysis located at the end of the swale. The site consists of soils belonging to Hydrologic Soil Group A.

2.2 <u>Proposed Conditions</u>

The proposed development of the site involves the expansion of an existing parking lot which will result in 1.58 acres of additional pavement. The additional pavement will consist of 2 sections of porous pavement and one section of standard asphalt pavement.

3.0 Methodology

The assessment of stormwater runoff has been based upon the Soil Conservation Service Methodology as described in Technical Release No. 55 (TR55), "Urban Hydrology for Small Watershed." Theoretical storms are modeled with the 24-hour SCS Unit Dimensionless Hydrograph, utilizing a Type III rainfall distribution and recurrence intervals of 2, 10 and 100 years. Hydrographs Program Version 7.0 (Hydraflow 2012). The program is tailored to model the SCS Method for hydrograph generations and to perform interactive solutions of continuity equation (outflow = inflow +/- storage) with the intermediate values of the routing curve obtained through linear interpretation.

For Somerset County, New Jersey these 24-hour rainfall amounts are as follows:

2-years	=	3.3 inches
10-years	=	5.0 inches
100-years	=	8.2 inches

The Soil Conservation Service Soil Survey (SCS) for Somerset County was utilized in order to classify the soils within the watershed. Soils within the project area belong to Hydrologic Soil Group A.

The Rational Method was used for the pipe capacity analysis. Rainfall intensities have been based upon the Somerset County rainfall intensity/duration curve for all design storms.

4.0 Stormwater Management Objectives

The primary objective of the Stormwater Management Plan is to limit the postdevelopment rate of runoff for the 2, 10 and 100 year frequency, 24-hour duration storms. This project will be developed in accordance with the Residential Site Improvements Standards and NJAC 7:8 with regards to peak stormwater runoff rate reductions and water quality requirements.

It is the intent of this report to demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the 2, 10 and 100 year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events.

5.0 Stormwater Runoff Control

The proposed impervious area contained within the drainage area shown in Appendix F consists entirely of the proposed pavement area. The runoff generated by the additional pavement that will result from this project will be infiltrated by one of the two porous pavement sections that will be installed. Each section will feature a stone bed whose thickness is dependent on the depth of ground water indicated by the soil tests performed within the area of the section. These stone beds were sized to infiltrate the volume of runoff generated by the 100-year storm event. Thus the peak flow rate at the Point of Analysis under proposed conditions will be lower than the peak flow rate corresponding to the existing conditions for every storm event.

	Point of Analysis								
Storm Frequency	Existing Condition Peak Flow	Proposed Condition Peak Flow							
	(CFS)	(CFS)							
2	0.33	0.00							
10	0.50	0.04							
100	2.37	0.97							

6.0 Water Quality

The total amount of additional impervious coverage for the proposed site is approximately 1.58 acres. This additional surface area will be treated with porous pavement which provides 80% TSS removal per the NJBMP Manual. Refer to Appendix D for more information.

7.0 Groundwater Recharge

The groundwater recharge amount was calculated using the NJDEP GSR-32 Spreadsheet. (See Appendix for Spreadsheet Calculations). The BMP Effective Depth was calculated by averaging the maximum and minimum depth of porous pavement and factoring in the 33% void ratio. The results indicate that the porous pavement will provide groundwater recharge by infiltrating more than 100 percent of the Annual Recharge Deficit. The total annual recharge of the site under pre-developed conditions is 156,401 cf. The annual recharge under post-developed conditions is 78,467 cf resulting in a deficit of 77,934 cf. The annual recharge volume provided by the porous pavement is 204,171 cf and thus the groundwater recharge requirement is fulfilled. The stone bed will drain within 72 hours (see Appendix D). A permeability rate of 7.5 in/hr has been used in the calculations as that is fifty percent of the slowest rate observed.

8.0 Conclusion

The proposed development will result in lower peak flow rates than existing conditions. The site closely mirrors existing condition discharge patterns. Accordingly, the new development will not negatively impact runoff on-site or downstream. All engineering calculations and their associated drainage area maps are incorporated in the appendix for further review.

9.0 References

- 1. Urban Hydrology for Small Watersheds, TR-55, USDA Soil Conservation Service, 1986.
- 2. NJDEP Stormwater Management Rules, NJAC 7:8, June 20, 2016.
- 3. NJDEP Stormwater Best Management Practices Manual, February 2016.
- 4. Standards for Soil Erosion and Sediment Control in New Jersey, New Jersey State Soil Conservation Committee, January 2014.
- 5. Web Soil Survey, United States Department of Agriculture, Natural Resource Conservation Service, Version 8, 2008.
- 6. Franklin Township Municipal Code.
- Bentley, StormCAD®, Version 8.11.02.75, 2011.
 Bently, Pond Pack version 8i, 2012.

<u>Appendix A</u>

Soil Map, CN Values and Time of Concentration



Conservation Service

Worksheet 2: Runoff Curve Number

Project	9911FS.01	Ву	KH	Date	9/18/2019
Location	Township of Franklin	Checked	d	Date	
Select One:	Undeveloped				
Area Name	EX. PERV DA				

1. Runoff Curve Number

Names	Cover Description		CN		Area	Product
Soil Name and Hydrologic Group (appendix A) A	(cover type, treatment, and hydrologic condition; percent impervious; unconnected/ connected area ratio) Open Space-Good Condition	Tab 2-2 39	, v	Fig 2-4	acres miles % 2.93	CN x area 114.27
	CN (weighted) = total product/ total area=	<u>114.27</u> 2.93		Totals Use CN =	2.93	I

Worksheet 2: Runoff Curve Number

Project	9911FS.01	By	KH	Date	9/18/2019
Location	Township of Franklin	Checked		Date	
Select One:	Undeveloped	-			
Area Name	EX. IMP DA	_			

1. Runoff Curve Number

Names	Cover Description		CN		Area	Product
Soil Name and	(cover type, treatment, and hydrologic condition; percent impervious; unconnected/ connected area ratio) Impervious Areas	Tab 2-2 98	Fig 2-3	Fig 2-4	acres miles	CN x area
	CN (weighted) = total product/ total area=	<u>11.76</u> 0.12		Totals Use CN =	0.12	

Worksheet 3: Time of C	Concentration (Tc) or Tra	avel Time (Tt)			
Project 9911FS.01		By	KH	Date	9/18/2019
Location Township of Franklin		Checked		Date	
Select One: Undeveloped		_		-	
Select One: Tc					
Area Name <u>EX. DA</u>		_			
		_			
Notes: Space for as many as two segment Include a Map, schematic, or descr		used for each	worksheet		
Sheet Flow (Applicable to Tc only)		Segment ID	A-B		
1 Surface Description (table 3-1)			Grass		
2 Mannings Roughness Coeff.,n (tab	le 3-1)		0.15		
3 Flow Length, L (total L < 300 ft)		ft	100		
4 Two-yr 24-hr rainfall, P2		in	3.3		
5 land slope, s		ft/ft			
6 Tt=(0.007*(nL)^0.8/((P2^0.5)*(s^0.4	 Compute Tt 	hr	0.21		0.21
Shallow Concentrated Flow		Segment ID	B-POA		
7 Surface Description (paved or unpa	aved)		Unpaved		
8 Flow Length, L	aveu)	ft	668		
9 Watercourse Slope, s		ft/ft	0.011		
10 Average velocity, V (figure 3-1)		ft/s	1.7		
11 Tt = L/(3600 V)	Compute Tt	hr	0.11		0.11
Channel Flow		Segment ID			
12 Cross sectional flow area, a		ft^2			
13 Wetted Perimeter, Pw		ft			
14 Hydraulic Radius, r=a/Pw Compute	er	ft			
15 Channel Slope, s		ft/ft			
16 Mannings roughness Coeff., n					
	npute V	ft/s			
18 Flow Length, L		ft			
19 Tt = L/(3600*V)	Compute Tt	hr		I	0.00
20 Water shed or Subarea Tc or Tt (a		hr	L I		0.32
,	· · · /	min		L	19.28

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

Worksheet 2: Runoff Curve Number

Project	9911FS.01	By	KH	Date	9/18/2019
Location	Township of Franklin	Checked		Date	
Select One:	Developed				
Area Name	PR. PERV DA				

1. Runoff Curve Number

Names	Cover Description		CN		Area	Product
Soil Name and Hydrologic Group (appendix A)	(cover type, treatment, and hydrologic condition; percent impervious; unconnected/ connected area ratio)	Tab 2-2	Fig 2-3	Fig 2-4	acres miles %	CN x area
Â	Open Space-Good Condition	39	~		1.47	57.33
		F7 00		Totals	1.47	57.33
	CN (weighted) = total product/ total area=	57.33 1.47		Use CN =	39.00	l

Worksheet 2: Runoff Curve Number

Project	9911FS.01	Ву	KH	Date	9/18/2019
Location	Township of Franklin	Checked	d	Date	
Select One:	Developed				
Area Name	PR. IMP DA				

1. Runoff Curve Number

Names	Cover Description		CN		Area	Product
(appendix A)	(cover type, treatment, and hydrologic condition; percent impervious; unconnected/ connected area ratio)	Tab 2-2	- v	Fig 2-4		CN x area
Α	Impervious Areas (Infiltrated)	98			1.58	154.84
					4.50	454.04
	CN (weighted) = total product/ total area=	154.84 1.58		Totals Use CN =	1.58 98.00	

	Worksheet 3: Time of Conce	ntration (Tc) or Tra	avel Time (Tt)			
Project	9911FS.01			KH	Date	9/18/2019
Location	Township of Franklin		_ Checked		Date	
	: Developed					
Select One						
Area Name	PR. DA		_			
Notes:	Space for as many as two segments per	flow type can be i	used for each v	worksheet		
10100.	Include a Map, schematic, or description			Workenoor		
Sheet Flow	(Applicable to Tc only)		Segment ID	A-B		
			Ū			
1	Surface Description (table 3-1)			Grass		
	Mannings Roughness Coeff.,n (table 3-1)		0.15		
	∃ Flow Length, L (total L < 300 ft)		ft	100		
	Two-yr 24-hr rainfall, P2		in	3.3		
	i land slope, s		ft/ft			
6	5 Tt=(0.007*(nL)^0.8/((P2^0.5)*(s^0.4))	Compute Tt	hr	0.23		0.23
Shallow Co	ncentrated Flow		Segment ID	B-POA		
-				L la a su s d		
	′ Surface Description (paved or unpaved) ۶ Flow Length, L		ft	Unpaved		
	Watercourse Slope, s		ft/ft	846 0.012		
	Average velocity, V (figure 3-1)		ft/s	1.8		
	$T_t = L/(3600*V)$	Compute Tt	hr	0.13		0.13
Channel Flo	<u>wo</u>		Segment ID			
12	Cross sectional flow area, a		ft^2			
	Wetted Perimeter, Pw		ft			
14	Hydraulic Radius, r=a/Pw Compute r		ft			
	Channel Slope, s		ft/ft			
16	Mannings roughness Coeff., n					
	V = 1.49(r^(2/3))*(s^(1/2))/n Compute	e V	ft/s			
	Flow Length, L		ft			
	$T_t = L/(3600*V)$	Compute Tt	hr			0.00
20	Water shed or Subarea Tc or Tt (add Tt	in steps 6, 11,19)	hr			0.36
			min		-	21.42

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)

<u>Appendix B</u> Pre-Development Hydrograph

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft ³)	Time to Peak (min)	Peak Flow (ft ³ /s)
EX PERV DA	2 yr	2	18.000	1,437.000	0.00
EX PERV DA	10 yr	10	2,104.000	774.000	0.09
EX PERV DA	100 yr	100	13,126.000	741.000	2.02
EX IMP DA	2 yr	2	1,335.000	726.000	0.33
EX IMP DA	10 yr	10	2,073.000	726.000	0.50
EX IMP DA	100 yr	100	3,465.000	726.000	0.82
PR PERV DA	2 yr	2	9.000	1,437.000	0.00
PR PERV DA	10 yr	10	1,054.000	777.000	0.04
PR PERV DA	100 yr	100	6,577.000	741.000	0.97
PR IMP DA (TO BE INFILTRATED)	2 yr	2	17,578.000	726.000	4.31
PR IMP DA (TO BE INFILTRATED)	10 yr	10	27,299.000	726.000	6.57
PR IMP DA (TO BE INFILTRATED)	100 yr	100	45,622.000	726.000	10.82

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft ³)	Time to Peak (min)	Peak Flow (ft³/s)
EX POA	2 yr	2	1,353.000	726.000	0.33
EX POA	10 yr	10	4,177.000	726.000	0.50
EX POA	100 yr	100	16,591.000	738.000	2.37
PR POA	2 yr	2	9.000	1,437.000	0.00
PR POA	10 yr	10	1,054.000	777.000	0.04
PR POA	100 yr	100	6,577.000	741.000	0.97
TO BE INFILTRATED	2 yr	2	17,578.000	726.000	4.31
TO BE INFILTRATED	10 yr	10	27,299.000	726.000	6.57
TO BE INFILTRATED	100 yr	100	45,622.000	726.000	10.82

Return Event: 2 years Storm Event: Synthetic curve 2YR

Storm Event	Synthetic curve 2YR	
Return Event	2 1	years
Duration	1,440.000 1	min
Depth	3.3 i	in
Time of Concentration (Composite)	6.000 ו	min
Area (User Defined)	0.120 a	acres
Computational Time		
Computational Time Increment	0.800 ו	min
Time to Peak (Computed)	726.400 ו	min
Flow (Peak, Computed)	0.33 f	ft³/s
Output Increment	3.000 ו	min
Time to Flow (Peak Interpolated Output)	726.000 ו	min
Flow (Peak Interpolated Output)	0.33 1	ft³/s
Drainage Area		
SCS CN (Composite)	98.000	
Area (User Defined)	0.120 a	acres
Maximum Retention (Pervious)	0.2 i	in
Maximum Retention (Pervious, 20 percent)	0.0 i	in
Cumulative Runoff		
Cumulative Runoff Depth (Pervious)	3.1 i	in
Runoff Volume (Pervious)	1,336.041 1	ft³
Hydrograph Volume (Area ur	nder Hydrograph ci	urve)
Volume	1,335.000 1	ft³
SCS Unit Hydrograph Param	eters	
SCS Unit Hydrograph Param Time of Concentration (Composite)	eters 6.000 r	min
Time of Concentration		
Time of Concentration (Composite) Computational Time	6.000 ו	
Time of Concentration (Composite) Computational Time Increment Unit Hydrograph Shape	6.000 n 0.800 n	
Time of Concentration (Composite) Computational Time Increment Unit Hydrograph Shape Factor	6.000 n 0.800 n 483.432	

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Return Event: 2 years Storm Event: Synthetic curve 2YR

SCS Unit Hydrograph Parameters		
Unit peak time, Tp	4.000 min	
Unit receding limb, Tr	16.000 min	
Total unit time, Tb	20.000 min	

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Return Event: 10 years Storm Event: Synthetic curve 10YR

Storm Event	Synthetic curve 10YR	
Return Event	10 years	
Duration	1,440.000 min	
Depth	5.0 in	
Time of Concentration (Composite)	6.000 min	
Area (User Defined)	0.120 acres	
Computational Time	0.800 min	
Increment		
Time to Peak (Computed)	726.400 min	
Flow (Peak, Computed)	0.50 ft ³ /s	
Output Increment	3.000 min	
Time to Flow (Peak Interpolated Output)	726.000 min	
Flow (Peak Interpolated Output)	0.50 ft³/s	
Drainage Area		
SCS CN (Composite)	98.000	
Area (User Defined)	0.120 acres	
Maximum Retention (Pervious)	0.2 in	
Maximum Retention (Pervious, 20 percent)	0.0 in	
Cumulative Runoff		
Cumulative Runoff Depth (Pervious)	4.8 in	
Runoff Volume (Pervious)	2,074.836 ft ³	
Hydrograph Volume (Area ur	ider Hydrograph curve)	
Volume	2,073.000 ft ³	
SCS Unit Hydrograph Param	eters	
Time of Concentration (Composite)	6.000 min	
Computational Time Increment	0.800 min	
Unit Hydrograph Shape Factor	483.432	
K Factor	0.749	
Receding/Rising, Tr/Tp	1.670	
Unit peak, qp	1.36 ft ³ /s	
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Return Event: 10 years Storm Event: Synthetic curve 10YR

SCS Unit Hydrograph Parameters			
Unit peak time, Tp	4.000 min		
Unit receding limb, Tr	16.000 min		
Total unit time, Tb	20.000 min		

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Return Event: 100 years Storm Event: Synthetic curve 100YR

Storm Event	Synthetic curve 100YR	
Return Event	100 years	
Duration	1,440.000 min	
Depth	8.2 in	
Time of Concentration (Composite)	6.000 min	
Area (User Defined)	0.120 acres	
Computational Time Increment	0.800 min	
Time to Peak (Computed)	725.600 min	
Flow (Peak, Computed)	0.82 ft ³ /s	
Output Increment	3.000 min	
Time to Flow (Peak Interpolated Output)	726.000 min	
Flow (Peak Interpolated Output)	0.82 ft³/s	
Drainage Area		
SCS CN (Composite)	98.000	
Area (User Defined)	0.120 acres	
Maximum Retention (Pervious)	0.2 in	
Maximum Retention (Pervious, 20 percent)	0.0 in	
Cumulative Runoff		
Cumulative Runoff Depth (Pervious)	8.0 in	
Runoff Volume (Pervious)	3,467.412 ft ³	
Hydrograph Volume (Area ur	nder Hydrograph curve)	
Volume	3,465.000 ft ³	
SCS Unit Hydrograph Param	neters	
Time of Concentration (Composite)	6.000 min	
Computational Time Increment	0.800 min	
Unit Hydrograph Shape Factor	483.432	
K Factor	0.749	
Receding/Rising, Tr/Tp	1.670	
Unit peak, qp	1.36 ft ³ /s	
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Return Event: 100 years Storm Event: Synthetic curve 100YR

SCS Unit Hydrograph Parameters		
Unit peak time, Tp	4.000 min	
Unit receding limb, Tr	16.000 min	
Total unit time, Tb	20.000 min	

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Return Event: 2 years Storm Event: Synthetic curve 2YR

Storm Event	Synthetic curve 2YR	
Return Event	2 years	
Duration	1,440.000 min	
Depth	3.3 in	
Time of Concentration (Composite)	19.280 min	
Area (User Defined)	2.930 acres	
Computational Time Increment	2.571 min	
Time to Peak (Computed)	1,439.573 min	
Flow (Peak, Computed)	0.00 ft ³ /s	
Output Increment	3.000 min	
Time to Flow (Peak Interpolated Output)	1,437.000 min	
Flow (Peak Interpolated Output)	0.00 ft³/s	
Drainage Area		
SCS CN (Composite)	39.000	
Area (User Defined)	2.930 acres	
Maximum Retention (Pervious)	15.6 in	
Maximum Retention (Pervious, 20 percent)	3.1 in	
Cumulative Runoff		
Cumulative Runoff Depth (Pervious)	0.0 in	
Runoff Volume (Pervious)	19.842 ft ³	
Hydrograph Volume (Area un	der Hydrograph curve)	
Volume	18.000 ft ³	
SCS Unit Hydrograph Parame	eters	
Time of Concentration (Composite)	19.280 min	
Computational Time Increment	2.571 min	
Unit Hydrograph Shape Factor	483.432	
K Factor	0.749	
Receding/Rising, Tr/Tp	1.670	
Unit peak, qp	10.33 ft³/s	
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Return Event: 2 years Storm Event: Synthetic curve 2YR

SCS Unit Hydrograph Parameters			
Unit peak time, Tp	12.853 min		
Unit receding limb, Tr	51.413 min		
Total unit time, Tb	64.267 min		

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Return Event: 10 years Storm Event: Synthetic curve 10YR

Storm Event	Synthetic curve 10YR	
Return Event	10 years	
Duration	1,440.000 min	
Depth	5.0 in	
Time of Concentration (Composite)	19.280 min	
Area (User Defined)	2.930 acres	
Computational Time	2.571 min	
Increment	2.3/1 11111	
Time to Peak (Computed)	773.771 min	
Flow (Peak, Computed)	0.09 ft ³ /s	
Output Increment	3.000 min	
Time to Flow (Peak Interpolated Output)	774.000 min	
Flow (Peak Interpolated Output)	0.09 ft³/s	
Drainage Area		
SCS CN (Composite)	39.000	
Area (User Defined)	2.930 acres	
Maximum Retention (Pervious)	15.6 in	
Maximum Retention (Pervious, 20 percent)	3.1 in	
Cumulative Runoff		
Cumulative Runoff Depth (Pervious)	0.2 in	
Runoff Volume (Pervious)	2,127.819 ft ³	
Hydrograph Volume (Area ur	nder Hydrograph curve)	
Volume	2,104.000 ft ³	
SCS Unit Hydrograph Param	eters	
Time of Concentration (Composite)	19.280 min	
Computational Time Increment	2.571 min	
Unit Hydrograph Shape Factor	483.432	
K Factor	0.749	
Receding/Rising, Tr/Tp	1.670	
Unit peak, qp	10.33 ft ³ /s	
Bentley Systems, Inc. Haestad Methods Solution		

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Return Event: 10 years Storm Event: Synthetic curve 10YR

SCS Unit Hydrograph Parameters			
Unit peak time, Tp	12.853 min		
Unit receding limb, Tr	51.413 min		
Total unit time, Tb	64.267 min		

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Return Event: 100 years Storm Event: Synthetic curve 100YR

Storm Event	Synthetic curve 100YR
Return Event	100 years
Duration	1,440.000 min
Depth	8.2 in
Time of Concentration (Composite)	19.280 min
Area (User Defined)	2.930 acres
Computational Time	2.571 min
Increment	2.5/1 (1)(1)
Time to Peak (Computed)	740.352 min
Flow (Peak, Computed)	2.02 ft ³ /s
Output Increment	3.000 min
Time to Flow (Peak Interpolated Output)	741.000 min
Flow (Peak Interpolated Output)	2.02 ft ³ /s
Drainage Area	
SCS CN (Composite)	39.000
Area (User Defined)	2.930 acres
Maximum Retention (Pervious)	15.6 in
Maximum Retention (Pervious, 20 percent)	3.1 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.2 in
Runoff Volume (Pervious)	13,208.648 ft ³
Hydrograph Volume (Area und	er Hydrograph curve)
Volume	13,126.000 ft ³
SCS Unit Hydrograph Paramet	ers
Time of Concentration (Composite)	19.280 min
Computational Time Increment	2.571 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	10.33 ft³/s
orne pearly ap	

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Return Event: 100 years Storm Event: Synthetic curve 100YR

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	12.853 min
Unit receding limb, Tr	51.413 min
Total unit time, Tb	64.267 min

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Summary for Hydrograph Addition at 'EX POA'

Upstream Link	Upstream Node
<catchment node="" outflow="" to=""></catchment>	EX IMP DA
<catchment node="" outflow="" to=""></catchment>	EX PERV DA

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (min)	Flow (Peak) (ft³/s)
Flow (From)	EX IMP DA	1,335.056	726.000	0.33
Flow (From)	EX PERV DA	18.214	1,437.000	0.00
Flow (In)	EX POA	1,353.270	726.000	0.33

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Summary for Hydrograph Addition at 'EX POA'

Upstream Link	Upstream Node
<catchment node="" outflow="" to=""></catchment>	EX IMP DA
<catchment node="" outflow="" to=""></catchment>	EX PERV DA

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (min)	Flow (Peak) (ft³/s)
Flow (From)	EX IMP DA	2,073.345	726.000	0.50
Flow (From)	EX PERV DA	2,104.061	774.000	0.09
Flow (In)	EX POA	4,177.406	726.000	0.50

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Summary for Hydrograph Addition at 'EX POA'

Upstream Link	Upstream Node
<catchment node="" outflow="" to=""></catchment>	EX IMP DA
<catchment node="" outflow="" to=""></catchment>	EX PERV DA

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (min)	Flow (Peak) (ft³/s)
Flow (From)	EX IMP DA	3,464.968	726.000	0.82
Flow (From)	EX PERV DA	13,126.263	741.000	2.02
Flow (In)	EX POA	16,591.230	738.000	2.37

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Bentley PondPack V8i [08.11.01.56] Page 16 of 17 <u>Appendix C</u> Post-Development Hydrograph

Return Event: 2 years Storm Event: Synthetic curve 2YR

Storm EventSynthetic curve 2YRReturn Event2 yearsDuration1,440.000 minDepth3.3 inTime of Concentration (Composite)6.000 minArea (User Defined)1.580 acresComputational Time Increment0.800 minTime to Peak (Computed)726.400 minFlow (Peak, Computed)4.31 ft³/sOutput Increment3.000 minTime to Flow (Peak Interpolated Output)726.000 minFlow (Peak Interpolated Output)4.31 ft³/sOutput)4.31 ft³/sDrainage Area2SCS CN (Composite)98.000Area (User Defined)1.580 acresMaximum Retention (Pervious)0.2 inMaximum Retention (Pervious, 20 percent)0.0 inCumulative Runoff3.1 in Runoff Volume (Pervious)Volume17,591.206 ft³Hydrograph Volume (Area under Hydrograph curve)Volume6.000 minIncrement0.800 minIncrement0.800 minComputational Time (Composite)0.800 minHydrograph Volume (Area under Hydrograph curve)Volume0.800 minIncrement0.800 minIncrement0.800 minIncrement0.800 minK Factor0.749Receding/Rising, Tr/Tp1.670Unit peak, qp17.90 ft³/s		
Duration1,440.000 minDepth3.3 inTime of Concentration (Composite)6.000 minArea (User Defined)1.580 acresComputational Time Increment0.800 minTime to Peak (Computed)726.400 minFlow (Peak, Computed)4.31 ft³/sOutput Increment3.000 minTime to Flow (Peak Interpolated Output)726.000 minFlow (Peak Interpolated Output)4.31 ft³/sDrainage Area5SCS CN (Composite)98.000Area (User Defined)1.580 acresMaximum Retention (Pervious)0.2 inMaximum Retention (Pervious)0.0 inCumulative Runoff0.0 inCumulative Runoff Depth (Pervious)3.1 in Runoff Volume (Pervious)Hydrograph Volume (Area under Hydrograph curve)Volume17,578.000 ft³Time of Concentration (Composite)6.000 minComputational Time Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor Receding/Rising, Tr/Tp1.670	Storm Event	-
Depth3.3 inTime of Concentration (Composite)6.000 minArea (User Defined)1.580 acresComputational Time Increment0.800 minTime to Peak (Computed)726.400 minFlow (Peak, Computed)4.31 ft³/sOutput Increment3.000 minTime to Flow (Peak Interpolated Output)726.000 minFlow (Peak Interpolated Output)4.31 ft³/sDrainage Area4.31 ft³/sSCS CN (Composite)98.000Area (User Defined)1.580 acresMaximum Retention (Pervious)0.2 inMaximum Retention (Pervious)0.0 inCumulative Runoff0.0 inCumulative Runoff3.1 inRunoff Volume (Pervious)17,591.206 ft³Hydrograph Volume (Area under Hydrograph curve)VolumeVolume6.000 minComputational Time Increment0.800 minUnit Hydrograph Parameters6.000 minComputational Time Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor Receding/Rising, Tr/Tp0.749Receding/Rising, Tr/Tp1.670	Return Event	2 years
Time of Concentration (Composite)6.000 minArea (User Defined)1.580 acresComputational Time Increment0.800 minTime to Peak (Computed)726.400 minFlow (Peak, Computed)4.31 ft³/sOutput Increment3.000 minTime to Flow (Peak Interpolated Output)726.000 minFlow (Peak Interpolated Output)4.31 ft³/sDrainage AreaSCS CN (Composite)SCS CN (Composite)98.000Area (User Defined)1.580 acresMaximum Retention (Pervious)0.2 inMaximum Retention (Pervious, 20 percent)0.0 inCumulative RunoffUumulative RunoffCumulative Runoff Depth (Pervious)3.1 inRunoff Volume (Pervious)17,591.206 ft³SCS Unit Hydrograph Parameters6.000 minTime of Concentration (Composite)6.000 minUnit Hydrograph Shape Factor483.432K Factor Receding/Rising, Tr/Tp1.670	Duration	1,440.000 min
(Composite)6.000 minArea (User Defined)1.580 acresComputational Time0.800 minIncrement726.400 minFlow (Peak, Computed)4.31 ft³/sOutput Increment3.000 minTime to Flow (Peak726.000 minInterpolated Output)726.000 minFlow (Peak Interpolated Output)4.31 ft³/sDrainage AreaSCS CN (Composite)SCS CN (Composite)98.000Area (User Defined)1.580 acresMaximum Retention (Pervious)0.2 inMaximum Retention (Pervious, 20 percent)0.0 inCumulative RunoffUumulative RunoffCumulative Runoff Depth (Pervious)3.1 inRunoff Volume (Pervious)17,591.206 ft³SCS Unit Hydrograph Parameters6.000 minComputational Time Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor Receding/Rising, Tr/Tp1.670	Depth	3.3 in
Computational Time Increment0.800 minTime to Peak (Computed)726.400 minFlow (Peak, Computed)4.31 ft³/sOutput Increment3.000 minTime to Flow (Peak Interpolated Output)726.000 minFlow (Peak Interpolated Output)4.31 ft³/sDrainage Area98.000SCS CN (Composite)98.000Area (User Defined)1.580 acresMaximum Retention (Pervious)0.2 inMaximum Retention (Pervious, 20 percent)0.0 inCumulative Runoff0.0 inCumulative Runoff Depth (Pervious)3.1 inHydrograph Volume (Area under Hydrograph curve)Volume17,578.000 ft³SCS Unit Hydrograph Parameters6.000 minTime of Concentration (Composite)6.000 minUnit Hydrograph Shape Factor483.432K Factor K Factor0.749Receding/Rising, Tr/Tp1.670		6.000 min
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Time to Peak (Computed)726.400 minFlow (Peak, Computed)4.31 ft³/sOutput Increment3.000 minTime to Flow (Peak Interpolated Output)726.000 minFlow (Peak Interpolated Output)4.31 ft³/sDrainage Area		0.800 min
Flow (Peak, Computed)4.31 ft³/sOutput Increment3.000 minTime to Flow (Peak Interpolated Output)726.000 minFlow (Peak Interpolated Output)4.31 ft³/sDrainage AreaSCS CN (Composite)98.000Area (User Defined)1.580 acresMaximum Retention (Pervious)0.2 inMaximum Retention (Pervious)0.0 inCumulative RunoffCumulative Runoff Depth (Pervious)3.1 inRunoff Volume (Pervious)17,591.206 ft³Hydrograph Volume (Area under Hydrograph curve)Volume17,578.000 ft³SCS Unit Hydrograph Parameters6.000 minTime of Concentration (Composite)6.000 minUnit Hydrograph Shape Factor483.432K Factor0.749Receding/Rising, Tr/Tp1.670		726 400 min
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Output)4.31 fto/sDrainage AreaSCS CN (Composite)98.000Area (User Defined)1.580 acresMaximum Retention (Pervious)0.2 inMaximum Retention (Pervious, 20 percent)0.0 inCumulative Runoff0.0 inCumulative Runoff Depth (Pervious)3.1 inRunoff Volume (Pervious)17,591.206 ft³Hydrograph Volume (Area under Hydrograph curve)VolumeVolume17,578.000 ft³SCS Unit Hydrograph Parameters5CS Unit Hydrograph ParametersTime of Concentration (Composite)6.000 minComputational Time Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor Receding/Rising, Tr/Tp0.749		726.000 min
SCS CN (Composite)98.000Area (User Defined)1.580 acresMaximum Retention (Pervious)0.2 inMaximum Retention (Pervious, 20 percent)0.0 inCumulative Runoff0.0 inCumulative Runoff Depth (Pervious)3.1 inRunoff Volume (Pervious)17,591.206 ft³Hydrograph Volume (Area under Hydrograph curve)VolumeVolume17,578.000 ft³SCS Unit Hydrograph Parameters5CS Unit Hydrograph ParametersTime of Concentration (Composite)6.000 minComputational Time Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor Receding/Rising, Tr/Tp0.749		4.31 ft ³ /s
Area (User Defined)1.580 acresMaximum Retention (Pervious)0.2 inMaximum Retention (Pervious, 20 percent)0.0 inCumulative Runoff0.0 inCumulative Runoff Depth (Pervious)3.1 inRunoff Volume (Pervious)17,591.206 ft³Hydrograph Volume (Area under Hydrograph curve)Volume17,578.000 ft³SCS Unit Hydrograph ParametersTime of Concentration (Composite)6.000 minComputational Time Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor0.749Receding/Rising, Tr/Tp1.670	Drainage Area	
Maximum Retention (Pervious)0.2 inMaximum Retention (Pervious, 20 percent)0.0 inCumulative Runoff0.0 inCumulative Runoff Depth (Pervious)3.1 inRunoff Volume (Pervious)17,591.206 ft³Hydrograph Volume (Area under Hydrograph curve)VolumeVolume17,578.000 ft³SCS Unit Hydrograph Parameters5CS Unit Hydrograph ParametersTime of Concentration (Composite)6.000 minComputational Time Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor0.749Receding/Rising, Tr/Tp1.670	SCS CN (Composite)	98.000
(Pervious)0.2 inMaximum Retention (Pervious, 20 percent)0.0 inCumulative Runoff0.0 inCumulative Runoff Depth (Pervious)3.1 inRunoff Volume (Pervious)17,591.206 ft³Hydrograph Volume (Area under Hydrograph curve)VolumeVolume17,578.000 ft³SCS Unit Hydrograph Parameters5CS Unit Hydrograph ParametersTime of Concentration (Composite)6.000 minComputational Time Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor0.749Receding/Rising, Tr/Tp1.670	Area (User Defined)	1.580 acres
(Pervious, 20 percent)0.0 inCumulative RunoffCumulative Runoff Depth (Pervious)Runoff Volume (Pervious)17,591.206 ft³Hydrograph Volume (Area under Hydrograph curve)Volume17,578.000 ft³SCS Unit Hydrograph ParametersTime of Concentration (Composite)Computational Time IncrementUnit Hydrograph Shape Factor483.432 K FactorK Factor0.749 Receding/Rising, Tr/Tp1.670		0.2 in
Cumulative Runoff Depth (Pervious)3.1 inRunoff Volume (Pervious)17,591.206 ft³Hydrograph Volume (Area under Hydrograph curve)Volume17,578.000 ft³SCS Unit Hydrograph ParametersTime of Concentration (Composite)6.000 minComputational Time Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor0.749Receding/Rising, Tr/Tp1.670		0.0 in
(Pervious)3.1 mRunoff Volume (Pervious)17,591.206 ft³Hydrograph Volume (Area under Hydrograph curve)Volume17,578.000 ft³SCS Unit Hydrograph ParametersTime of Concentration (Composite)6.000 minComputational Time Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor0.749Receding/Rising, Tr/Tp1.670	Cumulative Runoff	
Runoff Volume (Pervious)17,591.206 ft³Hydrograph Volume (Area under Hydrograph curve)Volume17,578.000 ft³SCS Unit Hydrograph ParametersTime of Concentration (Composite)6.000 minComputational Time Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor0.749Receding/Rising, Tr/Tp1.670		3.1 in
Volume17,578.000 ft3SCS Unit Hydrograph ParametersTime of Concentration (Composite)6.000 minComputational Time Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor0.749Receding/Rising, Tr/Tp1.670	x <i>y</i>	17,591.206 ft ³
SCS Unit Hydrograph ParametersTime of Concentration (Composite)6.000 minComputational Time Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor0.749Receding/Rising, Tr/Tp1.670	Hydrograph Volume (Area un	der Hydrograph curve)
Time of Concentration (Composite)6.000 minComputational Time Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor0.749Receding/Rising, Tr/Tp1.670	Volume	17,578.000 ft ³
(Composite)6.000 minComputational Time Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor0.749Receding/Rising, Tr/Tp1.670	SCS Unit Hydrograph Param	eters
Increment0.800 minUnit Hydrograph Shape Factor483.432K Factor0.749Receding/Rising, Tr/Tp1.670		6.000 min
Factor483.432K Factor0.749Receding/Rising, Tr/Tp1.670		0.800 min
Receding/Rising, Tr/Tp 1.670	, , , ,	483.432
	K Factor	0.749
Unit peak, qp 17.90 ft ³ /s	Receding/Rising, Tr/Tp	1.670
	Unit peak, qp	17.90 ft ³ /s

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Return Event: 2 years Storm Event: Synthetic curve 2YR

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	4.000 min
Unit receding limb, Tr	16.000 min
Total unit time, Tb	20.000 min

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Return Event: 10 years Storm Event: Synthetic curve 10YR

Storm Event	Synthetic curve 10YR
Return Event	10 years
Duration	1,440.000 min
Depth	5.0 in
Time of Concentration (Composite)	6.000 min
Area (User Defined)	1.580 acres
Computational Time Increment	0.800 min
Time to Peak (Computed)	726.400 min
Flow (Peak, Computed)	6.57 ft ³ /s
Output Increment	3.000 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	6.57 ft³/s
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.580 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.8 in
Runoff Volume (Pervious)	27,318.677 ft ³
Hydrograph Volume (Area und	ler Hydrograph curve)
Volume	27,299.000 ft ³
SCS Unit Hydrograph Parame	ters
Time of Concentration (Composite)	6.000 min
Computational Time Increment	0.800 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	17.90 ft ³ /s

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Return Event: 10 years Storm Event: Synthetic curve 10YR

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	4.000 min
Unit receding limb, Tr	16.000 min
Total unit time, Tb	20.000 min

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Return Event: 100 years Storm Event: Synthetic curve 100YR

Storm Event	Synthetic curve 100YR
Return Event	100 years
Duration	1,440.000 min
Depth	8.2 in
Time of Concentration (Composite)	6.000 min
Area (User Defined)	1.580 acres
Computational Time Increment	0.800 min
Time to Peak (Computed)	725.600 min
Flow (Peak, Computed)	10.82 ft ³ /s
Output Increment	3.000 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	10.82 ft³/s
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.580 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.0 in
Runoff Volume (Pervious)	45,654.255 ft ³
Hydrograph Volume (Area un	ider Hydrograph curve)
Volume	45,622.000 ft ³
SCS Unit Hydrograph Param	eters
Time of Concentration (Composite)	6.000 min
Computational Time Increment	0.800 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	17.90 ft ³ /s
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Subsection: Unit Hydrograph Summary Label: PR IMP DA (TO BE INFILTRATED)

Return Event: 100 years Storm Event: Synthetic curve 100YR

SCS Unit Hydrograph Parameters			
Unit peak time, Tp	4.000 min		
Unit receding limb, Tr	16.000 min		
Total unit time, Tb	20.000 min		

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Return Event: 2 years Storm Event: Synthetic curve 2YR

Storm Event	Synthetic curve 2YR
Return Event	2 years
Duration	1,440.000 min
Depth	3.3 in
Time of Concentration (Composite)	21.420 min
Area (User Defined)	1.470 acres
Computational Time	2.856 min
Increment	1 420 424 min
Time to Peak (Computed)	1,439.424 min
Flow (Peak, Computed) Output Increment	0.00 ft³/s 3.000 min
Time to Flow (Peak Interpolated Output)	1,437.000 min
Flow (Peak Interpolated Output)	0.00 ft³/s
Drainage Area	
SCS CN (Composite)	39.000
Area (User Defined)	1.470 acres
Maximum Retention (Pervious)	15.6 in
· · · · · · · · · · · · · · · · · · ·	
Maximum Retention (Pervious, 20 percent)	3.1 in
Maximum Retention	3.1 in
Maximum Retention (Pervious, 20 percent)	3.1 in 0.0 in
Maximum Retention (Pervious, 20 percent) Cumulative Runoff Cumulative Runoff Depth	
Maximum Retention (Pervious, 20 percent) Cumulative Runoff Cumulative Runoff Depth (Pervious)	0.0 in 9.953 ft ³
Maximum Retention (Pervious, 20 percent) Cumulative Runoff Cumulative Runoff Depth (Pervious) Runoff Volume (Pervious)	0.0 in 9.953 ft ³
Maximum Retention (Pervious, 20 percent) Cumulative Runoff Cumulative Runoff Depth (Pervious) Runoff Volume (Pervious) Hydrograph Volume (Area und	0.0 in 9.953 ft ³ der Hydrograph curve) 9.000 ft ³
Maximum Retention (Pervious, 20 percent) Cumulative Runoff Cumulative Runoff Depth (Pervious) Runoff Volume (Pervious) Hydrograph Volume (Area und Volume	0.0 in 9.953 ft ³ der Hydrograph curve) 9.000 ft ³
Maximum Retention (Pervious, 20 percent) Cumulative Runoff Cumulative Runoff Depth (Pervious) Runoff Volume (Pervious) Hydrograph Volume (Area und Volume SCS Unit Hydrograph Parame Time of Concentration	0.0 in 9.953 ft ³ der Hydrograph curve) 9.000 ft ³ ters
Maximum Retention (Pervious, 20 percent) Cumulative Runoff Cumulative Runoff Depth (Pervious) Runoff Volume (Pervious) Hydrograph Volume (Area und Volume SCS Unit Hydrograph Parame Time of Concentration (Composite) Computational Time	0.0 in 9.953 ft ³ der Hydrograph curve) 9.000 ft ³ ters 21.420 min
Maximum Retention (Pervious, 20 percent) Cumulative Runoff Cumulative Runoff Depth (Pervious) Runoff Volume (Pervious) Hydrograph Volume (Area und Volume SCS Unit Hydrograph Parame Time of Concentration (Composite) Computational Time Increment Unit Hydrograph Shape	0.0 in 9.953 ft ³ der Hydrograph curve) 9.000 ft ³ ters 21.420 min 2.856 min
Maximum Retention (Pervious, 20 percent) Cumulative Runoff Cumulative Runoff Depth (Pervious) Runoff Volume (Pervious) Hydrograph Volume (Area und Volume SCS Unit Hydrograph Parame Time of Concentration (Composite) Computational Time Increment Unit Hydrograph Shape Factor	0.0 in 9.953 ft ³ der Hydrograph curve) 9.000 ft ³ ters 21.420 min 2.856 min 483.432

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Subsection: Unit Hydrograph Summary Label: PR PERV DA

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Return Event: 2 years Storm Event: Synthetic curve 2YR

SCS Unit Hydrograph Parameters			
Unit peak time, Tp	14.280 min		
Unit receding limb, Tr	57.120 min		
Total unit time, Tb	71.400 min		

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Return Event: 10 years Storm Event: Synthetic curve 10YR

Storm Event	Synthetic curve 10YR		
Return Event	10 years		
Duration	1,440.000 min		
Depth	5.0 in		
Time of Concentration (Composite)	21.420 min		
Area (User Defined)	1.470 acres		
Computational Time Increment	2.856 min		
Time to Peak (Computed)	776.832 min		
Flow (Peak, Computed)	0.04 ft ³ /s		
Output Increment	3.000 min		
Time to Flow (Peak Interpolated Output)	777.000 min		
Flow (Peak Interpolated Output)	0.04 ft³/s		
Drainage Area			
SCS CN (Composite)	39.000		
Area (User Defined)	1.470 acres		
Maximum Retention (Pervious)	15.6 in		
Maximum Retention (Pervious, 20 percent)	3.1 in		
Cumulative Runoff			
Cumulative Runoff Depth (Pervious)	0.2 in		
Runoff Volume (Pervious)	1,067.541 ft ³		
Hydrograph Volume (Area ur	nder Hydrograph curve)		
Volume	1,054.000 ft ³		
SCS Unit Hydrograph Parameters			
Time of Concentration (Composite)	21.420 min		
Computational Time Increment	2.856 min		
Unit Hydrograph Shape Factor	483.432		
K Factor	0.749		
Receding/Rising, Tr/Tp	1.670		
Unit peak, qp	4.67 ft ³ /s		
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Bentley PondPack V8i [08.11.01.56] Page 9 of 19

Subsection: Unit Hydrograph Summary Label: PR PERV DA

-

Return Event: 10 years Storm Event: Synthetic curve 10YR

SCS Unit Hydrograph Parameters			
Unit peak time, Tp	14.280 min		
Unit receding limb, Tr	57.120 min		
Total unit time, Tb	71.400 min		

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Bentley PondPack V8i [08.11.01.56] Page 10 of 19 Subsection: Unit Hydrograph Summary Label: PR PERV DA

Return Event: 100 years Storm Event: Synthetic curve 100YR

Storm Event	Synthetic curve 100YR	
Return Event	100 y	ears
Duration	1,440.000 r	nin
Depth	8.2 i	n
Time of Concentration (Composite)	21.420 r	nin
Area (User Defined)	1.470 a	icres
Computational Time		
Increment	2.856 r	nin
Time to Peak (Computed)	742.560 r	nin
Flow (Peak, Computed)	0.98 f	t³/s
Output Increment	3.000 r	nin
Time to Flow (Peak Interpolated Output)	741.000 r	nin
Flow (Peak Interpolated Output)	0.97 f	t³/s
Drainage Area		
SCS CN (Composite)	39.000	
Area (User Defined)	1.470 a	cres
Maximum Retention (Pervious)	15.6 i	n
Maximum Retention (Pervious, 20 percent)	3.1 i	n
Currentetine Dun off		
Cumulative Runoff		
Cumulative Runoff Depth (Pervious)	1.2 i	n
Runoff Volume (Pervious)	6,626.864 f	t³
Hydrograph Volume (Area und	er Hydrograph cu	ırve)
Volume	6,577.000 f	t³
SCS Unit Hydrograph Paramet	ers	
Time of Concentration (Composite)	21.420 r	nin
Computational Time Increment	2.856 r	nin
Unit Hydrograph Shape Factor	483.432	
K Factor	0.749	
Receding/Rising, Tr/Tp	1.670	
Unit peak, qp	4.67 f	t³/s
Bentley Systems, In	c. Haestad Methods	Solution

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Bentley PondPack V8i [08.11.01.56] Page 11 of 19

Subsection: Unit Hydrograph Summary Label: PR PERV DA

-

Return Event: 100 years Storm Event: Synthetic curve 100YR

SCS Unit Hydrograph Parameters			
Unit peak time, Tp	14.280 min		
Unit receding limb, Tr	57.120 min		
Total unit time, Tb	71.400 min		

Pre and Post.ppc 10/31/2019

Bentley Systems, Inc. Haestad Methods Solution Center 27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Bentley PondPack V8i [08.11.01.56] Page 12 of 19 Subsection: Addition Summary Label: PR POA

Return Event: 2 years Storm Event: Synthetic curve 2YR

Summary for Hydrograph Addition at 'PR POA'

Upstream Link	Upstream Node
<catchment node="" outflow="" to=""></catchment>	PR PERV DA

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (min)	Flow (Peak) (ft ³ /s)
Flow (From)	PR PERV DA	9.047	1,437.000	0.00
Flow (In)	PR POA	9.047	1,437.000	0.00

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Bentley PondPack V8i [08.11.01.56] Page 13 of 19 Subsection: Addition Summary Label: PR POA

Return Event: 10 years Storm Event: Synthetic curve 10YR

Summary for Hydrograph Addition at 'PR POA'

Upstream Link	Upstream Node
<catchment node="" outflow="" to=""></catchment>	PR PERV DA

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (min)	Flow (Peak) (ft ³ /s)
Flow (From)	PR PERV DA	1,054.302	777.000	0.04
Flow (In)	PR POA	1,054.302	777.000	0.04

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Bentley PondPack V8i [08.11.01.56] Page 14 of 19 Subsection: Addition Summary Label: PR POA

Return Event: 100 years Storm Event: Synthetic curve 100YR

Summary for Hydrograph Addition at 'PR POA'

Upstream Link	Upstream Node
<catchment node="" outflow="" to=""></catchment>	PR PERV DA

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (min)	Flow (Peak) (ft ³ /s)
Flow (From)	PR PERV DA	6,577.460	741.000	0.97
Flow (In)	PR POA	6,577.460	741.000	0.97

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Bentley PondPack V8i [08.11.01.56] Page 15 of 19 Subsection: Addition Summary Label: TO BE INFILTRATED

Return Event: 2 years Storm Event: Synthetic curve 2YR

Summary for Hydrograph Addition at 'TO BE INFILTRATED'

Upstream Link	Upstream Node
<catchment node="" outflow="" to=""></catchment>	PR IMP DA (TO BE INFILTRATED)

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (min)	Flow (Peak) (ft³/s)
Flow (From)	PR IMP DA (TO BE INFILTRATED)	17,578.242	726.000	4.31
Flow (In)	TO BE INFILTRATED	17,578.242	726.000	4.31

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Bentley PondPack V8i [08.11.01.56] Page 16 of 19 Subsection: Addition Summary Label: TO BE INFILTRATED

Return Event: 10 years Storm Event: Synthetic curve 10YR

Summary for Hydrograph Addition at 'TO BE INFILTRATED'

Upstream Link	Upstream Node
<catchment node="" outflow="" to=""></catchment>	PR IMP DA (TO BE INFILTRATED)

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (min)	Flow (Peak) (ft³/s)
Flow (From)	PR IMP DA (TO BE INFILTRATED)	27,299.045	726.000	6.57
Flow (In)	TO BE INFILTRATED	27,299.045	726.000	6.57

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Bentley PondPack V8i [08.11.01.56] Page 17 of 19 Subsection: Addition Summary Label: TO BE INFILTRATED

Return Event: 100 years Storm Event: Synthetic curve 100YR

Summary for Hydrograph Addition at 'TO BE INFILTRATED'

Upstream Link	Upstream Node
<catchment node="" outflow="" to=""></catchment>	PR IMP DA (TO BE INFILTRATED)

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (min)	Flow (Peak) (ft³/s)
Flow (From)	PR IMP DA (TO BE INFILTRATED)	45,622.074	726.000	10.82
Flow (In)	TO BE INFILTRATED	45,622.074	726.000	10.82

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Bentley PondPack V8i [08.11.01.56] Page 18 of 19 <u>Appendix D</u> Water Quality Calculations & Soil Data

Water Quality Calculation Sheet

Design: KH

Date: September 27, 2019

Project No.: 9911FS.01

Pervious Pavement Sizing

Required Volume Per 100-Year Storm – 45,622 cf Total Porous Pavement Area – 54,202 sf Void Ratio: 33%

The volume of pervious pavement area within each of the two areas is calculated via the Average End Area Method as follows:

V=(A1+A2)/2 * L * Void Ratio V=Volume A1=End Area 1 A2=End Area 2 L=Distance Between A1 and A2

<u>Area I:</u> Surface Area = 5,905 sf Bottom of Stone Bed Elevation = 51.08 Thickness of Pavement Above Stone Bed = 0.5 ft

$$A1 = (52.25 - 51.08 - 0.5) + (52.43 - 51.08 - 0.5) * 18 = 13.68 \text{ sf}$$

$$2$$

$$A2 = (53.70 - 51.08 - 0.5) + (53.88 - 51.08 - 0.5) * 18 = 39.78 \text{ sf}$$

2

$$A3 = \frac{(53.34-51.08-0.5) + (53.56-51.08-0.5)}{2} * 22.45 = 41.98 \text{ sf}$$

L2 = 18 ft

V = V1+V2 = 2,699 + 243 = 2,942 cf

<u>Area II:</u> Surface Area = 48,297 sf Bottom of Stone Bed Elevation = 52.18 Thickness of Pavement Above Stone Bed = 0.5 ft

 $A1 = (\underline{53.56-52.18-0.5}) + (\underline{55.82-52.18-0.5}) * 63 = 126.63 \text{ sf}$

A2 = (52.85-52.18-0.5) + (55.35-52.18-0.5) * 63 = 89.46 sf

L1 = 260 ft

$$A3 = (57.85-52.18-0.5) + (52.85-52.18-0.5) * 126 = 336.42 \text{ sf}$$
2

$$A4 = (58.66-52.18-0.5) + (53.66-52.18-0.5) * 126 = 438.48 \text{ sf}$$
2

$$L2 = 198 \text{ ft}$$

$$A5 = (58.38-52.18-0.5) + (53.70-52.18-0.5) * 117 = 393.12 \text{ sf}$$
2

$$L3 = 52 \text{ ft}$$

V3 = (393.12+438.48)/2 * 52 * 0.33 = 7,135 sf

Volume of Pervious Pavement Beneath Emergency Access Drive:

Total Volume of Pervious Pavement within Area II:

9,270 + 25,316 + 7,135 + 5,506 = 47,227 cf

Total Volume of Pervious Pavement (Area I + Area II):

2,942 + 47,227 = 50,169 cf

Stone Bed Drain Time

Thickest Stone Layer: 87.84 inches Design Permeability Rate: 7.5 inches/hour (See Soil Log 3)

87.84 inches/(7.5 inches/hour) = 11.7 hours < 72 hours

Minimum Separation Between Stone Bed and SHGW Elevation

- Area I: Bottom of Stone Bed Elevation = 51.08 SHGW Elevation = 49.07 (See Soil Log 5) Minimum Separation = 51.08 - 49.07 = 2.01 feet
- Area II: Bottom of Stone Bed Elevation = 52.18 SHGW Elevation = 50.05 (See Soil Log 14) Minimum Separation = 52.18 – 50.05 = 2.13 feet

Water Quality Compliance

The porous pavement system is designed in accordance with Chapter 9.7 of the New Jersey Best Management Practices Manual. The stone bed beneath the pavement has been sized to store more than the water quality storm. The seasonal high ground water table has been established more than two feet below the system. An acceptable permeability rate for the system has been observed. The supporting data has been included in this appendix.

Subsection: Unit Hydrograph Summary Label: PR IMP DA (TO BE INFILTRATED)

Return Event: 100 years Storm Event: Synthetic curve 100YR

Storm Event	Synthetic curve 100YR
Return Event	100 years
Duration	1,440.000 min
Depth	8.2 in
Time of Concentration (Composite)	6.000 min
Area (User Defined)	1.580 acres
Computational Time Increment	0.800 min
Time to Peak (Computed)	725.600 min
Flow (Peak, Computed)	10.82 ft ³ /s
Output Increment	3.000 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	10.82 ft³/s
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.580 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.0 in
Runoff Volume (Pervious)	45,654.255 ft ³
Hydrograph Volume (Area un	ider Hydrograph curve)
Volume	45,622.000 ft ³
SCS Unit Hydrograph Param	eters
Time of Concentration (Composite)	6.000 min
Computational Time Increment	0.800 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	17.90 ft ³ /s
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SOMERSET	COUNTY/FRA	NKLIN TOWNSHIP	Block:	516.01	Lot: <u>1.01</u>	
1. Log N	Number <u>1</u>	Method (Check One):	Profile Pit:	Bo	oring:	
Date	Recorded: 2/14	4/19 & 2/15/19 and 2/25/	19 & 2/26/19			
2. Soil L	-00					
Depth (inches) Top-Bottom	Munsell Co Coarse Fra	olor Name and Symbo agment, If Present; S e, Size and Contrast, If	Structure; Moi	ist or Dry		e; Mottling ·
Description:						
0- 10" 10- 38" 38- 72"		Shale Gravel & Sandy Sandy Loam; No Stru Sandy Loam; No Stru	cture, Friable			
72 – 120"	5YR 4/4	Fractured Shale; 10% No Mottles Water @ 100"	Loam			
	nd Water Obse _ Seepage - Inc _ Pit/Boring Flo	vations: licate Depth: oded - Depth After24	Hours =			
	Massive Rock Excessively C Excessively C Hydraulically I Hydraulically I Perched Zone	k Substratum - Depth to Substratum - Depth to T oarse Horizon - Depth To oarse Substratum - Dept Restrictive Horizon - Dep Restrictive Substratum - I of Saturation - Depth To e of Saturation - Depth to	op op to Bottom th to Top th Top to Bottor Depth to Top op to Bottom	m		
5. Soil S	Suitability Classi	fication:				
data is a violati 7:14-8.	on of the Water Po	n furnished on Form 2b of this ollution Control Act (NJSA 58: Kyle J. Paterson	10a-1 et seq.) and	l is subject to	penalties as pres	cribed in NJAC
Signature of	Engineer	Michael K. Ford, PE N	J License No. 3	Da 34722	te	

<u>SOME</u>	RSET	COUNTY/FRAM	KLIN TOWNSHIP	Block:	516.01	Lot: 1.01	
1.	Log Nu	umber <u>2</u>	Method (Check One): F	Profile Pit:	Bo	oring:	
	Date R	Recorded: <u>2/14</u>	/19 & 2/15/19 and 2/25/1	9 & 2/26/19			
2.	Soil Lo	g					
	es) Sottom	Coarse Fra	lor Name and Symbol; gment, If Present; Si , Size and Contrast, If I	tructure; Moi	st or Dry		Mottling -
Descri	ption:						
0 —	16"	10YR 4/3	Sandy Loam; Weak Su	ıbangular Bloc	ky, Friable		
16 –	26"	7.5YR 5/4	Sandy Loam; No Struc	ture, Friable			
26 – 1	20"	5YR 4/4	Fractured Shale; 10%	Loam			
			No Mottles				
			Water @ 92"				
3.			vations: cate Depth: ded - Depth After24				
4.		Massive Rock Excessively Co Excessively Co Hydraulically R Hydraulically R Perched Zone	Substratum - Depth to T Substratum - Depth to To barse Horizon - Depth To barse Substratum - Depth estrictive Horizon - Depth estrictive Substratum - D of Saturation - Depth Top of Saturation - Depth to	op p to Bottom n to Top h Top to Botton pepth to Top o to Bottom	n		
5.	Soil Su	uitability Classif	ication:				
l herehi	1 certify th	nat the information	furnished on Form 2h of this	application is true	and accurate) am aware that fa	alsification of

I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (NJSA 58:10a-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Site Evaluator	Kyle J. Paterson	Date <u>2/26/19</u>
-----------------------------	------------------	---------------------

Signature of Engineer ______ Michael K. Ford, PE NJ License No. 34722

__ Date _____

			Soli Log and I	merpretation			
SOME	RSET	COUNTY/FRA	NKLIN TOWNSHIP	Block:	516.01	Lot: <u>1</u>	.01
1.	Log Nu	umber <u>3</u>	Method (Check One): F	Profile Pit:	B	oring:	
	Date R	ecorded: <u>2/14</u>	4/19 & 2/15/19 and 2/25/1	9 & 2/26/19			
2.	Soil Lo	g					
•	es) lottom	Coarse Fra	olor Name and Symbol agment, If Present; Se e, Size and Contrast, If	tructure; Moi			
Descri	ption:						
0 –	12"	10YR 4/3	Sandy Loam; Weak Su	ubangular Bloc	ky, Friable)	
12 –	20"	7.5YR 5/4	Sandy Loam; No Struc	ture, Friable			
20 –	36"	5YR 4/4	Sandy Loam; No Struc	ture, Friable			
36 – 1	12"	5YR 4/4	Fractured Shale; 10%	,			
			No Mottles				
			Seepage @ 80"	0"			
			Machine Refusal @ 11	2"			
3.	Group	d Water Obser	a votione:				
З.			ndicate Depth:			80)"
			oded - Depth After 24	Hours =			
4.	X		k Substratum - Depth to T Substratum - Depth to To			112	
		Excessively C	oarse Horizon - Depth To	p to Bottom			
			oarse Substratum - Deptł Restrictive Horizon - Dept		<u>n</u>		
			Restrictive Substratum - D				
		Perched Zone	of Saturation - Depth Top	p to Bottom			
		Regional Zone	e of Saturation - Depth to	Тор			
5.	Soil Su	uitability Classi	fication:				

I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (NJSA 58:10a-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Site Evaluation	tor Kyle J. Paterson	_ Date _	2/26/19
Signature of Engineer		Date	
	Michael K. Ford, PE NJ License No. 34722		

SOME	ERSET C	OUNTY/FRA	NKLIN TOWNSHIP	Block:	516.01	Lot:	1.01		
1.	Log Number <u>4</u> Method (Check One): Profile Pit: Boring:								
	Date R	ecorded: <u>2/14</u>	1/19 & 2/15/19 and 2/25/19 & 2	2/26/19					
2.	Soil Lo	g							
Depth (inche <u>Top-E</u>		Coarse Fra	olor Name and Symbol; Est agment, If Present; Struct a, Size and Contrast, If Prese	ure; Mois					
Descr	iption:								
0 —	6"	10YR 4/3	Sandy Loam; Weak Subang	gular Bloc	ky, Friable				
6 –	30"	10YR 4/4	Sandy Loam; No Structure,	Friable					
30 – 1	02"	5YR 4/4	Fractured Shale; 10% Loan	า					
			No Mottles						
3.		d Water Obser Seepage - Ind Pit/Boring Floo	vations: icate Depth: oded - Depth After <u>24</u> Ho	urs =					
 Soil Limiting Zones: X Fractured Rock Substratum - Depth to Top									
5.	Soil Su	iitability Classi	fication:						

I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (NJSA 58:10a-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Site Evaluate	or Kyle J. Paterson	Date <u>2/26/19</u>	
Signature of Engineer		Date	

SOME	RSET C	COUNTY/FRA	NKLIN TOWNSHIP	Block: 516.01	Lot: 1.01		
1.	Log Nu	umber <u>5</u>	Method (Check One): Prof	ile Pit: Bo	oring:		
	Date R	ecorded: <u>2/14</u>	1/19 & 2/15/19 and 2/25/19 &	2/26/19			
2.	Soil Lo	g					
Depth (inche <u>Top-B</u>		Coarse Fra		cture; Moist or Dry	ass; Estimated Volume % Consistence; Mottling -		
Descri	ption:						
0 – 1	0"	10YR 4/3	Sandy Loam; Weak Suba	ngular Blocky, Friable			
10 – 9	0"	9YR 4/4	Fractured Shale; 10% Loa	am			
			No Mottles				
			Water @ 58"				
 Ground Water Observations: Seepage - Indicate Depth: Pit/Boring Flooded - Depth After <u>24</u> Hours = 4. Soil Limiting Zones: X Fractured Rock Substratum - Depth to Top <u>90"</u> Massive Rock Substratum - Depth to Top Excessively Coarse Horizon - Depth Top to Bottom Excessively Coarse Substratum - Depth to Top Hydraulically Restrictive Horizon - Depth Top to Bottom Hydraulically Restrictive Substratum - Depth to Top Perched Zone of Saturation - Depth Top to Bottom Regional Zone of Saturation - Depth to Top 							
5.	Soil Su	uitability Classi	fication:				
I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (NJSA 58:10a-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.							
Signat	ure of S	ite Evaluator	Kyle J. Paterson	Da	ate <u>2/26/19</u>		

Signature of Engineer _____ Date ______ Date ______ Date _____ Date ______ Date ______ Date ______ Date ______ Date ______ Date ______ Date ___

<u>SOME</u>	RSET C	COUNTY/FRAM	NKLIN TOWNSHIP Block	k: <u>516.01</u> Lot: <u>1.01</u>
1.	Log Nu	umber <u>6</u>	Method (Check One): Profile Pit:	Boring:
	Date R	ecorded: <u>2/14</u>	/19 & 2/15/19 and 2/25/19 & 2/26/19	
2.	Soil Lo	g		
Depth (inche <u>Top-B</u>		Coarse Fra	- · · ·	d Textural Class; Estimated Volume % Noist or Dry Consistence; Mottling -
Descri	ption:			
0 —	6"	10YR 3/3	Sandy Loam; Weak Subangular Bl	locky, Friable
6 –	10"	5YR 4/4	Shaly Clay Loam, Fill; No Structure	e, Friable
10 —	55"	10YR 5/4	Sandy Loam; No Structure, Friable	9
55 – 1	20"	5YR 4/4	Fractured Shale; 10% Loam	
			No Mottles	
			Seepage @ 80"	
			Water @ 108"	
3.		d Water Obser Seepage - Indi		80"
			oded - Depth After <u>24</u> Hours =	

X Fractured Rock Substratum - Depth to Top	120"
Massive Rock Substratum - Depth to Top	
Excessively Coarse Horizon - Depth Top to Bottom	
Excessively Coarse Substratum - Depth to Top	
Hydraulically Restrictive Horizon - Depth Top to Bottom	
Hydraulically Restrictive Substratum - Depth to Top	
Perched Zone of Saturation - Depth Top to Bottom	
Regional Zone of Saturation - Depth to Top	

5. Soil Suitability Classification:

I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (NJSA 58:10a-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Site Evaluator	Kyle J. Paterson	_ Date _	2/26/19
Signature of Engineer		Date	
5 5	Michael K. Ford, PE NJ License No. 34722		

<u>SOME</u>	RSET C	COUNTY/FRA	NKLIN TOWNSHIP	Block: 51	6.01	Lot:	1.01		
1.	Log Number <u>13</u> Method (Check One): Profile Pit: Boring:								
	Date R	Recorded: <u>2/14</u>	4/19 & 2/15/19 and 2/25/19 & 2/	26/19					
2.	Soil Lo	og							
(inches) Coars		Coarse Fra	olor Name and Symbol; Estin agment, If Present; Structu e, Size and Contrast, If Prese	re; Moist		•			
Descri	ption:								
0 –	6"	10YR 4/3	Loam Topsoil						
6 –	85"	5YR 4/4	Fractured Shale; 10% Loam						
85 – 1	14"	5YR 4/4	Fractured Shale; 5% Loam						
			No Mottles						
			Water @ 107"						

Machine Refusal, Not Enough Water for Pit Bail

5.	Ground Water Observations: Seepage - Indicate Depth: Pit/Boring Flooded - Depth After24 Hours =	
	Soil Limiting Zones:	
	X Fractured Rock Substratum - Depth to Top	114"
	Massive Rock Substratum - Depth to Top	
	Excessively Coarse Horizon - Depth Top to Bottom	
	Excessively Coarse Substratum - Depth to Top	
	Hydraulically Restrictive Horizon - Depth Top to Bottom	
	Hydraulically Restrictive Substratum - Depth to Top	
	Perched Zone of Saturation - Depth Top to Bottom	
	Regional Zone of Saturation - Depth to Top	
	Soil Suitability Classification:	

I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (NJSA 58:10a-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Site Evaluator _	Kyle	J. Pater	rson		_ Date	2/26/19	
Signature of Engineer					Date		
				 0.4700			

SOMERSET COUNTY/FRANKLIN TOWNSHIP	Block: 516.0	01Lot:	1.01

1. Log Number <u>14</u> Method (Check One): Profile Pit: _____ Boring: _____

Date Recorded: 2/14/19 & 2/15/19 and 2/25/19 & 2/26/19

2. Soil Log

Depth
(inches)Munsell Color Name and Symbol; Estimated Textural Class; Estimated Volume %
Coarse Fragment, If Present; Structure; Moist or Dry Consistence; Mottling -
Abundance, Size and Contrast, If Present

Description:

0 – 15"	7.5YR 4/3	Loam Topsoil
15 – 35"	7.5YR 4/4	Sandy Loam; No Structure, Friable
35 – 117"	5YR 4/4	Fractured Shale; 10% Loam
		No Mottles
		Water @ 107"
		Seepage @ 97"
		Machine Refusal @ 117", Not Enough Water for Pit Bail

X Seepage - Indicate Depth:97" Pit/Boring Flooded - Depth After24 Hours =
Pit/Boring Flooded - Depth After <u>24</u> Hours =
4. Soil Limiting Zones:
X Fractured Rock Substratum - Depth to Top 117"
Massive Rock Substratum - Depth to Top
Excessively Coarse Horizon - Depth Top to Bottom
Excessively Coarse Substratum - Depth to Top
Hydraulically Restrictive Horizon - Depth Top to Bottom
<u>Hydraulically Restrictive Substratum - Depth to Top</u>
Perched Zone of Saturation - Depth Top to Bottom
Regional Zone of Saturation - Depth to Top
· · · g.· · · · · · · · · · · · · · · ·
5. Soil Suitability Classification:
I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification
data is a violation of the Water Pollution Control Act (NJSA 58:10a-1 et seq.) and is subject to penalties as prescribed in NJA
7:14-8.
Signature of Site Evaluator Kyle J. Paterson Date 2/26/19
Signature of Engineer Date
Michael K. Ford, PE NJ License No. 34722

<u>SOME</u>	RSET COUNTY/FRANKLIN TOWNSHIP	Block: <u>516.01</u>	Lot: <u>1.01</u>
1.	Log Number <u>15</u> Method (Check One): Profi	le Pit:	Boring:
	Date Recorded: 2/14/19 & 2/15/19 and 2/25/19 & 2	2/26/19	
2.	Soil Log		

DepthMunsell Color Name and Symbol; Estimated Textural Class; Estimated Volume %(inches)Coarse Fragment, If Present; Structure; Moist or Dry Consistence; Mottling -
Abundance, Size and Contrast, If Present

Description:

0 – 10"	10YR 3/4	Sandy Loam Topsoil; Granular, Friable
10 – 110"	5YR 4/4	Fractured Shale; 10% Loam
110 – 129"	5YR 4/4	Fractured Shale; 10% Loam
		No Mottles
		Water @ 105"

3.	Ground Water Observations: Seepage - Indicate Depth: Pit/Boring Flooded - Depth After <u>24</u> Hours =	
4.	Soil Limiting Zones: X Fractured Rock Substratum - Depth to Top Massive Rock Substratum - Depth to Top Excessively Coarse Horizon - Depth Top to Bottom Excessively Coarse Substratum - Depth to Top Hydraulically Restrictive Horizon - Depth Top to Bottom Hydraulically Restrictive Substratum - Depth to Top Perched Zone of Saturation - Depth Top to Bottom Pagiapal Zone of Saturation - Depth to Top	129"
5.	Regional Zone of Saturation - Depth to Top Soil Suitability Classification:	

I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (NJSA 58:10a-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Site Evaluator	Kyle J. Paterson	Date <u>2/26/19</u>
Signature of Engineer		Date

SOMERSET COUNTY/FRANKLIN TOWNSHIP	Block: <u>516.01</u>	Lot:	1.01	

1. Log Number <u>16</u> Method (Check One): Profile Pit: <u>Boring</u>:

Date Recorded: 2/14/19 & 2/15/19 and 2/25/19 & 2/26/19

2. Soil Log

Depth
(inches)Munsell Color Name and Symbol; Estimated Textural Class; Estimated Volume %
Coarse Fragment, If Present; Structure; Moist or Dry Consistence; Mottling -
Abundance, Size and Contrast, If Present

Description:

0 – 12"	7.5YR 4/3	Loam Topsoil; Subangular Blocky, Friable
12 – 78"	5YR 4/4	Fractured Shale; 10% Clay Loam
78 – 117"	5YR 4/4	Fractured Shale; 10% Loam
		No Mottles
		Water @ 90"

3.	Ground Water Observations:Seepage - Indicate Depth:	
	Pit/Boring Flooded - Depth After <u>24</u> Hours =	
4.	Soil Limiting Zones:	
	X Fractured Rock Substratum - Depth to Top	117"
	Massive Rock Substratum - Depth to Top	
	Excessively Coarse Horizon - Depth Top to Bottom	
	Excessively Coarse Substratum - Depth to Top	
	Hydraulically Restrictive Horizon - Depth Top to Bottom	
	Hydraulically Restrictive Substratum - Depth to Top	
	Perched Zone of Saturation - Depth Top to Bottom	
	Regional Zone of Saturation - Depth to Top	
5.	Soil Suitability Classification:	

I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (NJSA 58:10a-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Site Evaluator	Kyle J. Paterson	Date <u>2/26/19</u>
Signature of Engineer		Date
		Duic

SOME	RSET C	OUNTY/FRA	NKLIN TOWNSHIP Block: 516.01 Lot: 1.01	
1.	Log Nu	mber <u>17</u>	Method (Check One): Profile Pit: Boring:	
	Date R	ecorded: <u>2/14</u>	4/19 & 2/15/19 and 2/25/19 & 2/26/19	
2.	Soil Lo	g		
(inche	es) Sottom	Coarse Fra	olor Name and Symbol; Estimated Textural Class; Estimated Volume agment, If Present; Structure; Moist or Dry Consistence; Mottling e, Size and Contrast, If Present	
Descri	ption:			
0 –	12"	10YR 3/3	Sandy Loam; Granular, Friable	
12 –	53"	10YR 5/4	Sandy Loam; No Structure, Friable	
53 –	114"	5YR 4/4	Fractured Shale; 10% Loam	
			No Mottles	
			Water @ 84"	
3.	!		rvations: dicate Depth: oded - Depth After <u>24</u> Hours =	
4.	<u> </u>	Massive Rock	ck Substratum - Depth to Top	

X Fractured Rock Substratum - Depth to Top	114"
Massive Rock Substratum - Depth to Top	
Excessively Coarse Horizon - Depth Top to Botto	om
Excessively Coarse Substratum - Depth to Top	
Hydraulically Restrictive Horizon - Depth Top to	Bottom
Hydraulically Restrictive Substratum - Depth to T	
Perched Zone of Saturation - Depth Top to Botto	
Regional Zone of Saturation - Depth to Top	

I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (NJSA 58:10a-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Site Evaluate	or Kyle J. Paterson	Date <u>2/26/19</u>
Cignoture of Engineer		Data
Signature of Engineer		Date

<u>SOME</u>	RSET C	OUNTY/FRAN	IKLIN TOWNSHIP	Block:	516.01	Lot:	1.01	
1.	Log Nur	mber <u>24</u> N	Method (Check One): Profile	Pit:	Bo	oring:		
	Date Re	ecorded: <u>2/14/</u>	(19 & 2/15/19 and 2/25/19 & 2	2/26/19				
2.	Soil Log)						
Depth (inche <u>Top-B</u>		Coarse Frag	or Name and Symbol; Est gment, If Present; Struct Size and Contrast, If Pres	ure; Mois	at or Dry	Consi		ottling -
Descri	ption:							
0 —	18"	10YR 3/3	Sandy Loam; Granular, Fria	able				
18 –	62"	7.5YR 4/3	Sandy Loam; Subangular E	Blocky Friat	ole			
62 –	94"	5YR 4/4	Fractured Shale; 10% Loar	n				
			No Mottles					
			Seepage @ 75"					
3.		Water Observ				_		
	<u> </u>	eepage - Indic Pit/Boring Floor	ate Depth: ded - Depth After <u>24</u> Hc	urs –		/	(5"	
	·	it boining i look		uro – <u> </u>				
4.	<u> X </u> F		Substratum - Depth to Top _ Substratum - Depth to Top _					
	E	Excessively Co	arse Horizon - Depth Top to	Bottom				
			arse Substratum - Depth to T					
			estrictive Horizon - Depth Top estrictive Substratum - Depth					
	'F	Perched Zone	of Saturation - Depth Top to E	Bottom				
	F	Regional Zone	of Saturation - Depth to Top					
5.	Soil Sui	tability Classifi	cation:					

I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (NJSA 58:10a-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Site Evaluator _	Kyle J. Paterson	_ Date	2/26/19
Signature of Engineer		Date	
5 5 <u> </u>	Michael K. Ford, PE NJ License No. 34722		

- ----- -- ----- ------ ------ -----

SEE S ==== PIT B	:	======= = SL 1	Lot:	== ======	 24	Date Tested: Prop. Lot: 1.01 ====== ==== static water level:	=== 2-15-19 FRANKLIN ========	TWP. ======= 8.33	====== ===========
Depth (Dstr	n to Impern atum)	neable Strata 1.5 x	: pit depth	15.00 assumed		ratum - Dwater:		(Dwater) 6.67	ft.
	late the fol	llowing value: An = water s hrise = wate Aav = avera h = average (take aver convert to Ka = hrise/t	s and enter surface area r level rise i ge water su height of w rage of curro o feet, and s x Aav/2.27	into the table a in square for in inches urface area (/ vater level ab ent water leve subtract from 2 (H -h) x 60	e below: eet An + previou ove Dstratur rel and previo Dstratum) ir min/hr (K in	ous water level, ı ft. inches/hr)			
==== Tn(mi	in)	Dwater(in)	l, w (ft)		An(sft)	====== ===== hrise(in)	Aav(sft)	=======) h(ft)	====== Ka
==== t0 t1 t2 t3 t4 t5 t6	0 20 20 20 20 20 20 20 20	120.00 115.00 112.00 109.50 108.00 107.00 106.00	0.00 4.67 5.33 6.00 6.08 6.83 7.08	0.00 3.17 3.17 3.17 3.17 3.17 3.17 3.17	0.00 14.78 16.89 19.00 19.26	5.00 3.00 2.50 1.50 1.00 1.00	7.39 15.83 17.94 19.13 20.45 22.03	5.21 5.54 5.77 5.94 6.04 6.13	2.82 4.57 5.32 4.13 3.40 4.20
	(take ave	Height of 24 height of wa rage of d beg to feet, and s	24-hour hour-readin ater level ab inning and e	end of last ti	reading tratum n	====== =====			
Calcu	llate K usir	ng above data	a and final ti	ime interval o	of test:				
	K = [hris	se / t] x [Aav	/ 2.27(H-	h)] x 60 min/h	r				
	= [=	1.00 / 19.26 i	in/hr]x[22.03		2.78 -	1.27) x 60 min/ł	nr
accur Pollut	ate. I am a ion Contro	hat the inforn aware that fal I Act (N.J.S.A N.J.A.C. 7:1	sification of A. 58:10A-1	f data is a vio	plation of the	Water			

N.J.P.E. #34722

_ -

Engineer's Signature Michael K. Ford

License # and Seal

Al Shjarback Applicant: 2-15-19 Date Tested: Block: 516.01 Prop. Lot: 1.01 I ot. 1 Franklin Township SEE SOIL LOG SI 2 ____ _ _____ __ __ _____ ______ _____ PIT BAIL #: SL 2 Depth to pit bottom: 10.00 ft. 7.67 ft. 24 static water level: (Dwater) Depth to Impermeable Strata: 15.00 ft.; H = Dstratum - Dwater: 7.33 ft. (Dstratum) 1.5 x pit depth assumed Calculate the following values and enter into the table below: An = water surface area in square feet hrise = water level rise in inches Aav = average water surface area (An + previous An)/2 in sft. h = average height of water level above Dstratum (take average of current water level and previous water level, convert to feet, and subtract from Dstratum) in ft. 2 Ka = hrise/t x Aav/2.27 (H -h) x 60 min/hr (K in inches/hr) Tn(min) Dwater(in) l, w (ft) An(sft) hrise(in) Aav(sft)) h(ft) Ka 0.00 119.00 6.00 3.33 20.00 t0 t1 5.00 111.00 7.00 3.33 23.33 8.00 21.67 5.42 37.50 t2 5.00 108.00 7.67 3.33 25.56 3.00 24.44 5.88 20.13 t3 5.00 105.00 8.33 3.33 27.78 3.00 26.67 6.13 26.01 t4 5.00 103.00 9.17 3.33 30.56 2.00 29.17 6.33 22.56 10.00 ft. Final pit depth (Dstratum) 24-hour groundwater reading 7.67 ft. Height of 24 hour-reading above Dstratum 2.33 ft. (H) Average height of water level above Dstratum 1.33 ft. (h) (take average of d beginning and end of last time interval recorded, convert to feet, and subtract from Dstratum) Calculate K using above data and final time interval of test: K = [hrise / t] x [Aav / 2.27 (H - h)] x 60 min/hr = [2.00 / 5]x[29.17 / 2.27 (5.44 -1.78) x 60 min/hr 84.10 in/hr = I hereby certify that the information furnished on this form is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties

as prescribed in N.J.A.C. 7:14-8.

N.J.P.E. & L.S. #20792

Engineer's Signature Michael K. Ford

Al Shjarback Applicant: 2-15-19 Date Tested: Block: 516.01 Prop. Lot: 1.01 I ot. 1 Franklin Township SEE SOIL LOG SL 3 PIT BAIL #: SL 3 Depth to pit bottom: 6.67 ft. 9.33 ft. 24 static water level: (Dwater) Depth to Impermeable Strata: 14.00 ft.; H = Dstratum - Dwater: 7.33 ft. (Dstratum) 1.5 x pit depth assumed Calculate the following values and enter into the table below: An = water surface area in square feet hrise = water level rise in inches Aav = average water surface area (An + previous An)/2 in sft. h = average height of water level above Dstratum (take average of current water level and previous water level, convert to feet, and subtract from Dstratum) in ft. 2 Ka = hrise/t x Aav/2.27 (H -h) x 60 min/hr (K in inches/hr) Tn(min) Dwater(in) l, w (ft) An(sft) hrise(in) Aav(sft)) h(ft) Ka 0.00 112.00 0.00 0.00 0.00 t0 t1 5.00 106.00 3.00 2.92 8.75 6.00 4.38 4.92 4.69 t2 5.00 103.00 3.33 2.92 9.72 3.00 9.24 5.29 5.68 t3 5.00 101.50 4.00 2.92 11.67 1.50 10.69 5.48 3.57 t4 5.00 100.00 4.33 2.92 12.64 1.50 12.15 5.60 4.31 9.33 ft. Final pit depth (Dstratum) 24-hour groundwater reading 6.67 ft. Height of 24 hour-reading above Dstratum 2.67 ft. (H) Average height of water level above Dstratum 0.94 ft. (h) (take average of d beginning and end of last time interval recorded, convert to feet, and subtract from Dstratum) Calculate K using above data and final time interval of test: K = [hrise / t] x [Aav / 2.27 (H - h)] x 60 min/hr = [1.50 / 5]x[12.15 / 2.27 (7.11 -0.88) x 60 min/hr 15.46 in/hr = I hereby certify that the information furnished on this form is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties

as prescribed in N.J.A.C. 7:14-8.

N.J.P.E. & L.S. #20792

Engineer's Signature Michael K. Ford

			FORM 3	F - PII = == =	-BAIL	TEST DAT	A SHEE : ======= ===	. ===		
Applicant: Block:		Al Shjarba 16.01	ack Lot:	1		Prop. Lot:	Date Teste 1.01	d: Franklin T	2-14-19 ownship	
SEE SOIL SL 5										
==== === PIT BAIL #		SL 5	= = =====	= == = 7 ft.	=====	24	static water le	: =======	= ===== == 4.83 ft.	======
Depth to p		111.	0.07	п.		24	Static water le	vel.	(Dwater)	
Depth to Iı (Dstratum	ו)	1.5 x	pit dep	oth assu	umed		tratum - Dwate		5.17 ft.	
						able below:	======= ===	=======	: ====== =:	======
Saloalato	A	n = wate	er surface	area in	squar					
			ater level r			o(An + nrow)	(ious An)/2 in c	.#		
			•			above Dstr	/ious An)/2 in s atum	51L.		
		(take a	verage of	current	water	level and p	revious water le	evel,		
		conver	to feet, a	nd subt 2	ract fro	om Dstratur	n) in ft.			
				.27 (H			K in inches/hr) ====================================		- ======= ==	
Tn(min)	0	Owater(in) I, w ((ft)		An(sft)	hrise(in) ====================================	Aav(sft)) h(ft)	Ka
tO (0.00	89.00	6.33	3	3.33	21.11				
	3.00	84.00			3.33	22.22	5.00	21.67	2.79	50.50
	3.00 3.00	81.00 79.50			3.33 3.33	23.33 24.44	3.00 1.50	22.78 23.89	3.13 3.31	35.56 20.08
	3.00	76.50	7.67		3.33	25.56	3.00	25.00	3.50	45.75
	==== =	======				= ======= Dstratum)	====== ===	6.67		======
			24-ho	ur grou	indwat	er reading		4.83	ft.	
			24 hour-re						ft. (H)	
	-	-	water leve				/al recorded,	0.17	ft. (h)	
		-	d subtract				ai recorded,			
==== ===	==== =			= == =	=====	= ========	======= ===		=:	
		•								
K =	[hrise	e/t]x[A	Aav / 2.27	(H - h)] x 60	min/hr				
=	[3.00	/ 3]x[25.00	/ 2.27 (3.36 -	0.03) x 60 min/hr	
=		198.24	in/hr							
						his form is t				
						a violation o and is subie	f the Water ect to penalties			
as prescril		· ·		n-iel	seq.)	anu is subje	or to penalties			

N.J.P.E. & L.S. #20792

Engineer's Signature Michael K. Ford

							- -			
Δnnli	icant:	Al Shjarba					Data T	ested:	2-14-19	
Block		516.01		##	1.01	Prop. Lot:	1.01	Franklin T		
						-		=== =======	•	======
SEE SL 6		TION OF SO	DIL LOG							
====	- =======		= ======	===				=== =======		
	BAIL #:	SL 6								
Dept	h to pit bott	iom:	10.17	ft.		24	static wa	ter level:	9.00	
_					45.05	<i></i>			(Dwater)	,
		neable Stra	ta:			ft.; H = Ds	tratum - D	water:	6.25	ft.
•	DEPTH x	,			(Dstratum) ======			=== =======		
Calc	ulate the fo	An = wate hrise = wa Aav = ave h = averag (take av convert	r surface a ter level ris rage water ge height o rerage of c to feet, an	rea i se surf f wat urrer d sul 2	to the table be n square feet ace area (An ter level above nt water level a btract from Ds	+ previous / e Dstratum and previou tratum)	is water le			
			/t x Aav/2.2		,					
==== Tn(m	= ====== nin)	====== Dwater(in)				An(sft)	hrise(in)	=== ===== Aav(sft)	=======) h(ft)	====== Ka
==== t0	0.00	====== 122.00	=== ======	======						
t1	10.00	117.00	0.00 4.58		0.00 3.00	0.00 13.75	5.00	6.88	5.29	8.21
t2	10.00	115.00	5.42		3.08	16.70	2.00	15.23		10.20
t3	10.00	114.00	6.00		3.17	19.00	1.00	17.85		7.28
t4	10.00	113.00	6.33		3.17	20.06	1.00	19.53	5.79	9.35
t5	10.00	112.00	6.42		3.17	20.32	1.00	20.19	5.88	11.74
t6	10.00	111.00	6.50		3.17	20.58	1.00	20.45	5.96	15.18
t7	10.00	110.00	6.58		3.17	20.85	1.00	20.72	6.04	21.38
====	- =======	======	= ======			======	=====	=== =======	т =======	======
			24-bour		al pit depth undwater read	ina		10.17 9.00		
		Height of 2			above Dstrat				ft. (H)	
	Average	height of w							, , , , , , , , , , , , , , , , , , ,	
					nd of last time	interval ree	corded,			
		o feet, and			,					
							=====	=== ======	======	======
Calc	ulate K usir	ng above da	ita and fina	ii tim	e interval of te	est:				
	K = [hris	se/t]x[Aa	IV / 2.27 (H	-1^2 -	h^2)] x 60 m	in/hr				
	= [1.00	/ 10.00]×[20.72	/ 2.27 (1.36	- 0.92) x 60 min	/hr
	=	123.68	in/hr							
accu Pollu	rate. I am ition Contro	aware that f	alsification A. 58:10A	of d	ed on this forr lata is a violati t seq.) and is s	on of the W	/ater	N.J.P.E. #347	22	
		·						<u> </u>		

Engineer's Signature Michael K. Ford

Applican	t:	- Al Shjarbac			== =======	Date Tes		2-26-19	
Block:		516.01	Lot:	##	Prop. Lot:	1.01	Franklin T		
SEE SO				- == ====		=========			
==== == PIT BAIL Depth to	#:	====== = SL 15 om:	= ====== 10.75	= == ===== ft.	24	====== == static water	== ====== level:	====== 8.75	======
Depth to (Dstratu	-	neable Strat 1.5 x		16.1 h assume	3 ft.; H = Ds d	tratum - Dwa	ater:	(Dwater) 7.38	
		An = water : hrise = wate	surface a er level ris	irea in squ se in inche	S		n eft		
==		An = water = hrise = wate Aav = avera h = average (take ave convert to Ka = hrise/t	surface a er level ris age water height o rage of c o feet, an x Aav/2.2	rea in squ se in inche surface au f water lev urrent wate d subtract 27 (H^2 -h	are feet	vious An)/2 i atum revious wate m) in ft. /hr (K in incl	er level,		
==== == Tn(min) ==== ==		An = water = hrise = water Aav = average (take ave convert to Ka = hrise/t ====== = Dwater(in)	surface a er level ris age water e height o rage of c o feet, an x Aav/2.2 = ====== I, w (f	rea in squ se in inche surface al f water lev urrent wat d subtract 27 (H^2 -h = == ==== t)	are feet s rea (An + pre el above Dstr er level and p from Dstratur n^2) x 60 min ======= An(sft)	vious An)/2 i atum revious wate n) in ft. /hr (K in incl ======== hrise(in)	er level, hes/hr) == ====== Aav(sft)	======) h(ft)	====== Ka
```		An = water = hrise = water Aav = average (take ave convert to Ka = hrise/t ====== = Dwater(in)	surface a er level ris age water e height o rage of c o feet, an x Aav/2.2 = ====== I, w (f	rea in squ se in inche surface a f water lev urrent wat d subtract 27 (H^2 -h = == ==== t) 3.1 3.3 3.3 3.3	are feet s rea (An + prevel el above Dstr er level and p from Dstratur n^2 ) x 60 min = ====== An(sft) = ====== 7 21.11 3 25.00 3 30.00 3 33.33	vious An)/2 i atum revious wate n) in ft. /hr (K in incl ======== hrise(in)	er level, hes/hr) == ====== Aav(sft)	, , ,	38.7 42.2
==== == t0 t1 t2 t3 ==== == / (ta cd	===== 0.00 5.00 5.00 ===== Average ke aver onvert t	An = water = hrise = water Aav = average (take average)) (take average) (take average) (tak	surface a er level ris age water e height o rage of c o feet, an x Aav/2.2 = ===== I, w (f = ===== 6.67 7.50 9.00 10.00 = ===== Fina 24-hou I hour-rea vater leve ginning a subtract f	rea in squ se in inche surface a f water lev urrent wat d subtract 27 (H^2 -+ = = = ==== t) = = = ==== 3.1 3.3 3.3 = = = ==== I pit depth ur groundw ading abov I above Ds nd end of from Dstra	are feet s rea (An + pre- rel above Dstr er level and p from Dstratur n^2 ) x 60 min = ====== An(sft) = ====== 7 21.11 3 25.00 3 30.00 3 33.33 = ====== (Dstratum) vater reading ve Dstratum last time inter tum)	vious An)/2 i atum revious wate n) in ft. /hr (K in incl ====================================	er level, hes/hr) == Aav(sft) == 23.06 27.50 31.67 == 10.75 8.75 2.00 1.29	5.96 6.38 6.67 ====== ft. ft. ft. (H) ft. (H)	====== 38.7 42.2 50.4 ======
==== == t0 t1 t2 t3 ==== == (ta ca ==== ==	===== 0.00 5.00 5.00 ===== Average ke aver onvert t	An = water = hrise = water Aav = average (take average)) (take average (take average)) (take	surface a er level ris age water e height o rage of c o feet, an x Aav/2.2 = ===== I, w (f = ===== 6.67 7.50 9.00 10.00 = ===== Fina 24-hou t hour-rea vater leve ginning a subtract f	rea in squ se in inche surface a f water lev urrent wat d subtract 27 (H^2 -h = = = ==== 3.1 3.3 3.3 = = = ==== I pit depth ur groundw ading abov I above Ds nd end of from Dstrat = = =====	are feet s rea (An + prevent er labove Dstrevent er level and p from Dstratur (n^2) x 60 min = ======= An(sft) = ======= 7 21.11 3 25.00 3 30.00 3 33.33 = ====== (Dstratum) vater reading ve Dstratum last time inter	vious An)/2 i atum revious wate n) in ft. /hr (K in incl ====================================	er level, hes/hr) == Aav(sft) == 23.06 27.50 31.67 == 10.75 8.75 2.00 1.29	5.96 6.38 6.67 ====== ft. ft. ft. (H) ft. (H)	====== 38.7 42.2 50.4 ======
==== == t0 t1 t2 t3 ==== == (ta ci ca ca ca ca ca ca ca ca ca ca ca ca ca	===== 0.00 5.00 5.00 5.00 ===== Average ke aver onvert t ===== e K usir	An = water = hrise = water Aav = average (take average)) (take average (take average)) (take	surface a er level ris age water height o rage of c o feet, an x Aav/2.2 = ===== I, w (f = ===== 6.67 7.50 9.00 10.00 = ===== Kina 24-hou Hour-rea vater leve ginning a subtract f = ====== ta and fin	rea in squ se in inche surface al f water lev urrent wate d subtract 27 (H^2 -+ = = = ===== t) = = = ===== a.1 pit depth ur groundw ading abov I above De ind end of from Dstra = = = ===== nal time int	are feet s rea (An + prevent rea (An + prevent rea (An + prevent rea (An + prevent real above Dstratur from Dstratur (An (Sft) = ===================================	vious An)/2 i atum revious wate m) in ft. /hr (K in incl ====================================	er level, hes/hr) == Aav(sft) == 23.06 27.50 31.67 == 10.75 8.75 2.00 1.29	5.96 6.38 6.67 ====== ft. ft. ft. (H) ft. (H)	====== 38.7 42.2 50.4 ======
==== == t0 t1 t2 t3 ==== == (ta ct ct ct ct ct ct ct ct ct ct ct ct ct	===== 0.00 5.00 5.00 5.00 ===== Average ke aver onvert t ===== e K usir = [hris	An = water = hrise = water Aav = average (take average)) (take average (take average)) (take	surface a er level ris age water height o rage of c o feet, an x Aav/2.2 = ===== l, w (f = ===== 6.67 7.50 9.00 10.00 = ===== Fina 24-hou t hour-rea vater leve ginning a subtract f = ====== ta and fin v / 2.27 (	rea in squ se in inche surface al f water lev urrent wate d subtract $27 (H^2 - F$ = = = = = = = = = = = = = = = = = = =	are feet s rea (An + pre- rea (An + pre- rel above Dstr er level and p from Dstratur $n^2$ ) x 60 min = ====== An(sft) = ======= 7 21.11 3 25.00 3 30.00 3 33.33 = ======= (Dstratum) vater reading ve Dstratum last time inter- tum) = ======= erval of test:	vious An)/2 i atum revious wate m) in ft. /hr (K in incl ====================================	er level, hes/hr) == ====== 23.06 27.50 31.67 == ====== 10.75 8.75 2.00 1.29 I,	5.96 6.38 6.67 ====== ft. ft. ft. (H) ft. (H)	====== 38.7 42.2 50.4 ======

accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

N.J.P.E. . #34722

	F	ORM 3F - P	II-BAIL	IESIDAL	A SHEE I			
Applicant: Block:	= Al Shjarback 516.01 == ======= =	Lot: ##		Prop. Lot:	Date Teste	ed: Franklin T	2-25-19 ownship	
SEE SOIL LO SL 16	_							
		==	======					
PIT BAIL #: Depth to pit b	SL 16 ottom:	9.75 ft.		24	static water le	evel:	7.50 f (Dwater)	t.
(Dstratum)	ermeable Strata 1.5 x == =================================	pit depth as	sumed		tratum - Dwate	er:	7.13 f	t.
Calculate the	h = average (take aver	urface area level rise in ge water sur height of wa	in square ⊨inches face area ter level nt water	e feet a (An + prev above Dstra level and pr	rious An)/2 in s atum revious water l			
	Ka = hrise/t > == ====== = Dwater(in)		H^2 -h^2 ======	=======	hr (K in inche ====================================	s/hr) = ======== Aav(sft)	= ====== = ) h(ft)	 Ka
Tn(min) ==== ======	= ====== =		======	An(sft) =======	( )	= ========	) 11(11) = ======== =	r.a =======
t0 0.0 t1 5.0 t2 16.0	0 114.00	0.00 8.75 10.67	0.00 2.50 2.50	0.00 21.88 26.67	3.00 10.00	10.94 24.27	5.00 5.54	6.73 19.99
(take a conve	Height of 24 age height of wa verage of d beg rt to feet, and s	24-hour gr hour-reading iter level abo inning and e ubtract from	oundwat g above ove Dstra end of las Dstratur	Dstratum atum st time interv		5.42	ft. ft. (H) ft. (h)	
	sing above data			al of test:		- =======		
K= [ł	nrise / t ] x [ Aav	/ 2.27 ( H^2	? - h^2 )]	x 60 min/hr				
= [	10.00 /	16 ]x[	24.27	/ 2.27 (	56.25 -	5.06	) x 60 min/h	r
=	7.83 in	/hr						
accurate. I a Pollution Con	fy that the inform m aware that fai trol Act (N.J.S.A in N.J.A.C. 7:1	sification of A. 58:10A-1	data is a	violation o	f the Water	i		

N.J.P.E. . #34722

		FORM 3F	- PIT-BAIL	. IESI DAI	A SHEE I			
Applicant: Block:	Al Shjarba 516.01	ack Lot:	1	Prop. Lot:		d: Franklin T	2-26-19 ownship	
SEE SOIL L SL 17								
==== ===== PIT BAIL #: Depth to pit	=== ======= SL 17 hottom:	= = ===================================	: == =====:	= =====================================	static water le	: =======	= ====== = 7.00 ft	
							(Dwater)	
Depth to Imp (Dstratum)	permeable Str 1.5 x		14.25 h assumed	ft.; H = Ds	tratum - Dwate	r:	7.25 ft	-
	hrise = wa Aav = ave h = avera (take a conver	ge height of verage of cu t to feet, and	e in inches surface are water level urrent water d subtract fr 2	ea (An + pre above Dstr level and p om Dstratur	revious water l			
		= = ======	:== =====	= =======			= ====== = = )	====== Ka
Tn(min) ==== =====		= = ======	== =====	An(sft) = ======	hrise(in) = ===== ===	Aav(sft)	)h(ft) = ======= =	rta =======
t1 3.0		5.83 6.67 8.67	0.00 2.00 3.00 3.33 3.33	11.67 20.00 28.89	3.00 2.00 4.25 2.75	5.83 15.83 24.44 29.17	5.08	5.35 3.48 3.81 1.70
Ave (take a conv	Height of rage height of average of d b ert to feet, an	Fina 24-hou 24 hour-rea water level beginning ar d subtract fi	l pit depth (I r groundwa Iding above above Dstr nd end of las rom Dstratu	Dstratum) ter reading Dstratum ratum st time inter m)		9.50 7.00 2.50 0.89	ft. ft. ft. (H) ft. (h)	
	using above o					: =======	= ====== = =	
K= [	hrise / t] x [ /	Aav / 2.27 (	H - h )] x 60	) min/hr				
= [	2.75		]x[ 29.17		6.25 -	0.78	) x 60 min/hr	
=		in/hr		,				
I hereby cert accurate. I a Pollution Co	tify that the in am aware tha	formation fu t falsificatior .S.A. 58:10/	n of data is a	a violation o				

as prescribed in N.J.A.C. 7:14-8.

N.J.P.E. & L.S. #20792

Engineer's Signature Michael K. Ford

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Bloc	licant: ck: ======	Al Shjarback 516.01 =======	Ex. Lot:		Prop. Lc ======		Franklin T		р
SEE	SOIL	LOG	SL 24						
== PIT	===== BAIL #:	======= SL 24	====== :	= =====	=====	===== =	======	===== :	======
Dep	oth to pit	bottom:	7.83 1	ft.	24.00	static wate	er level:	6.25 (Dwat	
(Ds	stratum	oermeable Stra = 1.5 x ==========	pit depth	assume	d)	Ostratum - I		5.50	ft.
Car		e following valu An = water su hrise = water Aav = averag h = average h (take avera convert to f	Irface area level rise i e water su neight of wa age of curre	in squar n inches rface are ater level ent water	e feet a (An + p above D level and	previous Ar stratum d previous		<b>,</b>	
		Ka = hrise/t x	Aav/2.27 (	(H^2 -h /	2) x 60 m	nin/hr (K ir			
Tn(r	min)	Ka = hrise/t x ======== Dwater(in)	Aav/2.27 ( = ===== = I, w (ft)	(H^2 -h / = =====	2) x 60 m ====== An(sft)	nin/hr(K ir ===== = hrise(in)	====== Aav(sqft)	===== : h(ft)	Ka
Tn(r == t0	min) ====== 0.00	Ka = hrise/t x ======= Dwater(in) ========= 94.00	Aav/2.27 ( = ===== = I, w (ft) = ===== = 0.00	(H^2 -h / = ===== = ===== 0.00	2) x 60 m ====== An(sft) ====== 0.00	nin/hr (K ir ===== = hrise(in) ===== =	====== Aav(sqft) ======	====== h(ft) ======	Ka ======
Tn(r == t0 t1	min) ====== 0.00 5.00	Ka = hrise/t x ======= Dwater(in) ======== 94.00 87.00	Aav/2.27 ( ====== I, w (ft) ====== 0.00 5.25	(H^2 -h / = ===== 0.00 4.00	2) x 60 m ===== An(sft) ===== 0.00 21.00	nin/hr (K ir ===== = hrise(in) ===== = 7.00	====== Aav(sqft) ======= 10.50	===== h(ft) ====== 4.21	Ka ====== 30.98
Tn(r == t0 t1 t2	min) ===== 0.00 5.00 5.00	Ka = hrise/t x ======= Dwater(in) ======== 94.00 87.00 84.00	Aav/2.27 ( ====== = I, w (ft) ====== = 0.00 5.25 6.33	H^2 -h ^ = ===== 0.00 4.00 4.00	2) x 60 n ===== An(sft) ===== 0.00 21.00 25.33	nin/hr (K ir ===== = hrise(in) ===== = 7.00 3.00	====== Aav(sqft) ====== 10.50 23.17	+(ft) +(ft) 4.21 4.63	Ka ====== 30.98 41.47
Tn(r == t0 t1 t2 t3	min) ====== 0.00 5.00 5.00 5.00	Ka = hrise/t x ======= Dwater(in) ========= 94.00 87.00 84.00 82.50	Aav/2.27 ( ====== = l, w (ft) ====== = 0.00 5.25 6.33 7.33	(H^2 -h / = ===== 0.00 4.00 4.00 4.00 4.00	2) x 60 n ===== An(sft) ===== 0.00 21.00 25.33 29.33	nin/hr (K ir ===== = hrise(in) ===== = 7.00 3.00 1.50	====== Aav(sqft) ====== 10.50 23.17 27.33	4.21 4.63 4.81	Ka 30.98 41.47 30.57
Tn(r == t0 t1 t2 t3 t4	min) ===== 0.00 5.00 5.00 5.00 5.00	Ka = hrise/t x ====================================	Aav/2.27 ( ======= l, w (ft) ======= 0.00 5.25 6.33 7.33 7.75	(H^2 -h / = ===== 0.00 4.00 4.00 4.00 4.00 4.00	2) x 60 n ===== An(sft) ===== 0.00 21.00 25.33 29.33 31.00	nin/hr (K ir ===== = hrise(in) ===== = 7.00 3.00 1.50 1.50	Aav(sqft) 	4.21 4.63 4.81 4.94	Ka 30.98 41.47 30.57 40.74
Tn(r == t0 t1 t2 t3	min)  0.00 5.00 5.00 5.00 5.00 5.00	Ka = hrise/t x ======= Dwater(in) ========= 94.00 87.00 84.00 82.50	Aav/2.27 ( = ===== = I, w (ft) = ===== = 0.00 5.25 6.33 7.33 7.75 8.17	H ² -h ² ====== 0.00 4.00 4.00 4.00 4.00 4.00 4.	2) x 60 n ===== An(sft) ===== 0.00 21.00 25.33 29.33 31.00 32.67	nin/hr (K ir ===== = hrise(in) ===== = 7.00 3.00 1.50 1.50 1.00	====== Aav(sqft) ====== 10.50 23.17 27.33	4.21 4.63 4.81 4.94 5.04	Ka 30.98 41.47 30.57 40.74 34.83
Tn(r == t0 t1 t2 t3 t4	min)  0.00 5.00 5.00 5.00 5.00 5.00	Ka = hrise/t x ======= Dwater(in) ====== 94.00 87.00 84.00 82.50 81.00 80.00	Aav/2.27 ( = ===== = I, w (ft) = ===== = 0.00 5.25 6.33 7.33 7.75 8.17 = ===== =	H^2 -h / = ===== 0.00 4.00 4.00 4.00 4.00 4.00 4.00	2) x 60 n ===== An(sft) ===== 0.00 21.00 25.33 29.33 31.00 32.67	nin/hr (K ir ===== = hrise(in) ===== = 7.00 3.00 1.50 1.50 1.00 ===== =	Aav(sqft) 	4.21 4.63 4.81 4.94 5.04	Ka 30.98 41.47 30.57 40.74 34.83
Tn(r == t0 t1 t2 t3 t4	min)  0.00 5.00 5.00 5.00 5.00 5.00	Ka = hrise/t x ======= Dwater(in) ====== 94.00 87.00 84.00 82.50 81.00 80.00	Aav/2.27 ( ====== = I, w (ft) ====== = 0.00 5.25 6.33 7.33 7.75 8.17 ====== = Final	H ² -h ² ====== 0.00 4.00 4.00 4.00 4.00 4.00 ====== pit depth	2) x 60 n ===== An(sft) ===== 0.00 21.00 25.33 29.33 31.00 32.67 =====	nin/hr (K ir ===== = hrise(in) ===== = 7.00 3.00 1.50 1.50 1.00 ===== = m)	Aav(sqft) 	+.21 4.21 4.63 4.81 4.94 5.04 =====	Ka 30.98 41.47 30.57 40.74 34.83
Tn(r == t0 t1 t2 t3 t4	min) ====== 0.00 5.00 5.00 5.00 5.00 ======	Ka = hrise/t x ======== Dwater(in) ====== 94.00 87.00 84.00 82.50 81.00 80.00 =========	Aav/2.27 ( = ===== = I, w (ft) = ==== = 0.00 5.25 6.33 7.33 7.75 8.17 = ==== = Final 24-hou nour-readir	H ² -h / = ===== 0.00 4.00 4.00 4.00 4.00 9 = ==== pit depth in ground ng above	2) x 60 n ====== An(sft) ===== 0.00 21.00 25.33 29.33 31.00 32.67 ===== (Dstratum water rea Dstratum	nin/hr (K in ===== = hrise(in) ===== = 7.00 3.00 1.50 1.50 1.50 1.00 ===== = m) ading	Aav(sqft) ====== 10.50 23.17 27.33 30.17 31.83 ===== 7.83 6.25 1.58	+.21 4.21 4.63 4.81 4.94 5.04 ====== ft. ft. ft. (H)	Ka 30.98 41.47 30.57 40.74 34.83
Tn(r == t0 t1 t2 t3 t4	min) ===== 0.00 5.00 5.00 5.00 5.00 =====	Ka = hrise/t x ======= Dwater(in) ====== 94.00 87.00 84.00 82.50 81.00 80.00 ======== Height of 24 H ge height of 24 H	Aav/2.27 ( ====== = I, w (ft) ===== = 0.00 5.25 6.33 7.33 7.75 8.17 ===== = Final 24-hou nour-readir ater level al	H [^] 2 -h ' = ===== 0.00 4.00 4.00 4.00 4.00 9 = ==== pit depth ir ground ng above bove Dst	2) x 60 n ===== An(sft) ===== 0.00 21.00 25.33 29.33 31.00 32.67 ===== (Dstratum water rea Dstratum	nin/hr (K ir ===== = hrise(in) ===== = 7.00 3.00 1.50 1.50 1.50 1.00 ===== = m) ading	Aav(sqft) 	+.21 4.21 4.63 4.81 4.94 5.04 ====== ft. ft. ft. (H)	Ka 30.98 41.47 30.57 40.74 34.83
Tn(r == t0 t1 t2 t3 t4	min) ===== 0.00 5.00 5.00 5.00 5.00 ===== Averag (take av	Ka = hrise/t x ======== Dwater(in) ====== 94.00 87.00 84.00 82.50 81.00 80.00 =========	Aav/2.27 ( = ===== = I, w (ft) = ==== = 0.00 5.25 6.33 7.33 7.75 8.17 = ==== = 24-hou nour-readir ater level at inning and	H^2 -h / = ===== 0.00 4.00 4.00 4.00 4.00 4.00 9 = ==== pit depth ir ground ng above bove Dst end of la	2) x 60 m ===== An(sft) ===== 0.00 21.00 25.33 29.33 31.00 32.67 ===== (Dstratum water rea Dstratum ratum ast time in	nin/hr (K ir ===== = hrise(in) ===== = 7.00 3.00 1.50 1.50 1.50 1.00 ===== = m) ading	Aav(sqft) 	+.21 4.21 4.63 4.81 4.94 5.04 ====== ft. ft. ft. (H)	Ka 30.98 41.47 30.57 40.74 34.83
Tn(t == t0 t1 t2 t3 t4 t5 ==	min) ====== 0.00 5.00 5.00 5.00 5.00 ===== Averag (take av conver	Ka = hrise/t x ======= Dwater(in) ====== 94.00 87.00 84.00 82.50 81.00 80.00 ======== Height of 24 H ge height of 24 H ge height of deg	Aav/2.27 ( ====== = I, w (ft) ===== = 0.00 5.25 6.33 7.33 7.75 8.17 ===== = 24-hou nour-readir ater level al inning and ubtract from	H^2 -h / = ===== 0.00 4.00 4.00 4.00 4.00 4.00 9 = ==== pit depth ir ground mg above bove Dst end of la m Dstratu	2) x 60 m ===== An(sft) ===== 0.00 21.00 25.33 29.33 31.00 32.67 ===== (Dstratum water rea Dstratum ratum ast time in im)	nin/hr (K in ===== = hrise(in) ===== = 7.00 3.00 1.50 1.50 1.50 1.00 ===== = m) ading	Aav(sqft) 	+.21 4.21 4.63 4.81 4.94 5.04 ====== ft. ft. ft. (H) ft. (h)	Ka 30.98 41.47 30.57 40.74 34.83
Tn(r == t0 t1 t2 t3 t4 t5 ==	min) ====== 0.00 5.00 5.00 5.00 5.00 ===== Averag (take av conver	Ka = hrise/t x ======= Dwater(in) ====== 94.00 87.00 84.00 82.50 81.00 80.00 ======== Height of 24 H ge height of 24 H ge height of beg t to feet, and so	Aav/2.27 ( ====== = I, w (ft) ====== = 0.00 5.25 6.33 7.33 7.75 8.17 ===== = Final 24-hou nour-readir ater level al inning and ubtract from ====== =	H^2 -h / = ===== 0.00 4.00 4.00 4.00 4.00 4.00 5 ===== pit depth in ground ng above bove Dst end of la m Dstratu = =====	2) x 60 m ===== An(sft) ===== 0.00 21.00 25.33 29.33 31.00 32.67 ===== (Dstratum water rea Dstratum ratum ast time in im) ======	nin/hr (K ir ===== = hrise(in) ===== = 7.00 3.00 1.50 1.50 1.50 1.00 ===== = m) ading	Aav(sqft) 	+.21 4.21 4.63 4.81 4.94 5.04 ====== ft. ft. ft. (H) ft. (h)	Ka 30.98 41.47 30.57 40.74 34.83

K = [hrise / t] x [Aav / 2.27 (H² - h²)] x 60 min/hr

= [ 1.00 / 5.00 ]x 31.83 / 2.27 ( 2.51 - 1.27 ) x 60 min/hr

= 135.57 in/hr

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

N.J.P.E. #34722

<u>Appendix E</u> Groundwater Recharge Worksheet

New Jersey	sey	Annual Groundwater Recharge		alysis (	Analysis (based on GSR-32)	R-32)			Project Name:	<b>Pillar of Fire</b>		
Recharge Spreadsheet Version 2.0	heet 0	Select Township \downarrow	Average Annual P (in)	Climatic Factor					Description:	9911FS.01		
November	2003	SOMERSET CO., HILLSBOROUGH TWP	45.7	1.50					Analysis Date:	10/16/19		
		Pre-Developed Conditions	tions						Post-Developed Conditions	d Conditions		
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)	0	Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	2.93	Open space	Dunellen	14.7	156,401		1	1.47	Open space	Dunellen	14.7	78,467
2	0.12	Impervious areas	Dunellen	0.0	•		2	1.58	Impervious areas	Dunellen	0.0	•
3							e					
4							4					
5	0						5	0				
9	0						9	0				
7	0						7	0				
∞	0						ø	0				
6	0						6	0				
9	0						10	0				
1	0						11	0				
12	0						12	0				
13	0						13	0				
14	0						14	0				
15	0						15	0				
				Iotal Annual	l otal Annual						Iotal Annual	l otal Annual
Total =	3.1			Recharge (in)	Recharge (cu-ft)		Total =	3.1			Recharge (in)	Recharge (cu.ft)
				14.1	156,401		Annual F	Recharge	Annual Recharge Requirements Calculation	on ↓	7.1	78,467
Procedure	to fill the	Procedure to fill the Pre-Development and Post-Development Conditions Tables	tions Tables			% of Pre-De	veloped A	nnual Rec	% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)	68,825
For each land	d segment, firs	For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table	oil. Start from the top	o of the table		Post-Dev	elopmei	nt Annu	Post-Development Annual Recharge Deficit=	77,934	(cubic feet)	
and proceed (	downward. Do	and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with	es. Rows with A=0 w	A=0 will not be		Recharg	ge Efficie	ncy Par	Recharge Efficiency Parameters Calculations (area averages)	ea averages)		
displayed or u	used in calcula	displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover.	mpervious Areas" as	the Land Cover.		RWC= #	) V/N#	(in)	DRWC= #N/A	#N/A	(in)	
Soil type for ir	mpervious are	Soil type for impervious areas are only required if an infiltration facility will be built within these areas.	these areas.			ERWC = #N/A		(in)	EDRWC= #N/A	W/N#	(in)	

											al Recharge					Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The porti <mark>on</mark>	of BMP infiltration prior to filing 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 loss <mark>es</mark>	nual Recharge" sheet to litv and then solve for
			<u>Unit</u>	.⊑	. <u>e</u>	.⊆	Ë				fy Annu					to make rec	IP are ignor	gh for BMP	VC will be	wing consid	the "Anr AP. ation faci
			<u>Value</u>	2.83	3.06	35.6	35.6			SAGES	em to satis					are updated t	scupied by BM	is small enouç	ious areas" R'	nd Cover allo	Aimp" from le to the BN vour infiltra
		umeters	<u>Symbol</u>	Qdesign	Pdesign					CHECK MESSAGES	olve Proble	¥	ž	X		MP dimensions	and the area o	IBMP selected	i select "imperv	zone for this La	vious area " a is availab onnected to
D Type		<b>Recharge Design Parameters</b>	<u>Parameter</u>	Inches of Runoff to capture	Inches of Rainfall to capture	Recharge Provided Avg. over Imp. Area	Runoff Captured Avg. over imp. Area			CALCULATION CHI	Volume Balance-> Solve Problem to satisfy Annual Recharge	dBMP Check> OK	dEXC Check> OK	BMP Location> OK	OTHER NOTES	Pdesign is accurate only after BI	of BMP infiltration prior to filling	sensetive to dBMP, make sure c	Segment Location of BMP if you	the soil type and a shallow root a	and total proposed imper rom entire impervious are mpervious area directly c
BMP or LID 1ype		neters	Unit	.⊑	.5	. <u> </u>		2			unitless	cu.ft		cu.ft	Represents % Infiltration Recharged	%	%	%	%		volume "Vdef" ; ing the runoff fr e and Aimp to i
Date		lated Param	<u>Value</u>	0.74	0.00	0.00					0.79	67,075 cu.ft	Parameters	204,171 cu.ft	100.0%	77.9%	100.0%	100.0%	77.9%		ficit recharge ement assum ur target valu
Analysis Date	10/16/19	icity Calcul	<u>Symbol</u>	ERWC	EDRWC	RERWC				Parameters	Aratio	VBMP	<b>Calculated I</b>								es of total def harge require et Vdef to voi
		<b>Root Zone Water capacity Calculated Parameters</b>	<b>Parameter</b>	Empty Portion of RWC under Post-D Natural Recharge	ERWC Modified to consider dEXC	Empty Portion of RWC under Infilt. BMP				<b>BMP Calculated Size Parameters</b>	ABMP/Aimp	BMP Volume	<b>System Performance Calculated Parameters</b>	Annual BMP Recharge Volume	Avg BMP Recharge Efficiency	%Rainfall became Runoff	%Runoff Infiltrated	%Runoff Recharged	%Rainfall Recharged		eadsheet assigns the value <i>I</i> P to handle the entire rec e recharge requirement s
51-			<u>Unit</u>	sq.ft	Ē	Ē	Ë	unitless						cu.ft	sq.ft	Ŀ	i	no units	Ŀ	Ë	fault the spre r a single BN nIv part of th
Description	9911FS.01		<u>Value</u>	54202.0	14.9	6.0	51.0	2					Worksheet	77,934	68,825	2.97	0.00	1.50	45.7	13.6	olumes: By de ows solution fo to recharge o
	_	rameters	<u>Symbol</u>	ABMP	dBMP	dBMPu	dEXC	SegBMP					l Recharge	Vdef	Aimp	RWC	DRWC	C-factor	Pavg	ъ	recharge vo age. This allo or a LID-IMF
Project Name	PIIIAL OT FILE	<b>Recharge BMP Input Parameters</b>	<u>Parameter</u>	BMP Area	BMP Effective Depth, this is the design variable	Upper level of the BMP surface (negative if above ground)	Depth of lower surface of BMP, must be>=dBMPu	Post-development Land Segment Location of BMP	Input Zero if Location is distributed or undetermined				<b>Parameters from Annual Recharge Worksheet</b>	Post-D Deficit Recharge (or desired recharge volume)	Post-D Impervious Area (or target Impervious Area)	Root Zone Water Capacity	RWC Modified to consider dEXC	Climatic Factor	Average Annual P	Recharge Requirement over Imp. Area	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 part of the recharge requirement.

<u>Appendix F</u> Watershed Area Maps & Soil Log Exhibit