DRAINAGE ANALYSIS

FOR Washington Street

LOCATED IN FRANKLIN, MASSACHUSETTS

PREPARED FOR Franklin Flex Space, LLC 13 Clovelly Road Wellesley, MA

PREPARED BY
UNITED CONSULTANTS, INC.
850 FRANKLIN STREET, SUITE 11D
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DATE: June 28, 2021

Table of Contents

Appendix A - Narrative Description

Appendix B - Pre-Development vs. Post Development Rate and Volume of Runoff

Appendix C - Pre-development Drainage Analysis

Appendix D - Post-development Drainage Analysis

Appendix E - Manufacturers Stormceptor and CDS TSS Removal Rates

and TSS Removal Worksheet

Appendix F - Permeability Calculations and SCS Soil Map and Information

Appendix G - Pond Drain Time – 100 year storm

Appendix H - Checklist for Designers

Appendix I - Storm-water Management Checklist

Appendix J - Operation and Maintenance Plan, Stormwater Facilities Plan and Yearly

Inspection and Maintenance Log

Appendix K - Illicit Discharge Statement

Appendix L - Watershed Plans (Entire Site) Rear

APPENDIX A

I. DESCRIPTION

This report is offered in support of the stormwater management system designed for the "Site Plan – Washington Street" located in Franklin, Massachusetts. The primary goals of this system are to collect the stormwater runoff generated by the impervious building and parking area and treat it prior to discharge to the three on-site underground infiltration ponds. Additionally, there is a developed area located between Washington Street and the site which includes houses, driveways, lawn areas and wooded areas.. This offsite area will be captured in the three proposed trench drains and will be piped to the underground infiltration ponds.

The three building roofs will not have any gutters or downspouts and will have roofs that slope to the rear of the buildings. Stormwater from the roofs will be directed to the trench drains.

The parking areas will be captured in catch basins and water quality units. The catch basins will be piped to water quality units and all the catchment structures will discharge to the three underground infiltration ponds.

Both the pre-development and post-development storm-water conditions flowing to the downgradient wetland are summarized in Appendix B. This design will allow for the reduction of the rate and volume of runoff at the downgradient wetland. The required volume of storm-water infiltration as required by the Massachusetts State Storm-water Standards has been provided.

II. Purpose

The purpose of this report is to examine the hydrological and hydraulic aspects of the proposed "Washington Street" Site Plan. This report was developed for review by the Town of Franklin Planning Board, Conservation Commission and Zoning Board of Appeal to obtain the necessary permits to allow the project to proceed.

This report considers the overall hydrological impact of proposed, additional development upon the local watersheds with specific emphasis directed toward the adjacent and immediate downstream areas. The hydrology and criteria are consistent with the Town of Franklin Planning Board, Conservation Commission and the Massachusetts Department of Environmental Protection Storm Water Management Policies.

III. Pre-Development Conditions

The site consists of three parcels of land that were combined to create a parcel with 5. 66 acres of land. One of the three parcels was formerly a railroad right of way. The site is currently vacant. There is also a right of way which will have a portion of the proposed driveway located within it. There is an existing easement for the overhead power transmission lines that cross the site.

The upland soils for the site were taken from the soil survey of Norfolk and Suffolk counties. The soils are classified as Hinckley Loamy Sand which has a hydrologic soil group A. Soil testing was conducted on the site to confirm the soil types and to determine permeability rates. See the soils information and permeability test results located in Appendix F. Six permeability test were conducted on the site with two being located approximate to the three proposed underground infiltration ponds.

Utilizing a Hydrocad computer model the pre-development and post development conditions were calculated. The proposed development is located in an area with the Hinckley soils which led us to utilize a HSG of A (Hinckley) for the pre-development and post-development modeling. A comparison of the pre-development vs. post development rate and volume of runoff can be found in Appendix B.

IV. Post Development Conditions

The proposed development will consist of the construction of three buildings with vehicle parking areas. A storm-water systems has been proposed for the site. This storm-water system will have catch basin, water quality units and three trench drains to capture the stormwater. Additional water quality units will be included in line of the stormwater system to provide the required water quality treatment. Three underground infiltration ponds will also be constructed.

The underground infiltration pond 1 will provide storm-water infiltration for the entrance driveway, the parking area located to the south of building 1 and a portion of the larger parking area. CB 5 will be a Stormceptor WQU and DMH 3 will be a CDS WQU. Underground infiltration pond 2 will provide storm-water infiltration for buildings 1 and 2, and a portion of the larger parking area. CB 8 and CB9 will be a Stormceptor WQU's and DMH 7 will be a CDS WQU. Underground infiltration pond 3 will provide storm-water infiltration for building 3, and a portion of the larger parking area. CB 10 a CDS WQU. A municipal water connection and utility connections are proposed for the site. A septic system will be provided. The project will utilize a single driveway entrance from Washington Street. Utilizing the same computer model as the existing conditions we have modeled the changes in surfaces and ground cover and have calculated the post development conditions.

All calculations for the above have been included in this report. Pre-development calculations are located in Appendix C. Post-development calculations are located in Appendix D.

V. Conclusion

Storm-water from building and the proposed parking areas will be captured by catch basins, trench drains and water quality units then piped to the drain manholes and water quality units then through a manifold and into the underground infiltration ponds 1, 2 and 3. The comparison in Appendix B summarizes the rate and volumes of runoff leaving the site in both the pre-development and post-development conditions. This comparison indicates that there is not an increase in the rate or volume of runoff during the 2-year 10-year or 100-year storm events.

VI. Stormwater Management Standards

LID Measures

- Ground water infiltration is proposed to mimic pre-development conditions.

Standard 1: No New Untreated Discharges

No new untreated discharges are proposed.

Stormwater from the entrance driveway and parking areas will be captured in catch basins and grated water quality units. The catch basins will be directed to water quality units. This treatment in the water quality units will precede discharge into ponds 1, 2 or 3. See appendix E for TSS Removal Worksheets.

Standard 2: Peak Rate Attenuation

The drainage system has been designed to match or slightly reduce the rate of storm-water runoff from the site when comparing the pre-development conditions to the post development conditions. See Appendix B of this report for a summary of the design storms.

Standard 3: Recharge

- Soil testing has been completed. See Appendix F or this report.
- Ponds 1, 2 and 3 were designed based on the Static Method method.
- The required water recharge volume has been provided.
- Front site area Hinckley Soils Use A soils A soils -0.60 inches x 130,777 sq. ft. impervious = 6,539 cubic feet

Total storage required 6,536 cubic feet

Storage provided in Pond 1 = 4,195 cubic feet.

Storage provided in Pond 2 = 11,712 cubic feet

Storage provided in Pond 3 = 3,856 cubic feet

Total storage provided = 19,763

The three Recharge systems have been designed to store and infiltrate the required recharge volume.

- See Appendix G for a summary of drain times for Ponds 1, 2 and 3. Ponds 1, 2 and 3 are drained down by hour 24.4 (Ponds 1 and 2) and 24.8 (Pond 3). This is less than the 72 hours as provided in the Stormwater management standards Chapter 5.
- The drainage system has been designed to infiltrate the required water recharge volume. The soil report provides the depths of test pits and the indication of ESHGW based on the elevation of the bottom of the permeability test pits.

Standard 4: Water Quality

- The owner will include the necessary restrictions in the building lease agreements. The owner will be responsible for compliance with standard four requirements.
- Refer to sheet 6 for the Inspection and Maintenance Schedule and the Operation and Maintenance Schedule and refer to Appendix I for the O&M.
- See Appendix E for the Manufactures Stormceptor and CDS Unit TSS removal rates. The site is located within a zone II. Ponds 1, 2 and 3 have rapid soil infiltration rates. This led to the Stormceptor units and the CDS units being modeled with a 1 inch WQV.
- The proposed project will include three Stormceptor Water Quality Unit and three CDS water quality units all of which will provide TSS removal. The summary of the Manufacturers Predicted Net Annual results as well as the TSS Removal Worksheet are included in Appendix E.

Standard 5: Land uses with higher potential pollutant loads Not Applicable

Standard 6: Critical Areas

Zone II – Water Quality Volume – 1 inch.

Standard 7: Re-developments and Other Projects

Not Applicable

Standard 8: Construction Period Pollution Prevention and Erosion Sedimentation Control

- Refer to sheet 6 for the Inspection and Maintenance Schedule and the Operation and Maintenance Schedule.
- The project will be covered by a NPDES Construction General Permit.

Standard 9: Operation and Maintenance Plan

- Refer to sheet 6 for the Inspection and Maintenance Schedule and the Operation and Maintenance Schedule.
- The owner will be responsible for the storm-water management system, implementation of the operation and maintenance, the maintenance costs, and completion of the maintenance logs.
- Refer to sheet 6 for the Inspection and Maintenance Schedule and the Operation and Maintenance Schedule.
- Refer to Appendix J for the Operation and Maintenance Plan.

Standard 10: Prohibition of Illicit Discharges

- Owner to be responsible for compliance with avoiding illicit discharges. The owner or owner's representative will provide a signed illicit discharge statement with the application for a stormwater permit from the Town of Franklin DPW.
- The site will be connected to an onsite soil absorption system..

APPENDIX B

Pre-Development vs. Post Development Rate and Volume of Runoff

This analysis was prepared to show the summary of the pre-development and post development rate and volume of runoff as required by the Town of Franklin Storm-water Requirements.

The pre-development watershed areas were combined in Sub-catchment 1S and the post-development watersheds and ponds were combined in Link 1L. The below is a summary of the studied storm events:

n event (CFS)		2 year storm event (A.F.)						
	Post	Pre		Post				
vs	1L	1S	VS	1L				
	0.00	0.000		0.000				
rm event (CFS)		10 year storm	event (.	A.F.)				
	Post	Pre		Post				
VS	1L	1S	vs	1L				
	0.03	0.031		0.022				
100 year storm event (CFS) 100 year storm event (A								
	Post	Pre		Post				
VS	1L	1S	VS	1L				
	0.66	0.353		0.136				
	rm event (CFS) vs orm event (CFS)	Post vs 1L 0.00 rm event (CFS) Post vs 1L 0.03 orm event (CFS) Post vs 1L	Post Pre vs 1L 1S 0.00 0.000 rm event (CFS) 10 year storm Post Pre vs 1L 1S 0.03 0.031 orm event (CFS) 100 year storm Pre vs 1L 1S 0.03 Pre vs 1L 1S	Post Pre				

A reduction in the rate and volume of runoff has been realized with the proposed storm-water systems.

APPENDIX C

(N)

Link

Drainage Diagram for UC1502-PRE
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Subcat

Reach

2 YR PRE-DEVELOPMENT

Page 1 8/24/2021

Subcatchment 1S: 1 S

0.000 af, Depth= 0.00" 0.00 hrs, Volume= 0.00 cfs @ Runoff

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

Ar	ea (sf)	CN De	escription		
	17,166	98 Pa	aved parki	ng & roofs	ood, HSG A
	78,207 88,572	39 >7 30 W	nods. Go	od, HSG A	
	83,945		/eighted A		
	66,779	•	ervious Ar		
	17,166	In	npervious	Area	
Тс	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
5.4	50	0.1540	0.15		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.25"
4.0	000	0.4540	1.96		Shallow Concentrated Flow,
1.9	223	0.1540	1.50		Woodland Kv= 5.0 fps
0.7	45	0.0444	1.05		Shallow Concentrated Flow,
0.,					Woodland Kv= 5.0 fps
0.3	23	0.0869	1.47		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	00	0.1212	1.74		Shallow Concentrated Flow,
0.6	66	0.1212	1.1-4		Woodland Kv= 5.0 fps
0.4	54	0.1851	2.15		Shallow Concentrated Flow,
0. 1					Woodland Kv= 5.0 fps
0.2	36	0.2777	2.63		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	00	0.4500	1.94		Shallow Concentrated Flow,
0.3	39	0.1500	1.54		Woodland Kv= 5.0 fps
9.8	536	Total			

10 YR PRE-DEVELOPMENT

Page 2 8/24/2021

Subcatchment 1S: 1 S

Runoff = 0.04 cfs @ 17.17 hrs, Volume=

0.031 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs Type III 24-hr 10YR Rainfall=4.70"

	Aı	rea (sf)	CN D	escription		
		17,166	98 P	aved park	ing & roofs	
		78,207				ood, HSG A
	3	88,572		<u>Voods, Go</u>	<u>od, HSG A</u>	
		83,945		Veighted A	-	
		66,779	•	ervious Ar		
		17,166	Ir	mpervious	Area	
	Тс	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	Decompliant
	5.4	50	0.1540	0.15		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.25"
	1.9	223	0.1540	1.96		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.7	45	0.0444	1.05		Shallow Concentrated Flow,
	0.0	00	0.0000	4 47		Woodland Kv= 5.0 fps
	0.3	23	0.0869	1.47		Shallow Concentrated Flow,
	0.6	66	0.1212	1.74		Woodland Kv= 5.0 fps Shallow Concentrated Flow,
	0.0	00	0.1212	1.74		Woodland Kv= 5.0 fps
	0.4	54	0.1851	2.15		Shallow Concentrated Flow,
	. .	0.	0.1001	2.10		Woodland Kv= 5.0 fps
	0.2	36	0.2777	2.63		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.3	39	0.1500	1.94		Shallow Concentrated Flow,
-						Woodland Kv= 5.0 fps
	9.8	536	Total			

100 YR PRE-DEVELOPMENT

Page 3 8/24/2021

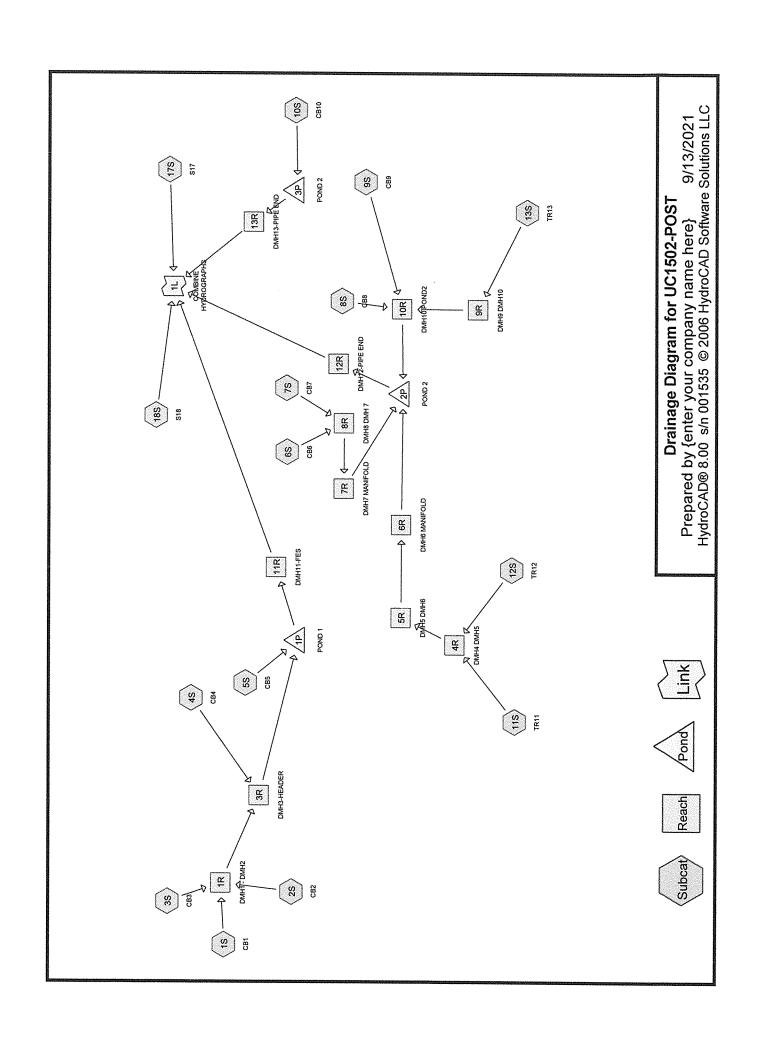
Subcatchment 1S: 1 S

Runoff 1.24 cfs @ 12.46 hrs, Volume= 0.353 af, Depth= 0.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs Type III 24-hr 100YR Rainfall=6.80"

	Aı	ea (sf)	CN D	escription		
		17,166			ing & roofs	
		78,207 88,572			od, HSG A	ood, HSG A
		83,945		Veighted A		
		66,779	,	ervious Ar		
		17,166	11	npervious	Area	
	Тс	Length	Slope	Velocity	Capacity	Description
<u>(r</u>	min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	5.4	50	0.1540	0.15		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.25"
	1.9	223	0.1540	1.96		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.7	45	0.0444	1.05		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.3	23	0.0869	1.47		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.6	66	0.1212	1.74		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.4	54	0.1851	2.15		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.2	36	0.2777	2.63		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.3	39	0.1500	1.94		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	9.8	536	Total			

APPENDIX D



2 YR POST-DEVELOPMENT

Page 1 9/13/2021

Subcatchment 1S: CB1

0.06 cfs @ 12.33 hrs, Volume= Runoff

0.013 af, Depth= 0.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

	Ar	ea (sf)	CN D	Description						
-		6,817 18,087	98 F 39 >	Paved parking & roofs >75% Grass cover, Good, HSG A						
		24,904 18,087 6,817	F	Veighted A Pervious Ar mpervious	ea					
	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description				
-	6.0 0.3	79	0.0100	4.91	3.86	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished				
	6.3	79	Total							

Subcatchment 2S: CB2

0.04 cfs @ 12.35 hrs, Volume= Runoff

0.008 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

Area (sf)	CN	Description					
4,842	98	Paved parking & roofs					
7,887	39	>75% Grass cover, Good, HSG A					
3,942	30	Woods, Good, HSG A					
16,671	54	Weighted Average					
11,829		Pervious Area					
4,842		Impervious Area					

UC1502-POST

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Page 2 9/13/2021

Description Slope Velocity Capacity Tc Length (cfs) (ft/sec) (ft/ft) (min) (feet) Sheet Flow, 0.16 0.1670 48 5.1 Woods: Light underbrush n= 0.400 P2= 3.25" **Shallow Concentrated Flow,** 2.36 0.2220 0.1 18 Woodland Kv= 5.0 fps **Shallow Concentrated Flow,** 2.10 22 0.0900 0.2 Short Grass Pasture Kv= 7.0 fps **Shallow Concentrated Flow,** 1.43 12 0.0420 0.1 Short Grass Pasture Kv= 7.0 fps **Shallow Concentrated Flow,** 2.87 70 0.0200 0.4 Paved Kv= 20.3 fps Direct Entry, Min TC 0.1 Circular Channel (pipe), 5.46 6.95 48 0.0200 0.1 Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished

Subcatchment 3S: CB3

Runoff =

6.1

218 Total

0.44 cfs @ 12.09 hrs, Volume=

0.031 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

Ar	ea (sf)									
	7,401 2,525	98 F	aved park	od, HSG A						
	9,926 2,525 7,401	83 V F	Veighted A Pervious Ar mpervious	verage ea						
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description					
6.0 0.0	8	0.0100		3.86	Direct Entry, MIN. TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished					
6.0	8	Total								

Subcatchment 4S: CB4

Runoff =

0.47 cfs @ 12.08 hrs, Volume=

0.038 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

	Area (sf)	CN	Description
····	6,551	98	Paved parking & roofs
	6,551		Impervious Area

	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
-	6.0 0.1	30	0.0100	4.91	3.86	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
-	6.1	30	Total			

Subcatchment 5S: CB5

Runoff

0.18 cfs @ 12.13 hrs, Volume=

0.019 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

 A۱	rea (sf)	CN D	escription		
	8,247			ing & roofs	
	2,985				od, HSG A
 	6,808		······································	od, HSG A	
	18,040		Veighted A	_	
	9,793	•	ervious Ar	-	
	8,247	Ir	npervious	Area	
Тс	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	·
 5.0	50	0.1830	0.17		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.25"
0.7	92	0.1830	2.14		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
0.4	45	0.1360	1.84		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
0.0	10	1.0000	7.00		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
0.4	72	0.0200	2.87		Shallow Concentrated Flow,
	00	0.0000	0.00		Paved Kv= 20.3 fps
0.3	60	0.0320	3.63		Shallow Concentrated Flow,
0.4	115	0.0400	4.91	3.86	Paved Kv= 20.3 fps Circular Channel (pipe),
0.4	115	0.0100	4.91	3.00	Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
 7.0	111	Total			11- 0.012 Condicto pipo, innoned
7.2	444	Total			

Subcatchment 6S: CB6

Runoff

0.70 cfs @ 12.08 hrs, Volume= 0.056 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

 Α	rea (sf)	CN I	Description		
	9,711	98	Paved park	ing & roofs	
	9,711	:	mpervious	Area	
Tc (min)	Length (feet)	Slope (ft/ft)	•	Capacity (cfs)	Description
 6.0 0.0	3	0.0200	6.95	5.46	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
 6.0	3	Total			

Subcatchment 7S: CB7

Runoff 0.70 cfs @ 12.09 hrs, Volume=

0.055 af, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

A	rea (sf)	CN E	Description	escription						
	9,781	98 F	aved parking & roofs							
	96	39 >	75% Grass cover, Good, HSG A							
	9,877	97 V	Weighted Average							
	96	F	Pervious Ar	ea						
	9,781	l	mpervious	Area						
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description					
6.0 0.4	120	0.0100	4.91	3.86	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished					
6.4	120	Total								

Subcatchment 8S: CB8

0.13 cfs @ 12.32 hrs, Volume= Runoff

0.023 af, Depth= 0.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

Area (sf)	CN	Description			
13,406	98	Paved parking & roofs			
8,447	39	>75% Grass cover, Good, HSG A			
14,855	30	Woods, Good, HSG A			
36,708	57	Weighted Average			
23,302		Pervious Area			
13,406		Impervious Area			

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Page 5 9/13/2021

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
 5.4	50	0.1540	0.15		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.25"
2.1	248	0.1540	1.96		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
0.0	10	1.0000	7.00		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
1.2	73	0.0210	1.01		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
0.4	87	0.0270	3.34		Shallow Concentrated Flow,
					Paved Kv= 20.3 fps
0.1	35	0.0331	8.94	7.02	
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
 9.2	503	Total			

Subcatchment 9S: CB9

Runoff = 0.58 cfs @ 12.09 hrs, Volume=

0.045 af, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

	Aı	rea (sf)	CN E	Description					
		8,051							
		107	39 >	·75% Gras	s cover, Go	ood, HSG A			
		8,158 107		Veighted A Pervious Ar	_				
		8,051	1	mpervious	Area				
	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description			
-	6.0 0.3	116	0.0100	5.90	4.63	Direct Entry, M IN. TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior			
-	6.3	116	Total						

Subcatchment 10S: CB10

Runoff = 0.64 cfs @ 12.10 hrs, Volume=

0.051 af, Depth= 0.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

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Page 6 9/13/2021

Α	rea (sf)	CN	Description		
-	17,784	98	Paved park	ing & roofs	
	3,409	39	>75% Ġras	s cover, Go	ood, HSG A
	9,781	30	Woods, Go	od, HSG A	
	30,974	70	Weighted A	verage	
	13,190		Pervious Ai	ea	
	17,784		Impervious	Area	
Tc (min)	Length (feet)	Slope (ft/ft)	•	Capacity (cfs)	Description
6.0					Direct Entry, MIN. TC
0.0	14	0.0100	4.91	3.86	Circular Channel (pipe),
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
6.0	14	Total			

Subcatchment 11S: TR11

0.15 cfs @ 12.31 hrs, Volume= Runoff

0.028 af, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

Area (sf)	CN	Description			
17,178	98	Paved parking & roofs			
17,371	39	>75% Grass cover, Good, HSG A			
15,648	30	Woods, Good, HSG A			
50,197	56	Weighted Average			
33,019		Pervious Area			
17,178		Impervious Area			

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Page 7 9/13/2021

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2020	0.17		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.25"
0.2	31	0.2020	2.25		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
0.2	30	0.1610	2.81		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
0.1	16	0.1250	2.47		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
0.1	15	0.0590	3.64		Shallow Concentrated Flow,
					Grassed Waterway Kv= 15.0 fps
0.3	19	0.0590	1.21		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
0.1	19	0.3160	2.81		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
0.2	10	0.0100	0.70		Shallow Concentrated Flow,
	_				Short Grass Pasture Kv= 7.0 fps
0.0	7	0.1420	2.64		Shallow Concentrated Flow,
			4 4 ****		Short Grass Pasture Kv= 7.0 fps
1.0	246	0.0050	4.17	3.28	
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
***************************************				,,,	n= 0.010 PVC, smooth interior
7.1	443	Total			

Subcatchment 12S: TR12

0.05 cfs @ 12.48 hrs, Volume= 0.021 af, Depth= 0.14" Runoff

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

A	rea (sf)	CN E	escription		
	20,701			ing & roofs	
	19,744	39 >	75% Gras	s cover, Go	ood, HSG A
	40,298	30 V	<u>Voods, Go</u>	od, HSG A	
	80,743	50 V	Veighted A	verage	
	60,042	F	ervious Ar	ea	
	20,701	11	mpervious	Area	
Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0					Direct Entry, MIN. TC.
1.1	274	0.0050	4.17	3.28	Circular Channel (pipe),
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.010 PVC, smooth interior
7.1	274	Total			

Page 8 9/13/2021

Subcatchment 13S: TR13

Runoff = 0.03 cfs @ 12.51 hrs, Volume=

0.016 af, Depth= 0.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

	Ar	ea (sf)	CN D	escription				
	18,951 98 Paved parking & roofs							
		6,647				od, HSG A		
		44,011	30 V	/oods, Go	od, HSG A			
		69,609		Veighted A				
		50,658		ervious Ar				
		18,951	Ir	npervious	Area			
		مأشم مديرا	Clana	\/olooity	Capacity	Description		
1~	Tc	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	(cfs)	Description		
	nin) 2.8	50	0.1170	0.30	(0.0)	Sheet Flow,		
	2.0	50	0.1170	0.50		Grass: Short n= 0.150 P2= 3.25"		
	0.3	48	0.1170	2.39		Shallow Concentrated Flow,		
	0.0	40	0.1110	2.00		Short Grass Pasture Kv= 7.0 fps		
	1.8	185	0.1170	1.71		Shallow Concentrated Flow,		
						Woodland Kv= 5.0 fps		
	0.0	9	0.2220	3.30		Shallow Concentrated Flow,		
						Short Grass Pasture Kv= 7.0 fps		
	0.1	18	0.1000	2.21		Shallow Concentrated Flow,		
						Short Grass Pasture Kv= 7.0 fps		
	1.0				_	Direct Entry, Min TC		
	0.9	226	0.0050	4.17	3.28			
						Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'		
						n= 0.010 PVC, smooth interior		
	6.9	536	Total					

Subcatchment 17S: S17

Runoff = 0.00 cfs @ 0.00 hrs, Volume=

0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

Area (sf)	CN	Description
 82,033	39	>75% Grass cover, Good, HSG A
14,902	30	Woods, Good, HSG A
 96,935	38	Weighted Average
96,935		Pervious Area

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	Tc in)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	1.6	35	0.1140	0.13		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.25"
•	1.2	15	0.5710	0.20		Sheet Flow,
,	. .	20	0.5740	2.70		Woods: Light underbrush n= 0.400 P2= 3.25"
,	0.1	20	0.5710	3.78		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
(0.1	21	0.2860	2.67		Shallow Concentrated Flow,
,			0.2000			Woodland Kv= 5.0 fps
(0.7	72	0.1110	1.67		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
•	1.3	86	0.0470	1.08		Shallow Concentrated Flow,
	2.0	75	0.4040	2 4 4		Woodland Kv= 5.0 fps
(0.6	75	0.1840	2.14		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1	0.3	23	0.0800	1.41		Shallow Concentrated Flow,
·	0.0		0.000			Woodland Kv= 5.0 fps
(0.1	44	0.0250	7.77	6.10	Circular Channel (pipe), XCB1-XDMH1
						Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
***************************************	~~~					n= 0.012 Concrete pipe, finished
1	9.0	391	Total			

Subcatchment 18S: S18

0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00" Runoff

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 2YR Rainfall=3.25"

Area (sf)	CN	Description
 4,614	39	>75% Grass cover, Good, HSG A
10,309	30	Woods, Good, HSG A
14,923	33	Weighted Average
14,923		Pervious Area

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	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	0.6	13	0.3080	0.34		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.25"
	1.2	17	0.1180	0.24		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.25"
	0.4	4	0.5000	0.15		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.25"
	0.5	16	0.7690	0.51		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.25"
	0.1	57	0.8770	6.56		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	3.2					Direct Entry, Min TC
	0.1	44	0.0250	7.77	6.10	Circular Channel (pipe), XCB1-XDMH1
						Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
						n= 0.012 Concrete pipe, finished
*****	6.1	151	Total			

Reach 1R: DMH1 - DMH2

Inflow Area = 1.182 ac, Inflow Depth = 0.52" for 2YR event Inflow = 0.47 cfs @ 12.10 hrs, Volume= 0.052 af

Outflow = 0.47 cfs @ 12.11 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Max. Velocity= 3.42 fps, Min. Travel Time= 0.3 min Avg. Velocity = 1.45 fps, Avg. Travel Time= 0.8 min

Peak Storage= 9 cf @ 12.11 hrs, Average Depth at Peak Storage= 0.23' Bank-Full Depth= 1.00', Capacity at Bank-Full= 4.03 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 67.0' Slope= 0.0109 '/' Inlet Invert= 255.08', Outlet Invert= 254.35'



Reach 3R: DMH3-HEADER

Inflow Area = 1.333 ac, Inflow Depth = 0.80" for 2YR event Inflow = 0.93 cfs @ 12.10 hrs, Volume= 0.089 af

Outflow = 0.93 cfs @ 12.10 hrs, Volume= 0.089 af, Atten= 0%, Lag= 0.2 min

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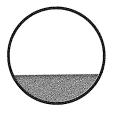
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Page 11 9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 4.60 fps, Min. Travel Time= 0.1 min Avg. Velocity = 1.58 fps, Avg. Travel Time= 0.3 min

Peak Storage= 6 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.30' Bank-Full Depth= 1.00', Capacity at Bank-Full= 4.63 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 30.0' Slope= 0.0100 '/' Inlet Invert= 254.25', Outlet Invert= 253.95'



Reach 4R: DMH4 DMH5

Inflow Area = 3.006 ac, Inflow Depth = 0.20" for 2YR event Inflow = 0.19 cfs @ 12.40 hrs, Volume= 0.050 af

Outflow = 0.19 cfs @ 12.41 hrs, Volume= 0.050 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 3.76 fps, Min. Travel Time= 0.3 min Avg. Velocity = 2.39 fps, Avg. Travel Time= 0.5 min

Peak Storage= 4 cf @ 12.40 hrs, Average Depth at Peak Storage= 0.12' Bank-Full Depth= 1.00', Capacity at Bank-Full= 6.69 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 72.0' Slope= 0.0300 '/' Inlet Invert= 256.46', Outlet Invert= 254.30'



Reach 5R: DMH5 DMH6

Inflow Area = 3.006 ac, Inflow Depth = 0.20" for 2YR event 0.19 cfs @ 12.41 hrs, Volume= 0.050 af

Outflow = 0.19 cfs @ 12.42 hrs, Volume= 0.050 af, Atten= 0%, Lag= 0.4 min

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Page 12 9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 4.16 fps, Min. Travel Time= 0.2 min Avg. Velocity = 2.64 fps, Avg. Travel Time= 0.4 min

Peak Storage= 3 cf @ 12.41 hrs, Average Depth at Peak Storage= 0.11' Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.72 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 61.0' Slope= 0.0400 '/' Inlet Invert= 254.20', Outlet Invert= 251.76'



Reach 6R: DMH6 MANIFOLD

Inflow Area = 3.006 ac, Inflow Depth = 0.20" for 2YR event Inflow = 0.19 cfs @ 12.42 hrs, Volume= 0.050 af

Outflow = 0.19 cfs @ 12.42 hrs, Volume= 0.050 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 3.71 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.35 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.42 hrs, Average Depth at Peak Storage= 0.12' Bank-Full Depth= 1.00', Capacity at Bank-Full= 6.55 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 18.0' Slope= 0.0200 '/' Inlet Invert= 251.66', Outlet Invert= 251.30'



Reach 7R: DMH7 MANIFOLD

Inflow Area = 0.450 ac, Inflow Depth = 2.96" for 2YR event Inflow = 1.40 cfs @ 12.09 hrs, Volume= 0.111 af

Outflow = 1.40 cfs @ 12.09 hrs, Volume= 0.111 af, Atten= 0%, Lag= 0.1 min

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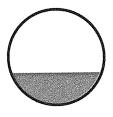
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Page 13 9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 5.98 fps, Min. Travel Time= 0.1 min Avg. Velocity = 1.95 fps, Avg. Travel Time= 0.2 min

Peak Storage= 5 cf @ 12.09 hrs, Average Depth at Peak Storage= 0.34' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.67 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 20.0' Slope= 0.0150 '/' Inlet Invert= 251.60', Outlet Invert= 251.30'



Reach 8R: DMH8 DMH 7

Inflow Area = 0.450 ac, Inflow Depth = 2.96" for 2YR event Inflow = 1.40 cfs @ 12.09 hrs, Volume= 0.111 af

Outflow = 1.40 cfs @ 12.09 hrs, Volume= 0.111 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 5.82 fps, Min. Travel Time= 0.1 min Avg. Velocity = 1.90 fps, Avg. Travel Time= 0.3 min

Peak Storage= 7 cf @ 12.09 hrs, Average Depth at Peak Storage= 0.35' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.46 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 30.0' Slope= 0.0200 '/' Inlet Invert= 252.30', Outlet Invert= 251.70'



Reach 9R: DMH9 DMH10

Inflow Area = 1.598 ac, Inflow Depth = 0.12" for 2YR event Inflow = 0.03 cfs @ 12.51 hrs, Volume= 0.016 af

Outflow = 0.03 cfs @ 12.54 hrs, Volume= 0.016 af, Atten= 0%, Lag= 1.2 min

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Page 14 9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 2.32 fps, Min. Travel Time= 0.7 min Avg. Velocity = 1.92 fps, Avg. Travel Time= 0.9 min

Peak Storage= 1 cf @ 12.52 hrs, Average Depth at Peak Storage= 0.04' Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.72 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 103.0' Slope= 0.0400 '/' Inlet Invert= 256.56', Outlet Invert= 252.44'



Reach 10R: DMH10 POND2

Inflow Area = 2.628 ac, Inflow Depth = 0.38" for 2YR event Inflow = 0.62 cfs @ 12.10 hrs, Volume= 0.084 af

Inflow = 0.62 cfs @ 12.10 hrs, Volume= 0.084 af Outflow = 0.62 cfs @ 12.11 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 4.78 fps, Min. Travel Time= 0.2 min Avg. Velocity = 1.89 fps, Avg. Travel Time= 0.4 min

Peak Storage= 6 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.22' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.74 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 47.0' Slope= 0.0221 '/' Inlet Invert= 252.34', Outlet Invert= 251.30'



Reach 11R: DMH11-FES

Inflow Area = 1.747 ac, Inflow Depth = 0.00" for 2YR event 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

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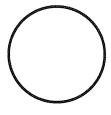
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Page 15 9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00' Bank-Full Depth= 1.00', Capacity at Bank-Full= 8.63 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 37.0' Slope= 0.0500 '/' Inlet Invert= 247.85', Outlet Invert= 246.00'



Reach 12R: DMH12-PIPE END

Inflow Area = 6.084 ac, Inflow Depth = 0.00" for 2YR event

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

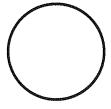
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00' Bank-Full Depth= 1.00', Capacity at Bank-Full= 8.63 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 26.0' Slope= 0.0500 '/' Inlet Invert= 243.30', Outlet Invert= 242.00'



Reach 13R: DMH13-PIPE END

Inflow Area = 0.711 ac, Inflow Depth = 0.00" for 2YR event Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

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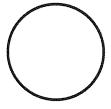
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Page 16 9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00' Bank-Full Depth= 1.00'. Capacity at Bank-Full= 8.63 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 18.0' Slope= 0.0500 '/' Inlet Invert= 242.90', Outlet Invert= 242.00'



Pond 1P: POND 1

Inflow Area = 1.747 ac, Inflow Depth = 0.74" for 2YR event
Inflow = 1.10 cfs @ 12.11 hrs, Volume= 0.108 af
Outflow = 0.88 cfs @ 12.07 hrs, Volume= 0.108 af, Atten= 20%, Lag= 0.0 min
Discarded = 0.88 cfs @ 12.07 hrs, Volume= 0.108 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 249.93' @ 12.17 hrs Surf.Area= 0.046 ac Storage= 0.002 af

Plug-Flow detention time= (not calculated: outflow precedes inflow) Center-of-Mass det. time= 0.9 min (842.8 - 841.8)

Volume	Invert	Avail.Storage	Storage Description
#1	249.80'	0.068 af	27.30'W x 73.00'L x 5.50'H Prismatoid
			0.252 af Overall - 0.081 af Embedded = 0.171 af x 40.0% Voids
#2	251.05'	0.081 af	48.0"D x 70.00'L Horizontal Cylinder x 4 Inside #1
		0.149 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	249.70'	19.110 in/hr Exfiltration over Surface area above invert
			Excluded Surface area = 0.000 ac
#2	Primary	253.95'	12.0" Vert. Orifice/Grate X 2.00 C= 0.600

Discarded OutFlow Max=0.88 cfs @ 12.07 hrs HW=249.86' (Free Discharge) 1=Exfiltration (Exfiltration Controls 0.88 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=249.80' (Free Discharge) 2=Orifice/Grate (Controls 0.00 cfs)

Page 17 9/13/2021

Pond 2P: POND 2

Inflow Area =	6.084 ac, Inflow Depth = 0.48"	for 2YR event
Inflow =	2.04 cfs @ 12.10 hrs, Volume=	0.245 af
Outflow =	1.92 cfs @ 12.09 hrs, Volume=	0.245 af, Atten= 6%, Lag= 0.0 min
Discarded =	1.92 cfs @ 12.09 hrs, Volume=	0.245 af
Primary =	0.00 cfs @ 0.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 247.21' @ 12.13 hrs Surf.Area= 5,460 sf Storage= 134 cf

Plug-Flow detention time= 1.0 min calculated for 0.245 af (100% of inflow) Center-of-Mass det. time= 1.0 min (839.9 - 838.9)

Volume	Invert	Avail.Storage	Storage Description
#1	247.15'	8,051 cf	27.30'W x 200.00'L x 5.50'H Prismatoid
		ŕ	30,030 cf Overall - 9,902 cf Embedded = 20,128 cf x 40.0% Voids
#2	248.40'	9,902 cf	48.0"D x 197.00'L Horizontal Cylinder x 4 Inside #1
		17 953 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	247.10'	15.200 in/hr Exfiltration over Surface area above invert
			Excluded Surface area = 0 sf
#2	Primary	251.30'	12.0" Vert. Orifice/Grate X 3.00 C= 0.600

Discarded OutFlow Max=1.92 cfs @ 12.09 hrs HW=247.21' (Free Discharge) 1=Exfiltration (Exfiltration Controls 1.92 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=247.15' (Free Discharge) 2=Orifice/Grate (Controls 0.00 cfs)

Pond 3P: POND 2

Inflow Area =	0.711 ac, Inflow Depth = 0.86"	for 2YR event
Inflow =	0.64 cfs @ 12.10 hrs, Volume=	0.051 af
Outflow =	0.17 cfs @ 11.99 hrs, Volume=	0.051 af, Atten= 73%, Lag= 0.0 min
Discarded =	0.17 cfs @ 11.99 hrs, Volume=	0.051 af
Primary =	0.00 cfs @ 0.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 248.88' @ 12.53 hrs Surf.Area= 1,665 sf Storage= 447 cf

Plug-Flow detention time= 15.9 min calculated for 0.051 af (100% of inflow) Center-of-Mass det. time= 15.9 min (890.5 - 874.6)

	Volume	Invert	Avail.Storage	Storage Description
•	#1	248.21'	2,498 cf	27.30'W x 61.00'L x 5.50'H Prismatoid
				9,159 cf Overall - 2,915 cf Embedded = 6,244 cf x 40.0% Voids
	#2	248.96'	2,915 cf	48.0"D x 58.00'L Horizontal Cylinder x 4 Inside #1
,			E 440 of	Total Available Storage

5,413 cf Total Available Storage

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Page 18

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Device	Routing	Invert	Outlet Devices
#1	Discarded	248.20'	4.470 in/hr Exfiltration over Surface area above invert
			Excluded Surface area = 0 sf
#2	Primary	251.86'	12.0" Vert. Orifice/Grate C= 0.600

Discarded OutFlow Max=0.17 cfs @ 11.99 hrs HW=248.27' (Free Discharge) 1=Exfiltration (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=248.21' (Free Discharge) 2=Orifice/Grate (Controls 0.00 cfs)

Link 1L: COMBINE HYDROGRAPHS

Inflow Area = 11.109 ac, Inflow Depth = 0.00" for 2YR event Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

10 YR POST-DEVELOPMENT

Subcatchment 1S: CB1

Runoff

0.42 cfs @ 12.11 hrs, Volume= 0.040 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 10YR Rainfall=4.70"

	Area (sf)	CN E	Description				
	6,817	98 F	8 Paved parking & roofs				
	18,087	39 >	·75% Gras	s cover, Go	ood, HSG A		
	24,904	55 V	Veighted A	verage			
	18,087	F	Pervious Ar	ea			
	6,817 Impervious Area						
To		Slope		Capacity	Description		
<u>(min</u>) (feet)	(ft/ft)	(ft/sec)	(cfs)			
6.0)				Direct Entry, Min TC		
0.3	3 79	0.0100	4.91	3.86	Circular Channel (pipe),		
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'		
					n= 0.012 Concrete pipe, finished		
6.3	3 79	Total					

Subcatchment 2S: CB2

Runoff

0.25 cfs @ 12.11 hrs, Volume=

0.025 af, Depth= 0.78"

Area (sf)	CN	Description			
4,842	98	Paved parking & roofs			
7,887	39	>75% Grass cover, Good, HSG A			
3,942	30	Woods, Good, HSG A			
16,671	54	Weighted Average			
11,829		Pervious Area			
4,842		Impervious Area			

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 Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	48	0.1670	0.16		Sheet Flow,
0.1	18	0.2220	2.36		Woods: Light underbrush n= 0.400 P2= 3.25" Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.2	22	0.0900	2.10		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0420	1.43		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
0.4	70	0.0200	2.87		Shallow Concentrated Flow,
					Paved Kv= 20.3 fps
0.1					Direct Entry, Min TC
0.1	48	0.0200	6.95	5.46	VI 1 //
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
 6.1	218	Total			

Subcatchment 3S: CB3

Runoff = 0.77 cfs @ 12.09 hrs, Volume= 0.055 af, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 10YR Rainfall=4.70"

	Aı	rea (sf)	CN E	Description					
		7,401		Paved parking & roofs					
		2,525	39 >	>75% Grass cover, Good, HSG A					
		9,926	83 V	3 Weighted Average					
		2,525	F	Pervious Area					
		7,401	lı	Impervious Area					
	Тс	Length	Slope	Velocity	Capacity	Description			
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)				
	6.0					Direct Entry, MIN. TC			
	0.0	8	0.0100	4.91	3.86	Circular Channel (pipe),			
						Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'			
						n= 0.012 Concrete pipe, finished			
•••	6.0	8	Total						

Subcatchment 4S: CB4

Runoff = 0.69 cfs @ 12.08 hrs, Volume= 0.056 af, Depth= 4.46"

	Area (sf)	CN	Description
	6,551	98	Paved parking & roofs
6,551 Impervious Area			Impervious Area

Page 21

9/13/2021

	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
•	6.0 0.1	30	0.0100	4.91	3.86	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
•	6.1	30	Total			

Subcatchment 5S: CB5

Runoff = 0.56 cfs @ 12.12 hrs, Volume=

0.046 af, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 10YR Rainfall=4.70"

Aı	rea (sf)	CN D	escription				
	8,247 98 Paved parking & roofs						
	2,985	od, HSG A					
	6,808	30 V	/oods, Go	od, HSG A			
	18,040		Veighted A				
	9,793		ervious Ar				
	8,247	Ir	npervious	Area			
Тс	Length	Slope	Velocity	Capacity	Description		
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)			
5.0	50	0.1830	0.17		Sheet Flow,		
					Woods: Light underbrush n= 0.400 P2= 3.25"		
0.7	92	0.1830	2.14		Shallow Concentrated Flow,		
					Woodland Kv= 5.0 fps		
0.4	45	0.1360	1.84		Shallow Concentrated Flow,		
			7.00		Woodland Kv= 5.0 fps		
0.0	10	1.0000	7.00		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps		
0.4	70	0.0000	2.87		Shallow Concentrated Flow,		
0.4	72	0.0200	2.01		Paved Kv= 20.3 fps		
0.3	60	0.0320	3.63		Shallow Concentrated Flow,		
0.5	00	0.0020	0.00		Paved Kv= 20.3 fps		
0.4	115	0.0100	4.91	3.86			
U. .			,,,		Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'		
					n= 0.012 Concrete pipe, finished		
7.2	444	Total					

Subcatchment 6S: CB6

Runoff = 1.02 cfs @ 12.08 hrs, Volume= 0.083

0.083 af, Depth= 4.46"

Page 22 9/13/2021

	A	rea (sf)	CN D	escription		
		9,711	98 P	aved park	ing & roofs	
_		9,711	Ir	npervious	Area	
	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
-	6.0 0.0	3	0.0200	6.95	5.46	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
-	6.0	3	Total			

Subcatchment 7S: CB7

Runoff = 1.02 cfs @ 12.09 hrs, Volume=

0.082 af, Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 10YR Rainfall=4.70"

,	Area (sf)	CN E	escription		
	9,781			ing & roofs	
	96	39 >	75% Gras	s cover, Go	ood, HSG A
	9,877	97 V	Veighted A	verage	
	96	F	Pervious Ar	ea	
	9,781	lı	mpervious	Area	
To		Slope	Velocity	Capacity	Description
(min	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0)				Direct Entry, Min TC
0.4	120	0.0100	4.91	3.86	Circular Channel (pipe),
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
6.4	1 120	Total			

Subcatchment 8S: CB8

Runoff = 0.67 cfs @ 12.15 hrs, Volume=

0.067 af, Depth= 0.95"

Area (sf)	CN	Description
 13,406	98	Paved parking & roofs
8,447	39	>75% Grass cover, Good, HSG A
14,855	30	Woods, Good, HSG A
 36,708	57	Weighted Average
23,302		Pervious Area
13,406		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
 5.4	50	0.1540	0.15		Sheet Flow,
-					Woods: Light underbrush n= 0.400 P2= 3.25"
2.1	248	0.1540	1.96		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
0.0	10	1.0000	7.00		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
1.2	73	0.0210	1.01		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
0.4	87	0.0270	3.34		Shallow Concentrated Flow,
	•				Paved Kv= 20.3 fps
0.1	35	0.0331	8.94	7.02	16 1 77
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
 92	503	Total			

Subcatchment 9S: CB9

0.85 cfs @ 12.09 hrs, Volume= Runoff

0.068 af, Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 10YR Rainfall=4.70"

Αı	rea (sf)	CN D	escription		
	8,051			ng & roofs	
	107	39 >	75% Gras	s cover, Go	ood, HSG A
	8,158	97 V	Veighted A	verage	
	107	F	ervious Ar	ea	
	8,051	11	mpervious	Area	
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0 0.3	116	0.0100	5.90	4.63	Direct Entry, M IN. TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
6.3	116	Total			

Subcatchment 10S: CB10

1.48 cfs @ 12.09 hrs, Volume= Runoff

0.108 af, Depth= 1.82"

6.0

14 Total

Aı	rea (sf)	CN [Description		
	17,784	98 F	Paved park	ing & roofs	
	3,409	39 >	75% Gras	s cover, Go	ood, HSG A
	9,781	30 \	<u> Voods, Go</u>	od, HSG A	
	30,974	70 \	Neighted A	verage	
	13,190	F	Pervious Ar	ea	
	17,784	1	mpervious	Area	
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	14	0.0100	4.91	3.86	Direct Entry, MIN. TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished

Subcatchment 11S: TR11

0.91 cfs @ 12.12 hrs, Volume= 0.086 af, Depth= 0.89" Runoff

, ,	Area (sf)	CN	Description
	17,178	98	Paved parking & roofs
	17,371	39	>75% Grass cover, Good, HSG A
	15,648	30	Woods, Good, HSG A
	50,197	56	Weighted Average
	33,019		Pervious Area
	17,178		Impervious Area

	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	4.9	50	0.2020	0.17		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.25"
	0.2	31	0.2020	2.25		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.2	30	0.1610	2.81		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	0.1	16	0.1250	2.47		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	0.1	15	0.0590	3.64		Shallow Concentrated Flow,
						Grassed Waterway Kv= 15.0 fps
	0.3	19	0.0590	1.21		Shallow Concentrated Flow,
	- 4					Woodland Kv= 5.0 fps
	0.1	19	0.3160	2.81		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.2	10	0.0100	0.70		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	0.0	7	0.1420	2.64		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	1.0	246	0.0050	4.17	3.28	
						Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
_						n= 0.010 PVC, smooth interior
	7.1	443	Total			

Subcatchment 12S: TR12

0.65 cfs @ 12.15 hrs, Volume= Runoff

0.089 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 10YR Rainfall=4.70"

	Α	rea (sf)	CN	Description							
		20,701	98	98 Paved parking & roofs							
		19,744	39	>75% Ġras	s cover, Go	ood, HSG A					
		40,298	30	Woods, Go	od, HSG A						
-		80,743	50	Weighted A	verage						
		60,042		Pervious Ai	rea						
		20,701		Impervious	Area						
	Tc (min)	Length (feet)	Slope (ft/ft)		Capacity (cfs)	Description					
	6.0	274	0.0050	117	2 20	Direct Entry, MIN. TC.					
	1.1	274	0.0050	4.17	3.28	Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'					
						n= 0.010 PVC, smooth interior					
	7 1	274	Total								

7.1 274 Total

Page 26 9/13/2021

Subcatchment 13S: TR13

Runoff = 0.47 cfs @ 12.16 hrs, Volume= 0.070 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 10YR Rainfall=4.70"

Ai	rea (sf)	CN D	escription		
	18,951	98 P	aved parki	ng & roofs	
	6,647	39 >	75% Ġras:	s cover, Go	ood, HSG A
	44,011	30 V	loods, Go	od, HSG A	
	69,609	49 V	Veighted A	verage	
	50,658	Р	ervious Ar	ea	
	18,951	Ir	npervious	Area	
			•		
Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
2.8	50	0.1170	0.30		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.25"
0.3	48	0.1170	2.39		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
1.8	185	0.1170	1.71		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
0.0	9	0.2220	3.30		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
0.1	18	0.1000	2.21		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
1.0					Direct Entry, Min TC
0.9	226	0.0050	4.17	3.28	Circular Channel (pipe),
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.010 PVC, smooth interior
6.9	536	Total			

Subcatchment 17S: S17

Runoff = 0.03 cfs @ 14.75 hrs, Volume= 0.022 af, Depth= 0.12"

Area (sf)	CN	Description
 82,033	39	>75% Grass cover, Good, HSG A
14,902	30	Woods, Good, HSG A
 96,935	38	Weighted Average
96,935		Pervious Area

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Page 27 9/13/2021

	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	4.6	35	0.1140	0.13		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.25"
	1.2	15	0.5710	0.20		Sheet Flow,
			. == 40	0.70		Woods: Light underbrush n= 0.400 P2= 3.25"
	0.1	20	0.5710	3.78		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	0.1	21	0.2860	2.67		Shallow Concentrated Flow,
	0.1	21	0.2000	2.01		Woodland Kv= 5.0 fps
	0.7	72	0.1110	1.67		Shallow Concentrated Flow,
	•					Woodland Kv= 5.0 fps
	1.3	86	0.0470	1.08		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.6	75	0.1840	2.14		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	0.0	22	0.0800	1.41		Shallow Concentrated Flow,
	0.3	23	0.0000	1.41		Woodland Kv= 5.0 fps
	0.1	44	0.0250	7.77	6.10	
	0.7		0.0-0			Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
						n= 0.012 Concrete pipe, finished
_	9.0	391	Total			

Subcatchment 18S: S18

0.001 af, Depth= 0.02" 0.00 cfs @ 21.56 hrs, Volume= Runoff

Area (sf)	CN	Description
4,614 10,309	39 30	>75% Grass cover, Good, HSG A Woods, Good, HSG A
14,923 14,923	33	Weighted Average Pervious Area

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Page 28

9/13/2021

(Tc min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	0.6	13	0.3080	0.34		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.25"
	1.2	17	0.1180	0.24		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.25"
	0.4	4	0.5000	0.15		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.25"
	0.5	16	0.7690	0.51		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.25"
	0.1	57	0.8770	6.56		Shallow Concentrated Flow,
	• • •	-				Short Grass Pasture Kv= 7.0 fps
	3.2					Direct Entry, Min TC
	0.1	44	0.0250	7.77	6.10	
	0.1	• • •	0.0200		• • • • • • • • • • • • • • • • • • • •	Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
						n= 0.012 Concrete pipe, finished
		4 - 4				TO COLUMN CONTROL PROGRAMMENTO
	6.1	151	Total			

Reach 1R: DMH1 - DMH2

Inflow Area = 1.182 ac, Inflow Depth = 1.22" for 10YR event Inflow = 1.42 cfs @ 12.10 hrs, Volume= 0.120 af

Outflow = 1.42 cfs @ 12.11 hrs, Volume= 0.120 af, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Max. Velocity= 4.69 fps, Min. Travel Time= 0.2 min Avg. Velocity = 1.73 fps, Avg. Travel Time= 0.6 min

Peak Storage= 20 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.41' Bank-Full Depth= 1.00', Capacity at Bank-Full= 4.03 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 67.0' Slope= 0.0109 '/' Inlet Invert= 255.08', Outlet Invert= 254.35'



Reach 3R: DMH3-HEADER

Inflow Area = 1.333 ac, Inflow Depth = 1.58" for 10YR event 1nflow = 2.09 cfs @ 12.10 hrs, Volume= 0.176 af

Outflow = 2.09 cfs @ 12.10 hrs, Volume= 0.176 af, Atten= 0%, Lag= 0.2 min

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Page 29

9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 5.75 fps, Min. Travel Time= 0.1 min Avg. Velocity = 1.89 fps, Avg. Travel Time= 0.3 min

Peak Storage= 11 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.47' Bank-Full Depth= 1.00', Capacity at Bank-Full= 4.63 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 30.0' Slope= 0.0100 '/' Inlet Invert= 254.25', Outlet Invert= 253.95'



Reach 4R: DMH4 DMH5

Inflow Area = 3.006 ac, Inflow Depth = 0.70" for 10YR event Inflow = 1.54 cfs @ 12.14 hrs, Volume= 0.174 af

Outflow = 1.54 cfs @ 12.14 hrs, Volume= 0.174 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 6.92 fps, Min. Travel Time= 0.2 min Avg. Velocity = 3.28 fps, Avg. Travel Time= 0.4 min

Peak Storage= 16 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.33' Bank-Full Depth= 1.00', Capacity at Bank-Full= 6.69 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 72.0' Slope= 0.0300 '/' Inlet Invert= 256.46', Outlet Invert= 254.30'



Reach 5R: DMH5 DMH6

Inflow Area = 3.006 ac, Inflow Depth = 0.70" for 10YR event Inflow = 1.54 cfs @ 12.14 hrs, Volume= 0.174 af

Outflow = 1.54 cfs @ 12.14 hrs, Volume= 0.174 af, Atten= 0%, Lag= 0.2 min

Type III 24-hr 10YR Rainfall=4.70"

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9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 7.67 fps, Min. Travel Time= 0.1 min Avg. Velocity = 3.62 fps, Avg. Travel Time= 0.3 min

Peak Storage= 12 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.30' Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.72 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 61.0' Slope= 0.0400 '/' Inlet Invert= 254.20', Outlet Invert= 251.76'



Reach 6R: DMH6 MANIFOLD

3.006 ac, Inflow Depth = 0.70" for 10YR event Inflow Area =

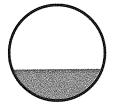
1.54 cfs @ 12.14 hrs, Volume= 0.174 af Inflow

1.54 cfs @ 12.15 hrs, Volume= 0.174 af, Atten= 0%, Lag= 0.1 min Outflow

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 6.81 fps, Min. Travel Time= 0.0 min Avg. Velocity = 3.23 fps, Avg. Travel Time= 0.1 min

Peak Storage= 4 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.33' Bank-Full Depth= 1.00', Capacity at Bank-Full= 6.55 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 18.0' Slope= 0.0200 '/' Inlet Invert= 251.66', Outlet Invert= 251.30'



Reach 7R: DMH7 MANIFOLD

0.450 ac, Inflow Depth = 4.41" for 10YR event Inflow Area =

0.165 af 2.04 cfs @ 12.09 hrs, Volume= Inflow

0.165 af, Atten= 0%, Lag= 0.1 min 2.04 cfs @ 12.09 hrs, Volume= Outflow

Type III 24-hr 10YR Rainfall=4.70"

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Page 31

9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 6.63 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.20 fps, Avg. Travel Time= 0.2 min

Peak Storage= 6 cf @ 12.09 hrs, Average Depth at Peak Storage= 0.41' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.67 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 20.0' Slope= 0.0150 '/' Inlet Invert= 251.60', Outlet Invert= 251.30'



Reach 8R: DMH8 DMH 7

Inflow Area = 0.450 ac, Inflow Depth = 4.41" for 10YR event Inflow = 2.04 cfs @ 12.09 hrs, Volume= 0.165 af

Outflow = 2.04 cfs @ 12.09 hrs, Volume= 0.165 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 6.45 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.14 fps, Avg. Travel Time= 0.2 min

Peak Storage= 10 cf @ 12.09 hrs, Average Depth at Peak Storage= 0.42' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.46 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 30.0' Slope= 0.0200 '/' Inlet Invert= 252.30', Outlet Invert= 251.70'



Reach 9R: DMH9 DMH10

Outflow = 0.47 cfs @ 12.17 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.6 min

Type III 24-hr 10YR Rainfall=4.70"

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Page 32

9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 5.42 fps, Min. Travel Time= 0.3 min Avg. Velocity = 2.83 fps, Avg. Travel Time= 0.6 min

Peak Storage= 9 cf @ 12.16 hrs, Average Depth at Peak Storage= 0.17' Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.72 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 103.0' Slope= 0.0400 '/' Inlet Invert= 256.56', Outlet Invert= 252.44'



Reach 10R: DMH10 POND2

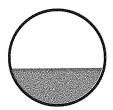
Inflow Area = 2.628 ac, Inflow Depth = 0.93" for 10YR event Inflow = 1.83 cfs @ 12.13 hrs, Volume= 0.205 af

Outflow = 1.83 cfs @ 12.13 hrs, Volume= 0.205 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 6.50 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.33 fps, Avg. Travel Time= 0.3 min

Peak Storage= 13 cf @ 12.13 hrs, Average Depth at Peak Storage= 0.39' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.74 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 47.0' Slope= 0.0221 '/' Inlet Invert= 252.34', Outlet Invert= 251.30'



Reach 11R: DMH11-FES

Inflow Area = 1.747 ac, Inflow Depth = 0.00" for 10YR event Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Type III 24-hr 10YR Rainfall=4.70"

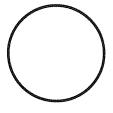
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Page 33 9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00' Bank-Full Depth= 1.00', Capacity at Bank-Full= 8.63 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 37.0' Slope= 0.0500 '/' Inlet Invert= 247.85', Outlet Invert= 246.00'



Reach 12R: DMH12-PIPE END

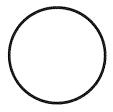
Inflow Area = 6.084 ac, Inflow Depth = 0.00" for 10YR event Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00' Bank-Full Depth= 1.00', Capacity at Bank-Full= 8.63 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 26.0' Slope= 0.0500 '/' Inlet Invert= 243.30', Outlet Invert= 242.00'



Reach 13R: DMH13-PIPE END

Inflow Area = 0.711 ac, Inflow Depth = 0.00" for 10YR event 1000 cfs 0 0.00 hrs, Volume 0.000 af

Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

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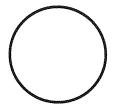
Page 34 9/13/2021

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Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00' Bank-Full Depth= 1.00', Capacity at Bank-Full= 8.63 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 18.0' Slope= 0.0500 '/' Inlet Invert= 242.90', Outlet Invert= 242.00'



Pond 1P: POND 1

Inflow Area =	1.747 ac, Inflow Depth = 1.52"	for 10YR event
Inflow =	2.65 cfs @ 12.11 hrs, Volume=	= 0.221 af
Outflow =	0.88 cfs @ 11.97 hrs, Volume=	= 0.221 af, Atten= 67%, Lag= 0.0 min
Discarded =	0.88 cfs @ 11.97 hrs, Volume=	= 0.221 af
Primary =	0.00 cfs @ 0.00 hrs, Volume=	= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 251.43' @ 12.47 hrs Surf.Area= 0.046 ac Storage= 0.032 af

Plug-Flow detention time= 7.4 min calculated for 0.221 af (100% of inflow) Center-of-Mass det. time= 7.4 min (843.3 - 835.9)

Volum	ie Invert	Avail.Storage	e Storage Description	
#1	249.80'	0.068 a	f 27.30'W x 73.00'L x 5.50'H Prismatoid	
			0.252 af Overall - 0.081 af Embedded = 0.171 af x 40.0% Voids	
#2	251.05'	0.081 a	48.0"D x 70.00'L Horizontal Cylinder x 4 Inside #1	
-		0.149 a	f Total Available Storage	
Device	e Routing	Invert C	Outlet Devices	
#1	Discarded	249.70' 1	9.110 in/hr Exfiltration over Surface area above invert	
		E	xcluded Surface area = 0.000 ac	
#2	Primary	253.95' 1	2.0" Vert. Orifice/Grate X 2.00 C= 0.600	

Discarded OutFlow Max=0.88 cfs @ 11.97 hrs HW=249.86' (Free Discharge) 1=Exfiltration (Exfiltration Controls 0.88 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=249.80' (Free Discharge) 2=Orifice/Grate (Controls 0.00 cfs)

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Pond 2P: POND 2

Inflow Area =	6.084 ac, Inflow Depth = 1.07"	for 10YR event
Inflow =	5.19 cfs @ 12.12 hrs, Volume=	0.544 af
Outflow =	1.92 cfs @ 12.01 hrs, Volume=	0.544 af, Atten= 63%, Lag= 0.0 min
Discarded =	1.92 cfs @ 12.01 hrs, Volume=	0.544 af
Primary =	0.00 cfs @ 0.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 248.49' @ 12.52 hrs Surf.Area= 5,460 sf Storage= 2,956 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow) Center-of-Mass det. time= 6.8 min (851.6 - 844.8)

Volume	Invert	Avail.Storage	Storage Description
#1	247.15'	8,051 cf	27.30'W x 200.00'L x 5.50'H Prismatoid
			$30,030 \text{ cf Overall} - 9,902 \text{ cf Embedded} = 20,128 \text{ cf } \times 40.0\% \text{ Voids}$
#2	248.40'	9,902 cf	48.0"D x 197.00'L Horizontal Cylinder x 4 Inside #1
		17,953 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	247.10'	15.200 in/hr Exfiltration over Surface area above invert
			Excluded Surface area = 0 sf
#2	Primary	251.30'	12.0" Vert. Orifice/Grate X 3.00 C= 0.600

Discarded OutFlow Max=1.92 cfs @ 12.01 hrs HW=247.21' (Free Discharge) 1=Exfiltration (Exfiltration Controls 1.92 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=247.15' (Free Discharge) 2=Orifice/Grate (Controls 0.00 cfs)

Pond 3P: POND 2

Inflow Area =	0.711 ac, Inflow Depth = 1.82"	for 10YR event
Inflow =	1.48 cfs @ 12.09 hrs, Volume=	0.108 af
Outflow =	0.17 cfs @ 11.75 hrs, Volume=	0.108 af, Atten= 88%, Lag= 0.0 min
Discarded =	0.17 cfs @ 11.75 hrs, Volume=	0.108 af
Primary =	0.00 cfs @ 0.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 250.04' @ 12.98 hrs Surf.Area= 1,665 sf Storage= 1,603 cf

Plug-Flow detention time= 78.9 min calculated for 0.108 af (100% of inflow) Center-of-Mass det. time= 78.9 min (929.9 - 851.1)

Volume	Invert	Avail.Storage	Storage Description
#1	248.21'	2,498 cf	27.30'W x 61.00'L x 5.50'H Prismatoid
			9,159 cf Overall - 2,915 cf Embedded = 6,244 cf x 40.0% Voids
#2	248.96'	2,915 cf	48.0"D x 58.00'L Horizontal Cylinder x 4 Inside #1
		5,413 cf	Total Available Storage

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Page 36 olutions LLC 9/13/2021

Device	Routing	Invert	Outlet Devices
#1	Discarded	248.20'	4.470 in/hr Exfiltration over Surface area above invert
			Excluded Surface area = 0 sf
#2	Primary	251.86'	12.0" Vert. Orifice/Grate C= 0.600

Discarded OutFlow Max=0.17 cfs @ 11.75 hrs HW=248.27' (Free Discharge) —1=Exfiltration (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=248.21' (Free Discharge) 2=Orifice/Grate (Controls 0.00 cfs)

Link 1L: COMBINE HYDROGRAPHS

Inflow Area = 11.109 ac, Inflow Depth = 0.02" for 10YR event 10.03 cfs @ 14.75 hrs, Volume= 0.022 af

Primary = 0.03 cfs @ 14.75 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

100 YR POST-DEVELOPMENT

9/13/2021

Subcatchment 1S: CB1

1.23 cfs @ 12.10 hrs, Volume= Runoff

0.095 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 100YR Rainfall=6.80"

	A۱	rea (sf)	CN [Description						
		6,817	98 F	Paved parking & roofs						
18,087 39 >75% Grass cover, Good, HSG A										
	. ,	24,904	55 \	Veighted A	verage					
		18,087	F	Pervious Ar	ea					
		6,817	1	mpervious	Area					
	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description				
	6.0 0.3	79	0.0100	4.91	3.86	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished				
_	6.3	79	Total							

Subcatchment 2S: CB2

Runoff 0.78 cfs @ 12.10 hrs, Volume= 0.061 af, Depth= 1.91"

Area (sf)	CN	Description
4,842	98	Paved parking & roofs
7,887	39	>75% Grass cover, Good, HSG A
3,942	30	Woods, Good, HSG A
16,671	54	Weighted Average
11,829		Pervious Area
4,842		Impervious Area

9/13/2021

(m		Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	5.1	48	0.1670	0.16		Sheet Flow,
`			•			Woods: Light underbrush n= 0.400 P2= 3.25"
().1	18	0.2220	2.36		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
(0.2	22	0.0900	2.10		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
(0.1	12	0.0420	1.43		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
(0.4	70	0.0200	2.87		Shallow Concentrated Flow,
						Paved Kv= 20.3 fps
(0.1					Direct Entry, Min TC
(0.1	48	0.0200	6.95	5.46	
						Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
						n= 0.012 Concrete pipe, finished
1	6.1	218	Total			

Subcatchment 3S: CB3

1.27 cfs @ 12.09 hrs, Volume= Runoff

0.092 af, Depth= 4.84"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 100YR Rainfall=6.80"

A	rea (sf)	CN E								
	7,401		Paved parking & roofs							
	2,525	39 >	>75% Grass cover, Good, HSG A							
	9,926	83 V	Veighted A	verage						
	2,525	F	ervious Ar	ea						
	7,401	lı	mpervious	Area						
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description					
6.0 0.0	8	0.0100	4.91	3.86	Direct Entry, MIN. TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished					
6.0	8	Total								

Subcatchment 4S: CB4

1.00 cfs @ 12.08 hrs, Volume= Runoff

0.082 af, Depth= 6.56"

	Area (sf)	CN	Description
	6,551	98	Paved parking & roofs
-	6,551		Impervious Area

	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
-	6.0 0.1	30	0.0100	4.91	3.86	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
	6.1	30	Total			

Subcatchment 5S: CB5

1.26 cfs @ 12.11 hrs, Volume= Runoff

0.095 af, Depth= 2.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 100YR Rainfall=6.80"

	Area (st	f)	CN D	escription		
	8,24	7			ing & roofs	
	2,98	5				ood, HSG A
	6,80	8	30 V	Voods, Go	od, HSG A	
	18,04	0	63 V	Veighted A	verage	
	9,79	3		ervious Ar		
	8,24	7	lr	npervious	Area	
Т	c Leng	nth	Slope	Velocity	Capacity	Description
(mir	_	-	(ft/ft)	(ft/sec)	(cfs)	
5.		50	0.1830	0.17		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.25"
0.	7	92	0.1830	2.14		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
0.	4	45	0.1360	1.84		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
0.	0	10	1.0000	7.00		Shallow Concentrated Flow,
_						Short Grass Pasture Kv= 7.0 fps
0.	.4	72	0.0200	2.87		Shallow Concentrated Flow,
•	^	^^	0 0000	2.02		Paved Kv= 20.3 fps Shallow Concentrated Flow
0.	.3	60	0.0320	3.63		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.	1 1	15	0.0100	4.91	3.86	•
0.	.4 1	10	0.0100	4.31	5.66	Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
						n= 0.012 Concrete pipe, finished
7.	.2 4	44	Total			

Subcatchment 6S: CB6

1.49 cfs @ 12.08 hrs, Volume= Runoff

0.122 af, Depth= 6.56"

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Page 58

9/13/2021

	Ar	ea (sf)	CN E	escription		
		9,711	98 F	aved park	ing & roofs	
	9,711 Impervious Area				Area	
	Tc in)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
- 6	3.0 0.0	3	0.0200	6.95	5.46	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
	6.0	3	Total			

Subcatchment 7S: CB7

Runoff =

1.49 cfs @ 12.09 hrs, Volume=

0.122 af, Depth= 6.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 100YR Rainfall=6.80"

	Ar	ea (sf)	CN D	escription							
		9,781		Paved parking & roofs							
		96	39 >	>75% Grass cover, Good, HSG A							
		9,877	97 V	Veighted A	verage						
		96	F	ervious Ar	ea						
		9,781	1	npervious	Area						
	Тс	Length	Slope	Velocity	Capacity	Description					
(r	nin)	(feet)	(ft/ft)	(ft/sec)	(cfs)						
	6.0					Direct Entry, Min TC					
	0.4	120	0.0100	4.91	3.86	Circular Channel (pipe),					
						Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'					
						n= 0.012 Concrete pipe, finished					
	64	120	Total								

Subcatchment 8S: CB8

Runoff

1.82 cfs @ 12.14 hrs, Volume=

0.153 af, Depth= 2.18"

Area	a (sf)	CN	Description				
13	3,406	98 Paved parking & roofs					
8	3,447	39	>75% Grass cover, Good, HSG A				
14	,855	30	Woods, Good, HSG A				
36	5,708	57	Weighted Average				
23	3,302		Pervious Area				
13	3,406		Impervious Area				

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	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
-	5.4	50	0.1540	0.15		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.25"
	2.1	248	0.1540	1.96		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.0	10	1.0000	7.00		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	1.2	73	0.0210	1.01		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	0.4	87	0.0270	3.34		Shallow Concentrated Flow,
						Paved Kv= 20.3 fps
	0.1	35	0.0331	8.94	7.02	\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\
						Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
						n= 0.012 Concrete pipe, finished
	92	503	Total			

Subcatchment 9S: CB9

Runoff = 1.23 cfs @ 12.09 hrs, Volume= 0.101 af, Depth= 6.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 100YR Rainfall=6.80"

	A	rea (sf)	CN [Description							
		8,051	98 F	aved parking & roofs							
		107	39 >	>75% Grass cover, Good, HSG A							
		8,158	97 \	Weighted Average							
		107	F	Pervious Area							
		8,051	1	mpervious	Area						
	Tc	Length	Slope	•	Capacity	Description					
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)						
	6.0					Direct Entry, M IN. TC					
	0.3	116	0.0100	5.90	4.63	Circular Channel (pipe),					
						Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'					
						n= 0.010 PVC, smooth interior					
-	63	116	Total								

Subcatchment 10S: CB10

Runoff = 2.88 cfs @ 12.09 hrs, Volume= 0.205 af, Depth= 3.45"

A	rea (sf)	CN	Description								
***************************************	17,784	98	Paved parking & roofs								
	3,409	39	>75% Grass cover, Good, HSG A								
	9,781	30	Woods, Go	od, HSG A							
	30,974	70 Weighted Average									
	13,190		Pervious Ar	ea							
	17,784		Impervious	Area							
Tc (min)	Length (feet)	Slope (ft/ft)	•	Capacity (cfs)	Description						
6.0					Direct Entry, MIN. TC						
0.0	14	0.0100	4.91	3.86	Circular Channel (pipe),						
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'						
					n= 0.012 Concrete pipe, finished						
6.0	14	Total									

Subcatchment 11S: TR11

Runoff 2.54 cfs @ 12.11 hrs, Volume= 0.201 af, Depth= 2.09"

 Area (sf)	CN	Description			
17,178	98	Paved parking & roofs			
17,371	39	>75% Grass cover, Good, HSG A			
15,648	30	Woods, Good, HSG A			
 50,197	56	Weighted Average			
33,019		Pervious Area			
17,178		Impervious Area			

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2020	0.17		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.25"
0.2	31	0.2020	2.25		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.2	20	0.1610	2.81		Shallow Concentrated Flow,
0.2	30	0.1010	2.01		Short Grass Pasture Kv= 7.0 fps
0.1	16	0.1250	2.47		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
0.1	15	0.0590	3.64		Shallow Concentrated Flow,
					Grassed Waterway Kv= 15.0 fps
0.3	19	0.0590	1.21		Shallow Concentrated Flow,
0.4	40	0.0460	2.81		Woodland Kv= 5.0 fps Shallow Concentrated Flow,
0.1	19	0.3160	2.01		Woodland Kv= 5.0 fps
0.2	10	0.0100	0.70		Shallow Concentrated Flow,
U.Z.	, ,	0.0100	0,, 0		Short Grass Pasture Kv= 7.0 fps
0.0	7	0.1420	2.64		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
1.0	246	0.0050	4.17	3.28	
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
					II- 0.010 FVC, SINOULI III.ENOI
7.1	443	Total			

Subcatchment 12S: TR12

2.78 cfs @ 12.12 hrs, Volume= Runoff

0.240 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 100YR Rainfall=6.80"

	A	rea (sf)	CN [Description						
		20,701	98 F	Paved parking & roofs						
		19,744		>75% Grass cover, Good, HSG A						
		40,298	30 \	Noods, Go	od, HSG A					
		80,743	50 \	Neighted A	verage					
		60,042		Pervious Ar						
		20,701	1	mpervious	Area					
	Tc	Length	Slope	Velocity	Capacity	Description				
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)					
	6.0	· · · · · · · · · · · · · · · · · · ·				Direct Entry, MIN. TC.				
	1.1	274	0.0050	4.17	3.28	Circular Channel (pipe),				
	• • •					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'				
						n= 0.010 PVC, smooth interior				
-	7 1	274	Total							

7.1 274 Total

Subcatchment 13S: TR13

Runoff = 2.23 cfs @ 12.12 hrs, Volume= 0.1

0.196 af, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Type III 24-hr 100YR Rainfall=6.80"

	Area	(sf)	CN D	escription		
	18,9	951	98 P	aved park	ing & roofs	
		347	39 >	75% Ġras:	s cover, Go	ood, HSG A
	44,0	011	30 V	Voods, Go	od, HSG A	
	69,6	309	49 V	Veighted A	verage	
	50,6			ervious Ar		
	18,9		Ir	npervious	Area	
	,			•		
Т	c Le	ngth	Slope	Velocity	Capacity	Description
(mir		feet)	(ft/ft)	(ft/sec)	(cfs)	·
2.	8	50	0.1170	0.30		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.25"
0.	3	48	0.1170	2.39		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
1.	8	185	0.1170	1.71		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
0.	0	9	0.2220	3.30		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
0.	.1	18	0.1000	2.21		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
1.	.0					Direct Entry, Min TC
0.	.9	226	0.0050	4.17	3.28	
						Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
						n= 0.010 PVC, smooth interior
6	.9	536	Total			

Subcatchment 17S: S17

Runoff = 0.63 cfs @ 12.35 hrs, Volume=

0.117 af, Depth= 0.63"

 Area (sf)	CN	Description
 82,033	39	>75% Grass cover, Good, HSG A
14,902	30	Woods, Good, HSG A
96,935	38	Weighted Average
96,935		Pervious Area

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Page 63 9/13/2021

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	35	0.1140	0.13		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.25"
1.2	15	0.5710	0.20		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.25"
0.1	20	0.5710	3.78		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
0.1	21	0.2860	2.67		Shallow Concentrated Flow,
		0.4440	4.07		Woodland Kv= 5.0 fps Shallow Concentrated Flow,
0.7	72	0.1110	1.67		Woodland Kv= 5.0 fps
4.0	96	0.0470	1.08		Shallow Concentrated Flow,
1.3	86	0.0470	1.00		Woodland Kv= 5.0 fps
0.6	75	0.1840	2.14		Shallow Concentrated Flow,
0.0	, 0	0.1040	A 1 1		Woodland Kv= 5.0 fps
0.3	23	0.0800	1,41		Shallow Concentrated Flow,
0.0					Woodland Kv= 5.0 fps
0.1	44	0.0250	7.77	6.10	
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
9.0	391	Total			

Subcatchment 18S: S18

0.009 af, Depth= 0.33" 0.03 cfs @ 12.44 hrs, Volume= Runoff

Area (sf)	CN	Description
 4,614	39	>75% Grass cover, Good, HSG A
10,309	30	Woods, Good, HSG A
 14,923	33	Weighted Average
14,923		Pervious Area

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Page 64

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	Tc in)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	0.6	13	0.3080	0.34		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.25"
	1.2	17	0.1180	0.24		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.25"
(0.4	4	0.5000	0.15		Sheet Flow,
`						Woods: Light underbrush n= 0.400 P2= 3.25"
(0.5	16	0.7690	0.51		Sheet Flow,
`	0.0		0000			Grass: Short n= 0.150 P2= 3.25"
	0.1	57	0.8770	6.56		Shallow Concentrated Flow,
`	U . 1	٠,	0.0770	0.00		Short Grass Pasture Kv= 7.0 fps
	3.2					Direct Entry, Min TC
		44	0.0250	7.77	6.10	and the state of t
1	0.1	44	0.0250	1.11	0.10	Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
						n= 0.012 Concrete pipe, finished
						11- 0.012 Concrete pipe, infished
	6.1	151	Total			

Reach 1R: DMH1 - DMH2

1.182 ac, Inflow Depth = 2.52" for 100YR event Inflow Area = 3.27 cfs @ 12.10 hrs, Volume= 0.248 af Inflow

0.248 af, Atten= 0%, Lag= 0.4 min 3.26 cfs @ 12.10 hrs, Volume= Outflow

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Max. Velocity= 5.71 fps, Min. Travel Time= 0.2 min Avg. Velocity = 2.01 fps, Avg. Travel Time= 0.6 min

Peak Storage= 38 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.68' Bank-Full Depth= 1.00', Capacity at Bank-Full= 4.03 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 67.0' Slope= 0.0109 '/' Inlet Invert= 255.08', Outlet Invert= 254.35'



Reach 3R: DMH3-HEADER

1.333 ac, Inflow Depth = 2.97" for 100YR event Inflow Area = 4.24 cfs @ 12.10 hrs, Volume= 0.330 af Inflow

0.330 af, Atten= 0%, Lag= 0.1 min 4.24 cfs @ 12.10 hrs, Volume= Outflow

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Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 6.69 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.22 fps, Avg. Travel Time= 0.2 min

Peak Storage= 19 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.75' Bank-Full Depth= 1.00', Capacity at Bank-Full= 4.63 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 30.0' Slope= 0.0100 '/' Inlet Invert= 254.25', Outlet Invert= 253.95'



Reach 4R: DMH4 DMH5

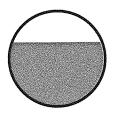
Inflow Area = 3.006 ac, Inflow Depth = 1.76" for 100YR event Inflow = 5.32 cfs @ 12.11 hrs, Volume= 0.441 af

Outflow = 5.31 cfs @ 12.12 hrs, Volume= 0.441 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 9.45 fps, Min. Travel Time= 0.1 min Avg. Velocity = 4.04 fps, Avg. Travel Time= 0.3 min

Peak Storage= 41 cf @ 12.12 hrs, Average Depth at Peak Storage= 0.67' Bank-Full Depth= 1.00', Capacity at Bank-Full= 6.69 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 72.0' Slope= 0.0300 '/' Inlet Invert= 256.46', Outlet Invert= 254.30'



Reach 5R: DMH5 DMH6

Inflow Area = 3.006 ac, Inflow Depth = 1.76" for 100YR event Inflow = 5.31 cfs @ 12.12 hrs, Volume= 0.441 af

Outflow = 5.31 cfs @ 12.12 hrs, Volume= 0.441 af, Atten= 0%, Lag= 0.2 min

Type III 24-hr 100YR Rainfall=6.80"

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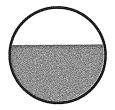
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Page 66 9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 10.60 fps, Min. Travel Time= 0.1 min Avg. Velocity = 4.47 fps, Avg. Travel Time= 0.2 min

Peak Storage= 31 cf @ 12.12 hrs, Average Depth at Peak Storage= 0.61' Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.72 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 61.0' Slope= 0.0400 '/' Inlet Invert= 254.20', Outlet Invert= 251.76'



Reach 6R: DMH6 MANIFOLD

Inflow Area = 3.006 ac, Inflow Depth = 1.76" for 100YR event Inflow = 5.31 cfs @ 12.12 hrs, Volume= 0.441 af

Outflow = 5.31 cfs @ 12.12 hrs, Volume= 0.441 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 9.29 fps, Min. Travel Time= 0.0 min Avg. Velocity = 3.98 fps, Avg. Travel Time= 0.1 min

Peak Storage= 10 cf @ 12.12 hrs, Average Depth at Peak Storage= 0.68' Bank-Full Depth= 1.00', Capacity at Bank-Full= 6.55 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 18.0' Slope= 0.0200 '/' Inlet Invert= 251.66', Outlet Invert= 251.30'



Reach 7R: DMH7 MANIFOLD

Inflow Area = 0.450 ac, Inflow Depth = 6.50" for 100YR event Inflow = 2.97 cfs @ 12.09 hrs, Volume= 0.244 af

Outflow = 2.97 cfs @ 12.09 hrs, Volume= 0.244 af, Atten= 0%, Lag= 0.1 min

Type III 24-hr 100YR Rainfall=6.80"

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Page 67 9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 7.30 fps, Min. Travel Time= 0.0 min Avg. Velocity = 2.47 fps, Avg. Travel Time= 0.1 min

Peak Storage= 8 cf @ 12.09 hrs, Average Depth at Peak Storage= 0.51' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.67 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 20.0' Slope= 0.0150 '/' Inlet Invert= 251.60', Outlet Invert= 251.30'



Reach 8R: DMH8 DMH 7

Inflow Area = 0.450 ac, Inflow Depth = 6.50" for 100YR event Inflow = 2.97 cfs @ 12.09 hrs, Volume= 0.244 af

Outflow = 2.97 cfs @ 12.09 hrs, Volume= 0.244 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 7.10 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.41 fps, Avg. Travel Time= 0.2 min

Peak Storage= 13 cf @ 12.09 hrs, Average Depth at Peak Storage= 0.53' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.46 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 30.0' Slope= 0.0200 '/' Inlet Invert= 252.30', Outlet Invert= 251.70'



Reach 9R: DMH9 DMH10

Inflow Area = 1.598 ac, Inflow Depth = 1.47" for 100YR event Inflow = 2.23 cfs @ 12.12 hrs, Volume= 0.196 af

Outflow = 2.23 cfs @ 12.12 hrs, Volume= 0.196 af, Atten= 0%, Lag= 0.4 min

9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Max. Velocity= 8.51 fps, Min. Travel Time= 0.2 min

Avg. Velocity = 3.66 fps, Avg. Travel Time= 0.5 min

Peak Storage= 27 cf @ 12.12 hrs, Average Depth at Peak Storage= 0.37'

Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.72 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished

Length= 103.0' Slope= 0.0400 '/'

Inlet Invert= 256.56', Outlet Invert= 252.44'



Reach 10R: DMH10 POND2

Inflow Area = 2.628 ac, Inflow Depth = 2.05" for 100YR event

Inflow = 5.15 cfs @ 12.12 hrs, Volume= 0.450 af

Outflow = 5.15 cfs @ 12.12 hrs, Volume= 0.450 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

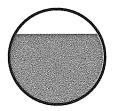
Max. Velocity= 8.27 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.81 fps, Avg. Travel Time= 0.3 min

Peak Storage= 29 cf @ 12.12 hrs, Average Depth at Peak Storage= 0.74'

Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.74 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 47.0' Slope= 0.0221 '/'

Inlet Invert= 252.34', Outlet Invert= 251.30'



Reach 11R: DMH11-FES

Inflow Area = 1.747 ac, Inflow Depth = 0.01" for 100YR event

Inflow = 0.07 cfs @ 12.61 hrs, Volume= 0.001 af

Outflow = 0.07 cfs @ 12.61 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.3 min

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Page 69

9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 3.38 fps, Min. Travel Time= 0.2 min Avg. Velocity = 2.46 fps, Avg. Travel Time= 0.3 min

Peak Storage= 1 cf @ 12.61 hrs, Average Depth at Peak Storage= 0.07' Bank-Full Depth= 1.00', Capacity at Bank-Full= 8.63 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 37.0' Slope= 0.0500 '/' Inlet Invert= 247.85', Outlet Invert= 246.00'



Reach 12R: DMH12-PIPE END

Inflow Area = 6.084 ac, Inflow Depth = 0.00" for 100YR event

Inflow 0.07 cfs @ 12.87 hrs, Volume= 0.002 af

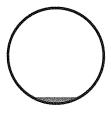
Outflow 0.07 cfs @ 12.87 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Max. Velocity= 3.38 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.63 fps, Avg. Travel Time= 0.2 min

Peak Storage= 1 cf @ 12.87 hrs, Average Depth at Peak Storage= 0.07' Bank-Full Depth= 1.00', Capacity at Bank-Full= 8.63 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 26.0' Slope= 0.0500 '/' Inlet Invert= 243.30', Outlet Invert= 242.00'



Reach 13R: DMH13-PIPE END

Inflow Area = 0.711 ac, Inflow Depth = 0.11" for 100YR event

0.07 cfs @ 13.44 hrs, Volume= Inflow 0.006 af

0.07 cfs @ 13.44 hrs, Volume= Outflow 0.006 af, Atten= 0%. Lag= 0.2 min

9/13/2021

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Max. Velocity= 3.26 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.43 fps, Avg. Travel Time= 0.1 min

Peak Storage= 0 cf @ 13.44 hrs, Average Depth at Peak Storage= 0.06' Bank-Full Depth= 1.00', Capacity at Bank-Full= 8.63 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 18.0' Slope= 0.0500 '/' Inlet Invert= 242.90', Outlet Invert= 242.00'



Pond 1P: POND 1

Inflow Area =	1.747 ac, Inflow Depth = 2.92"	for 100YR event
Inflow =	5.49 cfs @ 12.10 hrs, Volume=	0.425 af
Outflow =	0.96 cfs @ 12.61 hrs, Volume=	0.425 af, Atten= 83%, Lag= 30.4 min
Discarded =	0.88 cfs @ 11.76 hrs, Volume=	0.424 af
Primary =	0.07 cfs @ 12.61 hrs, Volume=	0.001 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 254.04' @ 12.61 hrs Surf.Area= 0.046 ac Storage= 0.116 af

Plug-Flow detention time= 37.6 min calculated for 0.425 af (100% of inflow) Center-of-Mass det. time= 37.6 min (864.0 - 826.3)

Volume	Invert	Avail.Storage	Storage Description	
#1	249.80'	0.068 af	27.30'W x 73.00'L x 5.50'H Prismatoid	
			0.252 af Overall - 0.081 af Embedded = 0.171 af \times 40.0% Voids	
#2	251.05'	0.081 af	48.0"D x 70.00'L Horizontal Cylinder x 4 Inside #1	
		0.149 af	Total Available Storage	
<u>Device</u>	Routing	Invert O	utlet Devices	
#1	Discarded	249.70' 1	19.110 in/hr Exfiltration over Surface area above invert	
		E	Excluded Surface area = 0.000 ac	
#2	Primary	253.95' 1 :	12.0" Vert. Orifice/Grate X 2.00 C= 0.600	

Discarded OutFlow Max=0.88 cfs @ 11.76 hrs HW=249.86' (Free Discharge) 1=Exfiltration (Exfiltration Controls 0.88 cfs)

Primary OutFlow Max=0.07 cfs @ 12.61 hrs HW=254.04' (Free Discharge) 2=Orifice/Grate (Orifice Controls 0.07 cfs @ 1.02 fps)

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Page 71 9/13/2021

Pond 2P: POND 2

Inflow Area =	6.084 ac, Inflow Depth = 2.24"	for 100YR event
Inflow =	13.25 cfs @ 12.12 hrs, Volume=	1.134 af
Outflow =	2.00 cfs @ 12.87 hrs, Volume=	1.134 af, Atten= 85%, Lag= 45.3 min
Discarded =	1.92 cfs @ 11.79 hrs, Volume=	1.132 af
Primary =	0.07 cfs @ 12.87 hrs, Volume=	0.002 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 251.37' @ 12.87 hrs Surf.Area= 5,460 sf Storage= 13,950 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow) Center-of-Mass det. time= 53.5 min (891.8 - 838.3)

Volume	Invert	Avail.Storage	Storage Description
#1	247.15'	8,051 cf	27.30'W x 200.00'L x 5.50'H Prismatoid
			$30,030 \text{ cf Overall} - 9,902 \text{ cf Embedded} = 20,128 \text{ cf } \times 40.0\% \text{ Voids}$
#2	248.40'	9,902 cf	48.0"D x 197.00'L Horizontal Cylinder x 4 Inside #1
		17,953 cf	Total Available Storage

<u>Device</u>	Routing	Invert	Outlet Devices
#1	Discarded	247.10'	15.200 in/hr Exfiltration over Surface area above invert
			Excluded Surface area = 0 sf
#2	Primary	251.30'	12.0" Vert. Orifice/Grate X 3.00 C= 0.600

Discarded OutFlow Max=1.92 cfs @ 11.79 hrs HW=247.21' (Free Discharge) 1=Exfiltration (Exfiltration Controls 1.92 cfs)

Primary OutFlow Max=0.07 cfs @ 12.87 hrs HW=251.37' (Free Discharge) 2=Orifice/Grate (Orifice Controls 0.07 cfs @ 0.91 fps)

Pond 3P: POND 2

Inflow Area =	0.711 ac, Inflow Depth = 3.45"	for 100YR event
Inflow =	2.88 cfs @ 12.09 hrs, Volume=	0.205 af
Outflow =	0.24 cfs @ 13.44 hrs, Volume=	0.205 af, Atten= 92%, Lag= 81.0 min
Discarded =	0.17 cfs @ 11.46 hrs, Volume=	0.198 af
Primary =	0.07 cfs @ 13.44 hrs, Volume=	0.006 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 251.98' @ 13.44 hrs Surf.Area= 1,665 sf Storage= 3,929 cf

Plug-Flow detention time= 214.7 min calculated for 0.205 af (100% of inflow) Center-of-Mass det. time= 214.7 min (1,046.9 - 832.2)

Volume	Invert	Avail.Storage	Storage Description
#1	248.21'	2,498 cf	27.30'W x 61.00'L x 5.50'H Prismatoid
			9,159 cf Overall - 2,915 cf Embedded = 6,244 cf x 40.0% Voids
#2	248.96'	2,915 cf	48.0"D x 58.00'L Horizontal Cylinder x 4 Inside #1
		5,413 cf	Total Available Storage

Type III 24-hr 100YR Rainfall=6.80"

UC1502-POST

Prepared by {enter your company name here}

Page 72

HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

9/13/2021

Device	Routing	Invert	Outlet Devices
#1	Discarded	248.20'	4.470 in/hr Exfiltration over Surface area above invert
			Excluded Surface area = 0 sf
#2	Primary	251.86'	12.0" Vert. Orifice/Grate C= 0.600

Discarded OutFlow Max=0.17 cfs @ 11.46 hrs HW=248.27' (Free Discharge) 1=Exfiltration (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.06 cfs @ 13.44 hrs HW=251.98' (Free Discharge) 2=Orifice/Grate (Orifice Controls 0.06 cfs @ 1.18 fps)

Link 1L: COMBINE HYDROGRAPHS

Inflow Area = 11.109 ac, Inflow Depth = 0.15" for 100YR event Inflow = 0.66 cfs @ 12.35 hrs, Volume= 0.136 af

Primary = 0.66 cfs @ 12.35 hrs, Volume= 0.136 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

APPENDIX E

Project:

Washington St

Location:

Franklin, MA

Prepared For:

United Consultants / Rick Goodreau



Purpose:

To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is

derived from the first 1" of runoff from the contributing impervious surface.

Reference:

Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of

Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure:

Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi²/watershed inches (csm/in).

Compute Q Rate using the following equation:

Q = (qu) (A) (WQV)

where:

Q = flow rate associated with first 1" of runoff qu = the unit peak discharge, in csm/in.

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (1" in this case)

Structure Name	Impv. (acres)	A (miles ²)	t _c (min)	t _c (hr)	WQV (in)	qu (csm/in.)	Q (cfs)
DMH 3	0.59	0.0009219	5.0	0.083	1.00	795.00	0.73
CB 5	0.19	0.0002953	5.0	0.083	1.00	795.00	0.23
DMH 7	0.45	0.0006984	5.0	0.083	1.00	795.00	0.56
CB 8	0.31	0.0004813	5.0	0.083	1.00	795.00	0.38
CB 9	0.19	0.0002891	5.0	0.083	1.00	795.00	0.23
CB 10	0.41	0.0006375	5.0	0.083	1.00	795.00	0.51





Brief Stormceptor Sizing Report - CB #5

Project Information & Location				
Project Name	Washington St	Project Number	685246	
City	Franklin	State/ Province	Massachusetts	
Country	United States of America	Date	8/31/2021	
Designer Information		EOR Information (o	ptional)	
Name	Jim Lyons	Name	Rick Goodreau	
Company	Contech ES	Company	United Consultants	
Phone #	413-246-5151	Phone #	508-922-1063	
Email	jlyons@conteches.com	Email	rick@uci850.com	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	CB #5
Target TSS Removal (%)	80
TSS Removal (%) Provided	94
Recommended Stormceptor Model	STC 450i

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizi	ng Summary
Stormceptor Model	% TSS Removal Provided
STC 450i	94
STC 900	97
STC 1200	97
STC 1800	97
STC 2400	98
STC 3600	98
STC 4800	99
STC 6000	99
STC 7200	99
STC 11000	99
STC 13000	99
STC 16000	100





	Sizing	Details		
Drainage	- Area	Water Qu	ality Objective	
Total Area (acres)	0.19	TSS Removal (%)		80.0
Imperviousness %	100.0	Runoff Volume Capture (%)		
Reinf	9 11	Oil Spill Capture Volu	ume (Gal)	····
Station Name	BLUE HILL	Peak Conveyed Flow Rate (CFS)		
State/Province	Massachusetts	Water Quality Flow Rate (CFS)		0.23
Station ID #	0736	Up Stream Storage		
Years of Records	58	Storage (ac-ft) Discharge (cfs)		ge (cfs)
Latitude	42°12'44"N	0.000	0.0	00
Longitude	71°6'53"W	Up Stream	Flow Diversion	0.
		Max. Flow to Stormes	eptor (cfs)	

	cle Size Distribution cled PSD defines TS		
OK-110			
Particle Diameter (microns)	Distribution %	Specific Gravity	
1.0	0.0	2.65	
53.0	3.0	2.65	
75.0	15.0	2.65	
88.0	25.0	2.65	
106.0	41.0	2.65	
125.0	15.0	2.65	
150.0	1.0	2.65	
212.0	0.0	2.65	

Notes

For Stormceptor Specifications and Drawings Please Visit: https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

[•] Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.

[•] Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.

[•] For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.





Brief Stormceptor Sizing Report - CB #8

	Project Informa	ntion & Location	
Project Name	Washington St	Project Number	685246
City	Franklin	State/ Province	Massachusetts
Country	United States of America	Date	8/31/2021
esigner Information		EOR Information (op	tional)
Name	Jim Lyons	Name	Rick Goodreau
Company	Contech ES	Company	United Consultants
Phone #	413-246-5151	Phone #	508-922-1063
Email	jlyons@conteches.com	Email	rick@uci850.com

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	CB #8	
Target TSS Removal (%)	80	***************************************
TSS Removal (%) Provided	91	
Recommended Stormceptor Model	STC 450i	

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Siz	ing Summary
Stormceptor Model	% TSS Removal Provided
STC 450i	91
STC 900	95
STC 1200	96
STC 1800	96
STC 2400	97
STC 3600	97
STC 4800	98
STC 6000	98
STC 7200	99
STC 11000	99
STC 13000	99
STC 16000	99





	Sizing	Details		
Drainage	Area	Water Qua	ality Objective	
Total Area (acres)	0.31	TSS Removal (%)		80.0
Imperviousness %	100.0	Runoff Volume Capture (%)		
Rainfa		Oil Spill Capture Volu	ıme (Gal)	
Station Name	BLUE HILL	Peak Conveyed Flow Rate (CFS)		
State/Province	Massachusetts	Water Quality Flow Rate (CFS)		0.23
Station ID #	0736	Up Stream Storage		
Years of Records	58	Storage (ac-ft) Discharge (cfs)		rge (cfs)
Latitude	42°12'44"N	0.000	0.0	000
Longitude	71°6'53"W	Up Stream	Flow Diversio	DΠ
		Max. Flow to Stormce	ptor (cfs)	

	cle Size Distribution cted PSD defines TS		
OK-110			
Particle Diameter (microns)	Distribution %	Specific Gravity	
1.0	0.0	2.65	
53.0	3.0	2.65	
75.0	15.0	2.65	
88.0	25.0	2.65	
106.0	41.0	2.65	
125.0	15.0	2.65	
150.0	1.0	2.65	
212.0	0.0	2.65	

Notes

For Stormceptor Specifications and Drawings Please Visit: https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

[•] Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.

Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal
defined by the selected PSD, and based on stable site conditions only, after construction is completed.

[•] For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.





Brief Stormceptor Sizing Report - CB #9

	Project Informa	tion & Location	
Project Name	Washington St	Project Number	685246
City	Franklin	State/ Province	Massachusetts
Country	United States of America	Date	8/31/2021
Designer Information		EOR Information (c	optional)
Name	Jim Lyons	Name	Rick Goodreau
Company	Contech ES	Company	United Consultants
Phone #	413-246-5151	Phone #	508-922-1063
Email	jlyons@conteches.com	Email	rick@uci850.com

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	CB #9
Target TSS Removal (%)	80
TSS Removal (%) Provided	94
Recommended Stormceptor Model	STC 450i

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormoeptor Siz	
Stormceptor Model	% TSS Removal Provided
STC 450i	94
STC 900	97
STC 1200	97
STC 1800	97
STC 2400	98
STC 3600	98
STC 4800	99
STC 6000	99
STC 7200	99
STC 11000	99
STC 13000	99
STC 16000	100





Drainage	Area	Water Qu	ality Objective	
Total Area (acres)	0.19	TSS Removal	(%)	80.0
Imperviousness %	100.0	Runoff Volume Capture (%)		
Rainfa	ill	Oil Spill Capture Vol	ume (Gal)	
Station Name	BLUE HILL	Peak Conveyed Flow Rate (CFS)		
State/Province	Massachusetts	Water Quality Flow Rate (CFS)		0.23
Station ID #	0736	Up Stre	eam Storage	
Years of Records	58	Storage (ac-ft)	Dischar	ge (cfs)
Latitude	42°12'44"N	0.000	0.0	00
Longitude	71°6'53"W	Up Stream	Flow Diversio	j.
		Max. Flow to Stormo	eptor (cfs)	

	icle Size Distribution cted PSD defines TS		
OK-110			
Particle Diameter (microns)	Distribution %	Specific Gravity	
1.0	0.0	2.65	
53.0	3.0	2.65	
75.0	15.0	2.65	
88.0	25.0	2.65	
106.0	41.0	2.65	
125.0	15.0	2.65	
150.0	1.0	2.65	
212.0	0.0	2.65	

Notes

For Stormceptor Specifications and Drawings Please Visit: https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

[·] Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.

<sup>Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design</sup>

assistance.





CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

WASHINGTON ST FRANKLIN, MA

Area 0.59 ac Weighted C 0.9

Unit Site Designation
Rainfall Station #

DMH 3 68

t_c 5 min

CDS Model 1515-3 CDS Treatment Capacity 1.0 cfs

0.02 0.04	9.3% 9.5%	9.3%		(cfs)	Removal (%)
0.04	0.5%	9.570	0.01	0.01	9.3
0.04	9.070	18.8%	. 0.02	0.02	9.5
0.06	8.7%	27.5%	0.03	0.03	8.7
0.08	10.1%	37.6%	0.04	0.04	10.0
0.10	7.2%	44.8%	0.05	0.05	7.1
0.12	6.0%	50.8%	0.06	0.06	5.9
0.14	6.3%	57.1%	0.07	0.07	6.2
0.16	5.6%	62.7%	0.08	0.08	5.4
0.18	4.7%	67.4%	0.10	0.10	4.5
0.20	3.6%	71.0%	0.11	0.11	3.5
0.25	8.2%	79.1%	0.13	0.13	7.8
0.50	14.9%	94.0%	0.27	0.27	13.2
0.75	3.2%	97.3%	0.40	0.40	2.7
1.00	1.2%	98.5%	0.53	0.53	0.9
1.50	0.7%	99.2%	0.80	0.80	0.5
2.00	0.8%	100.0%	1.06	1.00	0.4
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
					95.6

Removal Efficiency Adjustment² = 6.5%
Predicted % Annual Rainfall Treated = 93.5%

Predicted Net Annual Load Removal Efficiency = 89.1%

^{1 -} Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

^{2 -} Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.





CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

WASHINGTON ST FRANKLIN, MA

Area 0.45 ac Unit Site Designation DMH 7
Weighted C 0.9 Rainfall Station # 68

t_c 5 min

CDS Model 1515-3 CDS Treatment Capacity 1.0 cfs

<u>Rainfall</u> <u>Intensity¹</u> (in/hr)	Percent Rainfall Volume ¹	<u>Cumulative</u> <u>Rainfall Volume</u>	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	9.3%	9.3%	0.01	0.01	9.3
0.04	9.5%	18.8%	0.02	0.02	9.5
0.06	8.7%	27.5%	0.02	0.02	8.7
0.08	10.1%	37.6%	0.03	0.03	10.1
0.10	7.2%	44.8%	0.04	0.04	7.1
0.12	6.0%	50.8%	0.05	0.05	6.0
0.14	6.3%	57.1%	0.06	0.06	6.2
0.16	5.6%	62.7%	0.06	0.06	5.5
0.18	4.7%	67.4%	0.07	0.07	4.6
0.20	3.6%	71.0%	0.08	0.08	3.5
0.25	8.2%	79.1%	0.10	0.10	7.9
0.50	14.9%	94.0%	0.20	0.20	13.7
0.75	3.2%	97.3%	0.30	0.30	2.8
1.00	1.2%	98.5%	0.40	0.40	1.0
1.50	0.7%	99.2%	0.60	0.60	0.5
2.00	0.8%	100.0%	0.80	0.80	0.5
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
					96.9

Removal Efficiency Adjustment² = 6.5%
Predicted % Annual Rainfall Treated = 93.5%

Predicted Net Annual Load Removal Efficiency = 90.5%

^{1 -} Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

^{2 -} Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.





CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

WASHINGTON ST FRANKLIN, MA

Area 0.41 ac Unit Site Designation CB 10 Weighted C 0.9 Rainfall Station # 68

t_c 5 min

CDS Model 1515-3 CDS Treatment Capacity 1.0 cfs

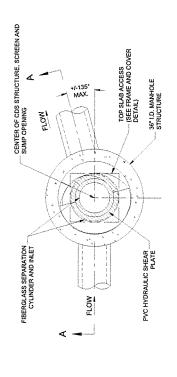
<u>Rainfall</u> <u>Intensity¹</u> (in/hr)	Percent Rainfall Volume ¹	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	9.3%	9.3%	0.01	0.01	9.3
0.04	9.5%	18.8%	0.01	0.01	9.5
0.06	8.7%	27.5%	0.02	0.02	8.7
0.08	10.1%	37.6%	0.03	0.03	10.1
0.10	7.2%	44.8%	0.04	0.04	7.1
0.12	6.0%	50.8%	0.04	0.04	6.0
0.14	6.3%	57.1%	0.05	0.05	6.2
0.16	5.6%	62.7%	0.06	0.06	5.5
0.18	4.7%	67.4%	0.07	0.07	4.6
0.20	3.6%	71.0%	0.07	0.07	3.5
0.25	8.2%	79.1%	0.09	0.09	7.9
0.50	14.9%	94.0%	0.18	0.18	13.8
0.75	3.2%	97.3%	0.28	0.28	2.8
1.00	1.2%	98.5%	0.37	0.37	1.0
1.50	0.7%	99.2%	0.55	0.55	0.5
2.00	0.8%	100.0%	0.73	0.73	0.5
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
					97.3

Removal Efficiency Adjustment² = 6.5%
Predicted % Annual Rainfall Treated = 93.5%

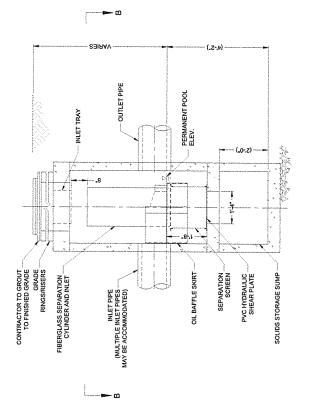
Predicted Net Annual Load Removal Efficiency = 90.8%

^{1 -} Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

^{2 -} Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.



PLAN VIEW B-B N.T.S.



ELEVATION A-A



CDS1515-3-C DESIGN NOTES

CDS1515-3-C RATED TREATMENT CAPACITY IS 1.0 CFS, OR PER LOCAL REGULATIONS.

THE STANDARD CDS1515-3-C WITH GRATED INLET COMFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION

GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES

DATA REQUIREMENTS SITE SPECIFIC

INLET TRAY NOT TO SCALE

WATER QUALITY FLOW RATE (CFS OR L/s) FEAK FLOW WATE (CFS OR L/s) FEAK CHOW (YRS) SCREEN APERTURE (2400 OR 4700) PRE DATA. INLET PRE 1 OUTLET PRE 2 OUTLET PRE 2 OUTLET PRE 3 SMELEVATION RM ELEVATION ANTI-LOTATION BALLAST WIDTH HEIGHT HEIGHT WOTH HEIGHT	STRUCTURE ID			
YRS))) ' ' ' WIDTH	WATER QUALITY	FLOW RAT	E (CFS OR L/s)	
YRS))) ' ' ' WIDTH	PEAK FLOW RATI	E (CFS OR	(\$)	-
TERNAL	RETURN PERIOD	OF PEAK F	LOW (YRS)	•
· · · · · · · · · · · · · · · · · · ·	SCREEN APERTL	JRE (2400 C	R 4700)	٠
	PIPE DATA:	ij	MATERIAL	DIAMETER
WIDTH	INLET PIPE 1			•
WIDTH	INLET PIPE 2	•	•	
WIDTH .	OUTLET PIPE	٠	•	•
нд .	RIM ELEVATION	AND AND ADDRESS OF THE AND ADDRESS OF THE ADDRESS O		•
NOTES/SPECIAL REQUIREMENTS:	ANTI-FLOTATION	BALLAST	HTGIW	HEIGHT
NOTES/SPECIAL REQUIREMENTS:			•	•
	NOTES/SPECIAL	REQUIREM	ENTS:	

24" X 24" FRAME AND GRATE

(MAY VARY)
NOT TO SCALE

· PER ENGINEER OF RECORD

- GENERAL NOISE

 1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.

 2. FOR STRIE SPECIFIC DIARMINES WITH DEFILALED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED

 2. FOR STRIE SPECIFIC DIARMINES WITH DEFILALED STRUCTURE DIARMINES.

 3. COS WHATER OLGHET SHALL BET SHALL BE HACCORDANCE WITH ALL DESIGNS DATA AND INFORMATION CONTAINED IN THIS DRAWING.

 4. STRUCTURE SHALL MEET AASHTO HSOOL GAD RATING, ASSUMINE EARTH COVER OF 0 2, AND GROUNDWATER ELEVATION AT, OR BELLOW, THE OUTLE THE WINE TELEVATION LENGEN FOR RECOME OF CONFIRM ACTUAL GROUNDWATER ELEVATION AT, OR BELLOW, THE CONTECH LOSO.

 5. FREGULIED, PPC THORAQLIC ENERS PLATE BY PACED ON SHELF AT BOTTOM OF SCREEN CYLINGER. REMOVE AND REPLACE AS MICHAEL BY PACED ON SHELF AT BOTTOM OF SCREEN CYLINGER. REMOVE AND REPLACE AS MECASING. CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

- NSTALLATION NOTES

 A. NY SUBGRASSE, BACKELL DEPTH, ANDIOR ANTI-ELOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE
 ANY SUBGRASSE, BACKELD BY ERCORD.

 B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SHEPICEIN LIFTING AND ASSENBLE STRUCTURE.

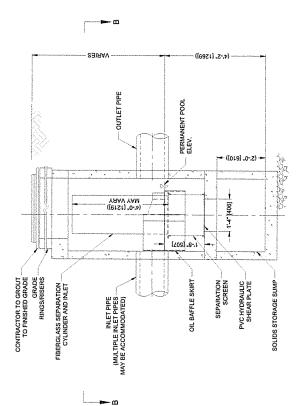
 C. CONTRACTOR TO INSTALL, AND GROUT INLET AND OUTLET PIPE(S), MATCH PIPE INVESTS WITH ELEVATIONS SHOWN, ALL PIPE
 CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET PIPE(S), MATCH PIPE INVESTS WITH ELEVATIONS SHOWN, ALL PIPE
 CONTRACTOR TO TAKE APPROPRIATE MESSARE TO SASSINGE UNITS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS
 SUGGESTED THAT ALL JOHN'S BELOW PIPE INVERTS ARE GROUTED.

9025 Centre Pointe Dr., Suite 400, West Chester, OH 45089 800-338-1122 513-645-7000 513-645-7993 FAX CAS NEED SOLUTIONS LLC

ONLINE CDS STANDARD DETAIL CDS1515-3-C

CDS1515-3-C RATED TREATMENT CAPACITY IS 1.0 CFS, OR PER LOCAL REGULATIONS. THE STANDARD CDS1515-3-C CONFIGURATION IS SHOWN. CENTER OF CDS STRUCTURE, SCREEN AND SUMP OPENING TOP SLAB ACCESS (SEE FRAME AND COVER DETAIL) 36" [914] I.D. MANHOLE STRUCTURE NO I PLAN VIEW B-B N.T.S. +/-65° MAX. FIBERGLASS SEPARATION CYLINDER AND INLET PVC HYDRAULIC SHEAR PLATE FLOW < →

CDS1515-3-C DESIGN NOTES







DATA REQUIREMENTS SITE SPECIFIC

14 C 15 C 17 C 17 17 10 C 17 19 11		
(S) とうりょう コード MAI は (C) のうとう (S)	(CFS OR L/s)	
PEAK FLOW RATE (CFS OR L/s)	(s)	•
RETURN PERIOD OF PEAK FLOW (YRS)	OW (YRS)	•
SCREEN APERTURE (2400 OR 4700)	٦ 4700)	•
PIPE DATA: I.E.	MATERIAL	DIAMETER
INLET PIPE 1		•
INLET PIPE 2	•	•
OUTLET PIPE .		•
RIM ELEVATION	And the control of th	•
ANTI-FLOTATION BALLAST	WIDTH	незснт
NOTES/SPECIAL REQUIREMENTS:	NTS:	-

CONTECH

FRAME AND COVER (DIAMETER VARIES) N.T.S.

* PER ENGINEER OF RECORD

- GENERAL WOTES

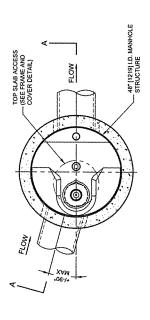
 1. CONTRICT TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
 2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED
 3. CONTROTS LIC FREMESENTATIOL. WANG-CHARGES CONTROTS LIC FREMESENTATION CONTROLS ON THE STRUCTURE BELEVEST SEQUIREMENTS OF PROJECT.
 3. COS WATER COADRIAN STRUCTURE METER SEGUIREMENTS OF PROJECT.
 3. CONTRACTOR TO COORDING STRUCTURE METER SEGUIREMENTS OF PROJECT.
 3. FIRECURED, PREVET ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION AT, OR BELOW,
 3. FIRECURED, PROFE CAST WITH THE CONTECH LOGO.
 3. FIRECURED, PROFE CAST WITH THE SPLACED ON SHEEF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS MICESSARY DURING MAINTENANCE CLEANING.
 4. COSTITUTES SHALL BE PRECAST CONCRETE CONFORMING TO ASTIM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.

- INSTALLATION NOTES

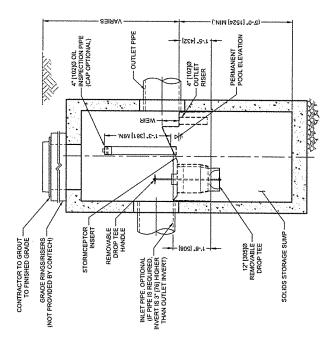
 A. ANY SUB-PAGE, EACHEL DEPTH, ANDOR NATH-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE
 SPECIFIED BY ENGINEER OF RECORD.
 B. CONTRACTOR TO PROVIDE CENTEMENT SHALL SHEFICIENT LIFTING AND REACH AND ASSEMBLE STRUCTURE.
 C. CONTRACTOR TO NISTAL, LON'T SEAJANT BETWEEN ALL SHEUTHE SECTIONS AND ASSEMBLE STRUCTURE.
 C. CONTRACTOR TO PROVIDE CENTING CENTERLARS.
 D. CONTRACTOR TO PROVIDE CENTING CENTERLARS.
 CENTERLARS TO NATCH PIPE OF DENING CENTERLARS.
 C. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO SEASON SHOWN SHOWN THE EVAITONS SHOWN. ALL PIPE C. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSEMBLE STRUCTURE.
 C. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSEMBLE STRUCTURE.
 C. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSEMBLE WIT IS WATER TIGHT, HOLDING WATER TO FLOWILNE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.



ONLINE CDS STANDARD DETAIL CDS1515-3-C



PLAN VIEW TOP SLAB NOT SHOWN



SECTION A-A

Stormceptor.

STORMCEPTOR DESIGN NOTES

THE STANDARD STC450I CONFIQURATION WITH ROUND, SOLID FRAME AND COVER, AND INLET PIPE IS SHOWN, ALTERNATE CONFIGURATIONS ARE AVALLABLE AND ARE LISTED BELOM, SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION

GRATED INLET WITH INLET PIPE OR PIPES GRATED INLET ONLY (NO INLET PIPE)

CURB INLET WITH INLET PIPE OR PIPES CURB INLET ONLY (NO INLET PIPE)

CONTECH

DIAMETER MATERIAL STRUCTURE ID WATER QUALITY FLOW RATE (cfs [L/s]) PEAK FLOW RATE (cfs [L/s]) RETURN PERIOD OF PEAK FLOW (yrs) OUTLET PIPE NOTES / SPECIAL REQUIREMENT

DATA REQUIREMENTS

SITE SPECIFIC

FRAME AND COVER (MAY VARY) NOT TO SCALE

FRAME AND GRATE (MAY VARY) NOT TO SCALE

- GENERAL NOTES

 1. CORTIECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.

 2. FOR SITE SPECIFIC DRAWNGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED STOUTIONS LICE FREESENATURE. ***AWACHARDES CONTACT TOUR CONTRICTS CONTRACTOR TO THE SHALL BE THACOPODANCE WITH ALL DESIGN DATA AND INFORMATION CONTRINED IN THIS STRUCTURE SHALL BE THAT INFO. ***SPECIAL PRET ANATHOR HAS AND THE ALL SETS AND THE ANATHOR ASSUMED EARTH COVER OF 0**

 3. STORMCEPTOR STRUCTURE SHALL BET ANATHOR HAS DADA RANDER OF THE CONTRIBUTION OF THE CHARTHOR AT OR BELOW, THE OUTLET PIPE INNEST ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL BET ANATHOR MASS AND THE CONTRIBUTION.

 5. STORMCEPTOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM CATA AND AASHTO LOAD FACTOR DESIGN METHOD.

 6. STORMCEPTOR STRUCTURE SHALL BE THE CASTING THE CONFIRM ACTUAL GROUNDWATER ELEVATION.

 5. STORMCEPTOR STRUCTURE SHALL BE THE CAST CONCRETE CONFORMING TO ASTM CATA AND AASHTO LOAD FACTOR DESIGN METHOD.

 6. ALTERNATE UNITS ARE SHOWN IN MALLIMETERS Inm).

- INSTALATION NOTES

 A MY SUBGASEE, BACKELL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE
 SPECIFIED BY ENGINEER OF RECORD.
 B. CONTRACTOR TO ROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMCEPTOR MANHOLE
 STRUCTURE
 C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
 C. CONTRACTOR TO INSTALL, AND GROUT INELT AND OUTLET PIPE(S), MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE
 CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
 E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS
 SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.



9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069 800-338-1122 513-645-7000 513-645-7993 FAX

STORMCEPTOR STANDARD DETAIL STC450i

- 1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
- 2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
- 3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
- 4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
- 5. Total TSS Removal = Sum All Values in Column D

		Cald	Rem on W		neet		•	
Project: Project: Prepared By: Date:	1			The Horizon	6 + 8 19 550 2010 3 11 11 15	BMP ¹	>	Location.
10 12 1 12 1 12 1 1 1 1 1 1 1 1 1 1 1 1	Total T			BOB Wheer	Grant G	TSS Removal Rate ¹	1	Location: Valestation Control Control
	Total TSS Removal =			06.1	1.00	Starting TSS Load*	C	
*Equals remaining load from previous BMP (E) which enters the BMP	808			333	6 6 6	Amount Removed (B*C)		
ı previous BMP (E)	Separate Form Needs to be Completed for Each Outlet or BMP Train			202	8 4 5 C	Remaining Load (C-D)	ш	
							•	

- 1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
- 2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
- 3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
- 4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
- 5. Total TSS Removal = Sum All Values in Column D

		Cald	TSS culati	Remon W		neet			
Project: Prepared By: Date:					CHIO TONNET	Despering	BMP ¹	>	Location:
	Total T					9 6 T	TSS Removal Rate ¹	መ ላ.	Location: Washing 7800 :
	Total TSS Removal =			188		1.00	Starting TSS Load*	C	
*Equals remaining load from previous BMP (E)	8			8	56.84	2500	Amount Removed (B*C)	D	
י previous BMP (E)	Separate Form Needs to be Completed for Each Outlet or BMP Train			20%	Fold, Carl	75%	Remaining Load (C-D)	Ш	
							2	•	





Head #1

Reservoir Type (enter "1" for Combined and "2" for inner reservoir):

Enter water Head Height ("H" in cm):

Enter the Borchole Radius ("a" in cm):
3

Enter the soft texture-structure category (enter one of the bolow numbers): 45,000 for the category (enter soft intertains start) as

4. Most smaciared sody from days through fearns, also materies landfill caps and leters, lassisties or measure rediments, etc.

2. Sods which are facts from tentured (clayer or silty) and
westructured, may abornelade some tone saids.

4 - Control and Maxiely search; may also mistocle storme highly steamspored sich vielb lauge and for numetous cearls, maxielyens, etc. applicable for agricultural seds.

programmed receilings and fine sands. Plancakegory from the programment

Steady State Rate of Water Lovel Change ("R" in om/min): 18,8000

Kyy 3 1,32E-02 cm/sec ###### cm/mm 3,32E-04 m/sec 7,84E-01 mm/min 1,31E-02 mm/min € ≈ 0.80315 ♀ ≈ 11,0356

Resutt Input

Support: as@sormoisture com

Head #2

Reservoir Type (enter "1" for Combined and "2" for inner reservoir);
Enter water Head Height ("H" in cm);
Enter the Borehole Radkas ("a" in cm);

inter the soll texture-structure category (enter one of the below numbers):

obstructive dependants and lone sands. The calogory most frequently spike able to agreeding a sele. Most attractive on the transfer through bases, also includes. Compacted, Structure less, charge outpendentals soth as landful case, and livers, Jacobino or matrix preference, etc. state which are both free textured Mayor or soly) and

Steady State Rate of Water Level Change ("R" in emirrin): 23,0006 Lourse and gravely sandly may aboundable some highly shoumed salls with large and/or pomerosy tracks, macroports, etc.

K₁₂ = 2.07£.02 cm/en ###### cm/mi 2.07£.04 m/es 4.89£.01 mc//m 8.15£.03 mc//m C. 8,76E.02 (m/ G. 0.36 C = 1,28754 Q = 13,501

Calculaton kinnias ritand to rachad and worked unklods. When h is really riter tast of fall of water in restrict (cm.), h_{i,i} is visit annual dy annual condensity (cm.), t₀ ... a beli mante flux powerful (cm.), t₀ ... it Materistopis capitary longly parameter (four Table 2), a i Bonchett sader (cm.), h_i is the fifth back of water emblished in bornhair (cm.), h_i is the stream hands of water realished its convolutions and its Nayr factor (from T inc.).

One Head, Cemblined Reservoir	Q, e. A, x 35,22	$h_{f,\delta} \approx \frac{C \times G_1}{3\pi H_1^2 + \pi a^2 C_1 + 2\pi \left(\frac{H_2}{a}\right)}$
Ove Hend, Inner Reserveir	Q. w A, x 2.16	$\phi_{rr} = (2\pi H_1^2 + 3\pi^2 - C_1^2)\alpha^2 + 2\pi H_1$
		$G_{i} = \frac{H_{i}G_{i}}{\pi(3H_{i}H_{i}(H_{i}+H_{i})+\pi^{2}(H_{i}G_{i}-H_{i}G_{i}))}$
Two Head,	Q1 . A1 × 35.22	6; $a_i(2n_i R_i(R_i - R_i) + a^2(R_i C_i - R_i C_i))$
	Q: = R; × 35 23	$S_{f,g} = G_2 Q_2 = G_1 Q_1$
		$G_1 = 2\pi (3H_1H_1(H_2 - H_1) + a^2(H_1G_2 - H_2G_1))$
Two Head, Junet Reservoir	Q = F1 × 2.16	$G_{s} = \frac{(2H_{1}^{2} + a^{2}C_{1})C_{2}}{2\pi(2H_{1}H_{1}^{2})B_{1} - H_{1}) + a^{2}(H_{1}C_{1} - H_{2}C_{1})}$
	gradie de la compa	\$ 10 10 10 10 10 10 10 10 10 10 10 10 10

Action to make stated a sign has of Chen Ke set from an institute of the considerate to design (Challes). Capalased is the observed water to see any of the considerate the considerate to be selected when the considerate th
on, a bostole best cause o s normany opair rapid strat had a section section in the section reconstruct of sec Facor sectional article on the calculated while for the branchest C, and C, are obsulted (singers), 1995. Intelligent the section of C and the calculated while for the branchest C, and C, are obsulted (singers), 1995.

9.22E.02 (m) nm

A Company of the Comp		Sound a state of	
Comparted, Stutime-less, clayey or silty materials such an it hadfill cope and lineri. Jacurities of marine additionants of	0.01	$C_1 = \begin{pmatrix} H_1/a \\ C_1 \text{ 102} + 0.1130 \begin{pmatrix} H_1/a \\ H_2/a \end{pmatrix} \end{pmatrix}$ (41)	One Head, Combined Rere
		$(2.102 + 0.118(H_{i}/q))$	One Hend. Inner Reserv
Solt which are both far textured (chayey or ality) and unstructured; nay also include some fine sands.	0.04	$C_1 = \begin{pmatrix} H_1/\alpha \\ 1.992 + 0.091(H_1/\alpha) \\ H_2/\alpha \\ 1.992 + 0.091(H_2/\alpha) \end{pmatrix}_{a \in \Omega}$	Two Head.
Most structured soils from clays through learns; also includes unstructured medium and fare scates. The reageny most frequently applicable for agricultural soils.	0.52	$\xi_1 \approx \left(\frac{H_1 \ell_0}{2.034 + 0.093 (H_1 \ell_0)}\right)^{1/4}$ $\xi_2 \approx \left(\frac{H_2 \ell_0}{2.034 + 0.093 (H_2 \ell_0)}\right)^{0.54}$	AAA TA
Contraind growly sands may also instude some highly emperient data with large and/or inspectors cracks, macro pores, etc.	0.46	$C_1 = \frac{B_1 g}{\sqrt{2.075 + 0.093/R_1 g_2}} = C_2 = \frac{B_2 g}{\sqrt{2.075 + 0.093/R_1 g_2}} = C_2 = \frac{B_2 g}{\sqrt{2.075 + 0.093/R_1 g_2}} = C_2 = \frac{B_2 g}{\sqrt{2.075 + 0.093/R_1 g_2}}$	Two Head. Juner Reserve

Two Head Method

Average

deserroir Type (enter "1" for Combined and "2" for Inner reservold):	Enter the tiff water head neight ("H2" in cin); o
--	---

cture category (enter one of the below numbers): ed, Mortos (605, 60pe) of silly maleonily such as not learns, becambers of maron bedaments, sto

Enter the Borehole Radius ("a" in cm): 3

recines and factorial of the Lategory might frequently agreement modes. in hand sook from cays through loams; also includes ich are kults dem Fraktrout (dammy zu züm) krad. 3. may also tielistie sysme fine sands

ils south langer and/or numerous teache, miscropeus, etc of gravely sands, may also include some logish-

ste Rate of Water Level Change ("Rt" in cm/min): 16,8000

ate Raie of Water Level Change ("R2" in cm/min); 23,0000. 1.85 $\langle \cdot \rangle_{\rm c} = 0.8768$ 0.80316 C: 1,28754 6, = 0.00498 G; :: 0.00397 G₃ ≈ 0.05589 Qz = 0.528

No. in management convince substitutes convince management invocation substitute includes management includes Cn. 4,776.02 (/m//ma)

G. = 0.02416

Guelph Permeameter Data Sheet

Investigator:		ate: 6/1/2/
Location: Wash, St. fr	<u>ouk@</u> n Test Id:	er go ball
Depth of hole: 60' Rad	ius: <u> </u>	andard calcs assume 3 cm radius)
Reservoirs used during test (chec		
Reservoir constant used: 💆 💆		

Water level in well = 5 cm						
Time t (min)	D <i>t</i> (min)	Water level in reservoir h (cm)	D <i>h</i> (cm)	Rate of change Dh/ Dt		
0		20				
::/3	0.22	25	5	25.1		
123	0,23	30	5	21.4		
142	0,25		rem From	30.0		
156	0-23	40	S	21.4		
1:11	0,25	A ST	garet No. 2 No. 2	20.0		
1725	0,23	50	5	21,4		
1:41	<i>5</i> .2) _		i series	18.8		
1:55	p.23	60	2.00 10.00 10.00	21.4		
2:17	0,27	6,5	1	18.8		
2:28	0.28	20	Nove They	17,6		
2,41	0.22	75	\$100 \$100 \$100 \$100 \$100 \$100 \$100 \$100	23, [
Carrie I				10 0		

Time t (min)	D∉ (min)	Water level in reservoi r	D <i>h</i> (cm)	Rate of change Dh/ Dt
0		Section 1999		
1/12	073	30	Grand Grand	75,0
125	0.22	35	43	23,1
133	0.72	40		23,/
1 team of	0.22	45		83,7
1154	0,22	50	der-	23,/
1:17	0.22	55	Les Les	23,7
11.31	0,23	60	5	21,4
1544	0.72	63	5	2.3, /
1158	023	70	5	21,4
202	0,23	75	5	21.4

Water level in well = 10 cm

Steady rate for 3 consecutive readings (R_1) : 18.8

Steady rate for 3 consecutive readings (R_2) :

25,0

Comments:

Ko = 0.639 /1/mil = 38.22 1/1/9-

GP FIELD DATA SHEET	_ /	SECTION 1: SITE INFORMATION
Date <u>Shrizi</u> Investigator		
Site Location	<u> </u>	auclin
Dominant Soil Type(s)	harte Dony 1	more way to make a toler
Site Map:	Soil Prof	ile Description (horizon depth, structure, color, etc.):
Andrew Control	Depth	Description
	6" - 6 23" - C	Sandy Joan - 10483/2 Sandy Joan - 3,548.5/4 Medium Sand - 2,544/3
Presence of special soil induration, compacted lay Comments and Notes (topog	ers, etc.):	vegetation, etc.):



Head #1

Reservoir Type (enter "1" for Combined and "2" for inner reservoir):

Enter water Head Height ("H" in cm):

Enter water Head Height ("H" in cm):

Enter the Borehole Radius ("a" in cm):

3

Ener the soft texture-structure category (enter one of the below numbers):

1. (ampaters), structure one bits, shaper at slip materials such as landfill, cap, and livers, haust these or matery stid ments, etc.

Rock which are both four textured friting or cites and unstructional, may also include some four sands.

 Meet some towards with from days through fearing, also includes.

d. Goarse and gravily sands; may also meluto some bigliby structured solo with lenge and for marsonus cracks, mastopers, etc. ussytuetined medium mel fine sands. The category enert treuwently applicable for applicable decides.

Steady State Rate of Water Level Change ("R" in cm/min): 24,1000

No. 4.26E.02 cm/sec. Withdraw covins 4.25E.04 m/sec. EMMERM Inchros . nr. 9220 € % 0.80315 ⊖ % 14.1467

Result Input

Enter the soil texture-structure category (enter one of the below numbers); Reservoir Type (enter "1" for Combined and "2" for Inner reservoir); Enter water Head Helght ("1" in em); Enter the Borehole Radus ("a" in em);

 Most atracture's soly tryin chays throughs having, also includes universalist mediam and fine saids. The collegisty most frequently. Course and gravely pands; may also metalic some logidy structured saks with large and for numerous reacks, smetchors, etc. Europated, Stratture-Insh. dayoy or otty materials such as fandtôl (aps and brevs. Acostúlie or maisle sedements, 195.). 2. Sods which are bots top transfed (clapey or selfy) ond institutioned, may abounded aume fine saids, applicable for agree official sofe.

Steady State Rate of Water Level Change ("R" in cm/min):

Kr. 27 я а Э

One Head, Combined Reservoir	Q, w. R, x 35.22	$K_{f,\nu} = \frac{c_f \times c_f}{2\pi B_f^2 + \pi a^2 C_f + 2\pi \left(\frac{B_f}{a^2}\right)}$
One Head, Inner Roservoit	Q1 = R1 × 2.16	of me Control of the Control of the High
		$G_1 = \pi(2H_1H_2(H_2 - H_1) + a^2(H_1G_2 - H_2G_3))$
Two Read,	Q, v. R, x 35.22	$G_1 = \frac{H_1 C_1}{\pi (2 H_1 H_2 (H_1 - H_1) + \alpha^2 (H_1 C_2 - H_2 C_1))}$
Company Manager	Q: 10 A; x 35.27	$N_{f_d} = G_f Q_f = G_f Q_f$
		$G_1 = 2\pi \left(2M_1 H_2 (W_1 + G^2 C_2) C_3 \right)$
Two Head,	Q = B, × 2.16	$G_* = \frac{(2M_*^2 + a^2C_3)C_2}{2\pi(2M_*^2(M_* - M_*) + a^2(M_* C_* - H_* C_3))}$
laner Reservoir	Q. m. F. x 2.16	

Kye m 3,84E-02 cm/sec 2,18E-00 cm/min 3,64E-04 m/s 6,00E-01 morbhin 1,43E-02 mc/vsec	Co., co. 101E.01 (col/col/col)	4				÷ = = = = = = = = = = = = = = = = = = =	7.0
-2.		933	_ ::::::::::::::::::::::::::::::::::::	1,28754	3.03E-02 cm/sec ####### cm/min 3.03E-04 m/ses	7.16E-01 inchmin 1.19E-02 inch/sec	8,41E-02(ns/mm)

1,18E-01 (10/33)

Soll Texture-Structure Category	(ca), u	Shape Factor	
Comparted Structure-bes. clayer or slity materials such actional to the section of material sections and instr. Incusting or mating sections are to a	0.91	$\xi_1 = \left(\frac{H_1/a}{2.162 + 0.118(H_2/a)}\right)^{(15)}$	One Hea Combined Re
		(2.102 + 0.118(H2/a))	One Hea
Solft which are both fare texturyd (clayey or siby) and unstructured; may also include some fine fauld).	9.04	$C_1 = \left(\frac{H_{1/3}}{1.992 + 0.091(H_{1/3})}\right)^{3.932}$ $C_2 = \left(\frac{H_{1/3}}{1.992 + 0.091(H_{1/3})}\right)^{3.933}$	Two Hea
Mon structure soils from clays through loams; also includes unsurcented meritians and fine ands. The contenty mapping the partenium of the content of the co	0.12	$C_{1} = \left(\frac{H_{1}/g}{2.074 + 0.093(H/g)}\right)^{2.134}$	
spils.		C_{2} to $(2.074 \pm 0.093(^{13})_{a})$	
Course and gasely smilt; may also include some highly interental tools with large sasker manerous eracket mater povers, etc.	0.38	$C_1 = \begin{pmatrix} H_1 \\ 2.07 + 0.093(H_1/a) \\ H_2 \\ G_3 = \begin{pmatrix} 2.07 + 0.093(H_2/a) \\ 187 $	lane Rese
necessor		THE TOTAL PROPERTY.	

Two Head Method

Average

Support sligsasmoisture.com

Head #2

Enter the Borehole Radius ("a" in cm): 3

 Most structured solk from Cass through Gumsy ako sickades sostructured medium and fine sands. The catagory from thepierity. Sandibleaps and brees, broadmeen manner cobresents, etc. 2. Spits which are bath fine tentianed telapop or salph and инистидитей, таку едестибаци котон бие кылды.

stractured sols whichings and/or transmissis tracks, macropors, 4. Coarse and ground sands, may discindade some lights applicable for agreealistical year.

Steady State Rato of Water Level Change ("Rt" in cm/min); 24,1900

1.65 Q. = 0.8676 Steady State Rate of Water Level Change ("R2" in on/min): 33,8000 0.80315 C. 1.28764 6 = 0.00496 62 = 0.00397 6, 0.05569 Q: = 1,2096

K₂ = 8.08E-04 cm/sec 3.03E-02 cm/m 5.08E-06 m/sec 1.19E-02 inch/m 1.98E-04 inch/sec C. - 1.91E.Q2 (m/hp:) $G_{\Delta} = 0.02416$

Guelph Permeameter Data Sheet

Investigator: 140/186	Date: 6/11/2/
Location: 1200 a. 19 French	GMTest Id: PT- 4
Depth of hole: 54" Radius: 3	(standard calcs assume 3 cm radius)
Reservoirs used during test (check one): (Combined: Inner only:
Reservoir constant used: 35 22	

Water level in well = 5 cm						
Time t (min)	Dt (min)	Water level in reservoir h (cm)	D <i>h</i> (cm)	Rate of change Dh/ Dt		
2		# O				
11/	0./8	25	ia granovi Novali Spacetion	27,3		
:22	013	30	Common Common Common	29,3		
133	0.18	35	\$	27.3		
145	0,7	40	ang. Cara-	25,0		
:56	0/8	45	Albert Constitution	22,3		
1109	0,22	50	Com.	23,/		
	o. එම	65	A STATE OF THE STA	25,0		
1/33	0,2	60	gradustis National p National part	25.0		
1146	0.22	65	Marine Second	25,/		
1553	0.2	70	5	25,0		
2/11	C + 72	7.5	5	200		
o		. *	/D.).	201		

	Water	level in w	vell = 10 cm	1
Time t (min)	Dt (min)	Water level in reservoi r	D <i>h</i> (cm)	Rate of change Dh/ Dt
0		70		
:10	017	100	10	60,0
.426	0,27	40	10	37, S
154	0,43	45	Section 1	39.5
143	015	52	glissoni i Maggi Dalini	33, 3
151	0.13	55	\$	39,s
1:00	0.15	60	form.	33.3
1.10	0.17		5	30.0
1:13	0,/3	save	group Comme	37,5
1189		af G	agen Silver Silver	753
				· · · · · · · · · · · · · · · · · · ·

Steady rate for 3 consecutive readings (R_1) :

Steady rate for 3 consecutive readings (R_2) :

33. G

Comments:

Kf = 0.86 M/Min = 51.6 iu/q.

GP FIELD DATA SHEET		SECTION 1: SITE INFORMATION
Date 6/1/2/ Investigator	<u>. 0402/82</u> 6	
Site Location	English Fry	auten
Site Location	motophy b	the roll College St.
Site Map:	Soil Prof	ile Description (horizon depth, structure, color, etc.):
PT-4	Depth	Description
	12/ B 35/1 - C	Sandy band 1048 3/2 Sandy band - 7,548 5/4 Sandy band - 25844/3
Presence of special soil of induration, compacted layout the second special special soil of induration special special soil of induration special spec	ers, etc.):	vegetation, etc.):



| | Input | | | Result

Head #2	

Head #1

Reservoir Type (enter "1" for Combined and "2" for inner reservoir); 1

Enter water Head Hoight ("H" in cm); 6

Enter the Borotofe Radius ("a" in cm); 3

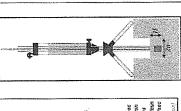
Enter bo soil excluse-attructure category fenter one of the below numbers!: [8] Compared, Structure less, charps or olds materials such as bothlickness and enter our numbers of the rest. [7] Veila, which are bothly there returned followers with and workfurturely may also enclude come fores saids.

inostructural medium and for saids. The calogory nest frequently applicable solving applicable to applications of applications and compared and applications and compared as medium or and applications and applications and applications are applications and applications and applications are applications are applications and applications are applications are applications and applications are applications are applications are applications and applications are applications are applications are applications and applications are applications and applications are applications are applications are applications and applications are applications are applications are applications are applications and applications are applications are applications are applications. 3. Stast structured same from claps through basins, alw sustables

Steady State Rate of Water Level Change ("R" in cm/min): 27,3900

Ky v 4.02E-02 crysso MMMMM crynni 4.02E-04 m/soc MMMMM inch/min 1.90E-02 inch/soc 11. 0.36 Link Ç ≈ 0.80315 Ç ≈ 16.0261

4... 7,566.02(m)/mail Support al@solmorahire.com C = 1,287 Q = 17.6 K,, = 2.70E 2.70E 6.38E 1,06E Steady State Rate of Water Level Change ("R" in cm/min): 30.0 r the soil texture-structure category (enter one of the below numbers): st. sparen verkgrannely sunds, may also modade some frigisky. Sostrustneed spiks with lange and for numerous states, mercoperes, etc. Most vrenzurg sons from clays the cargot barres, at the ire factors.
 Increasing the drawn and fare saids. The cargotiff restrict the greently. Reservoir Type (enter "1" for Combined and "2" for knet reservoir);
Enter water Hoad Hoght ("H" in cm);
Enter the Boretvole Radius ("a" in cm); Compared, Structure less, dayer or sity realerade socials. lymfill cass and favors, lacustring or marine systements, etc. 2 — kois exterts are both from textured gislaver or safety and mystructured, mysplace reflects some free sands. applicable for applicultural rads



Caralises fermás fittad de carábad aná wechad aná wechada probat. Vizer is istadyctus que of fils of waier is deservoir (enro, x_p, is see parmed y sycaute coalassy) (ent.), d. e. 286 annie de na potentia (cal·); s. u Matericeps copiliary logit paramete (figu. 1848, j. s. id Denhade radius (m. k). H. in fost back of waier entablished in borboir (aus). As if the second broad kere entablished in potentie (cal·) and fo. Super favor (figu. 734 z.).

Reservoir 1	Enter the soil text	And the state of t	<i>8</i> 0 80	
K, = 378E.D2 carsee 2.28E406 carbon 3.78E.94 mb 8.88E-01 fockfroi f.48E-02 fockfroi 6.64E-02 fockfroi			5 /	
		00000	266 161	E-02 cm/ssc #### cm/min E-04 m/ses E-01 inch/min E-02 mch/ssc

Condoine formats rabust for days from C. Where M. the west producing, any Myor the normal near traditions on a 1981, a backed to that a missionely replace high there has a benefit workely to the not transectorate entropic Forms a backed to that his traditionely when for non-standards C, and C, or calculate T for print 1970.

Soll frature Snucture Category o' (cur')

1,34E-01 (07:00)

· 0 6	8 8		જ ઇ		
One Head, Combined Reservoir One Head	Two Head, Combined Reservoir		Two Head, Inner Reservoir		
$\mathcal{E}_{1} = \left(\frac{H_{1}'_{0}}{2.102 + 0.110^{(H_{2}'_{0})_{2}}}\right)^{(44)}$ $\mathcal{E}_{2} = \left(\frac{H_{1}'_{0}}{2.102 + 0.110^{(H_{2}'_{0})_{2}}}\right)^{(44)}$	$C_1 \approx \left(\frac{H_1/L_0}{1.992 + 0.091 (^{H_1/L_0})}\right)^{0.000}$ $C_2 \approx \left(\frac{H_2/L_0}{1.992 + 0.091 (^{H_1/L_0})}\right)$	$C_1 = \left(\frac{H_1}{2.074 + 0.093(H_1/a)}\right)^{0.23}$ $C_2 = \left(\frac{H_2}{2.074 + 0.093(H_1/a)}\right)^{0.234}$	$C_1 = \begin{pmatrix} 2.074 + 0.0933^{(1)}/A_1 \end{pmatrix}$ $C_2 = \begin{pmatrix} H_1 & & & & & \\ 2.074 + 0.0933^{(1)}/A_2 \end{pmatrix}$ $H_{1,1} & & & & & & & & \\ & & & & & & & & \\ & & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & \\ & & & & \\ & & \\ & & & \\ & & & \\ & & \\ & & & \\ & & \\ & & & \\ & & \\ & & \\ & & \\ & & & \\ & \\ & & \\ & \\ & \\ & & \\ & & \\ & \\ & & \\ & \\ & \\ & \\ & $	C2 av (2574 + 0.093 (1°3/4))	
10'0	9,01		97.0		
Compared, Streetwesters, clayey or ship materials such sea bandful capt and liters, herstiffer or market soldments, etc. Salla valida net both fine restured (clayey or elity) and unstructured, may also fine lessured (clayey or elity) and unstructured, may also fine lessure fine seals.		Most structured solis from clays theorgal bouns, also includes unstructured medium and fine stade. The contessys most frequently applicable for agricultural	vate. Coure and pavely rands; may also include some highly smenured soils with large and or nonenus cackly.	Coaste and gravely trade; may also include some highly nutritude tells with large and/or numerous, cracks, macro pears, etc.	

Two Head Method

Average

Reservoir Type (enter "1" for Combined and "2" for limer reservoid); if Enter the first water Head Height ("H1" in cm); if Enter the second water Head Height ("H2" in cm); if)

Enter the Borehole Radius ("a" in cm): 3

imegrinitured; nisy also ilitidae salare fine sands. J. Mosc gruntinest sals from clays through barns; also includes portrational insolation and the sands. The category most triminents are distributed seeds in section of seeds.

, de 0,36 155 Course and gravely surds may also include some highly extred sole with large and for nonerous stacks, macropols, etc

40.000	Steady state hate of variet level consists ($\Delta_{\rm c} \approx 0.00$
Stordy State Halp of Proces Level Lines of the Halp of the State Halp State St	() = ()
	<u> </u>
1300	
io me	15 SEC.
e de de	y suite y
Steam of	26830

	1			
0,05569	G3 E		ij	
			1 1 1 1	
0.00397	2 20	a k	11.	
0.00496	3 = 5			
. 1.28754	Ŝ,	-	100	
0.50315	น้ำ			
1.08	Ø₂ ≈			

N ₁₁ or ###################################	2.87E-02 (market)
# J.V.	3 5

Guelph Permeameter Data Sheet

Investigator: GLQ/RRG	Date: 6/16/8/
Location: Wasa. St Frau	1)cery Test Id: PT-5
Depth of hole: 48" Radius:	(standard calcs assume 3 cm radius)
Reservoirs used during test (check on	e): Combined: // Inner only:
Reservoir constant used: 35.2	The second secon

	Water le	evel in we	ll = 5 cn	1	
Time t (min)	D <i>t</i> (min)	Water level in reservoir h (cm)	D <i>h</i> (cm)	Rate of change Dh/ Dt	
O		20			
:08	0.13	25	Johnson, Stanton	37.5	
112	0.07	30	gander Gander Gander Gander	75,0	
123	0/8	35	Towns	29,3	
	0.17	40	5	30,0	
145	0.20	45	Samuel Services	25.0	
154	0.15	570	garagean P Section 1974 Assessment	35.3	
1,04	0.10	Carlo June	the second	30,0	
1117	0.82	60	Cons.	23.7	
1,28	0.18	65	5	27.3	70
1:39	0.18	70	Marine Marine Marine Marine	27,8	
1/53	0/23	75	Mental Control	21.4	
Steady ra	ite for 3 cons	ecutive reading	ngs (R 1):	233	

Water	level in w	ell = 10 cm	
D <i>t</i> (min)	Water level in reservoi r	D <i>h</i> (cm)	Rate of change Dh/ Dt
	20		
0.08	Z S	gritarion Capaci Capaci	60.0
0.1	30	girl Maring Turner	50,0
0.15	35	anticosi ^k Remoci _{lista} Custosi stal ^k	23,2
0,17	40	gargarish Gertaman Marian	3 0.0
0/17	45	Marian Marian Marian	W.e
0119	50	land .	30,0
017	55	Leave Encounter Encounter	10,0
0:17	60		30,0
0,12	65	and the second	R P
0.17	20	Estate Estate No. 12 and Estate	
0,17	75	Approximents According to the According to the second to t	30,0
	Dt (min) 0.08 0.15 0.17 0.17 0.17 0.17 0.17 0.17	Dt (min) Water level in reservoi r h (cm) 20	Dt level in reservoid reservoid reservoid (cm) Dh h (cm) cm) Long S Long Long Long Long Long Long Long Long Long Long Long Lo

30.0

Comments:

Kg = 0.888 in/min = 53, 3 in/a-

Steady rate for 3 consecutive readings (R_2) :

P FIELD DATA			SECTION 1: SITE INFORMATION
ate <u>6/11/2/</u>	_Investigator	<u> </u>	1.4
ite Location		175.1 FY	auther "
ominant Soil	Type(s)	unbany 1	orrang Copasti
ite Map:		Soil Prof	ile Description (horizon depth, structure, color, etc.):
for the same of th	generative the second of the s	Depth	Description
		A B	5,6,-10 48 3/3 5,6,-3,5 4/6 4/4 Soudd Gard 2544/4
induration,	compacted lay	ers, etc.):	nottling, water table depth, hardparent



solmostuke Guelph Permeameter Calculations

Input

Result

Support al@solanoisture.com

Reservoir Type (enter "1" for Combined and "2" for inner reservoir): 1

Enter water Head Height ("H" in cm): 5

Enter the Borehole Radius ("a" in cm): 3

ir the soli toxture-structure category (enter one of the below numbers):

- tandfill caps and liners, tacustrike or marine sediments, inc.

 2. Solly which are both fine textured (clayer or sity) and structured; may also riskide some fine sands.
- Most structured softs from days through learner siso includes unstructured medium and fine sands. The category most frequently
- applicable for agrecultural soils.
- 4 Coarse and gravely sands, may also righter some ligitly structured sods with large and for numerous cracks, macronors, etc.

Steady State Rate of Water Level Change ("R" in an/min): 4.4550

### #### ############################	(us) stu)	Φ 2.18E-02 (m) mu)	÷ 1		
%	594/200	3,092,03			2.4
# 40 T a	inch/min	1.986-01		A- 1- 1- 1- 1- 1- 1- 1- 1- 1- 1- 1- 1- 1-	5.
χ. φτ υ ο ο ο ο ο ο ο ο ο ο ο ο ο ο ο ο ο ο ο	205,44	7,86E-95			
₹; ↓ ↓ ↓	caryania	4.71E-01			
	CTIVSEC	7.85E-03	- Page 19	\$4	2
					0.75
		2.61216	€ 6		É
		0,50315	9 10 10		
	103.5	0.36	22	ă en	
50 Apr. 157	3		• **	2	
					67 140

Head #2

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):

Enter water Head Haight ("H" in cm):

Enter the Borehole Radius ("a" in cm): -8-

> 75 11 Average

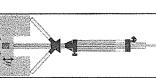
8.31E-03 cnylsec 3.79E-01 cm/min 8.31E-05 m/s 1.48E-01 inch/min 2.49E-03 inch/mer

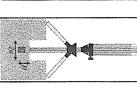
Enfor the soll texture-structure category (enter one of the below numbers):

- Compacted, Structure less, clavery or sally materials such as faredtall care and liners, bioloxiline or mailine sediments, esc.
- Sails which are both tips textured (dayey or sity) and unstructured, may also technide speek file saints.
- Most structured seds have slays through truens, afterinefada.
- applicable for agricultural sods unstructures endous and fine varies. The category most features by
- Course and gravely sands, may also include searce highly structured spile sents larger and/or purpersus cracks, experipries, etc.

Steady State Rate of Water Level Chango ("R" in on/min): 6,3000







Calculation formulas character of experience and revoked analysis. Where B is residently expected Machiner in reservi-cience, b_i, it is an analysis of partial conservation to the partial control of the p

Co-dama (insula rabid to dape timo (*). Yang 15, a te fan sam erat lagif mij. Ha a lie medi sain med begi mij. a batada oma (insulad 7 a monosopy orgân bagid Amerikah a doald rondag vi the sel tittanatetine entyst; Fernica batada omelikanski Fareka ber edishafak shib faren samandasik, a da Car e-reviakol (Zong et a), 1995,

Compacted, Structure-less, clayey or sitty materials such as landfull cops and liners, lacustime or maribe ardiments, etc.

3.01

 $\begin{array}{c} \text{Shape Factor} \\ G_1 \text{ to } \left(\frac{H_{1/a}}{2.162 + 0.110 (H_{1/a})} \right)^{4/3} \\ G_2 \text{ to } \left(\frac{H_{1/a}}{2.162 + 0.110 (H_{1/a})} \right)^{4/3} \end{array}$

5382 2482

	The second secon	N: 5.20 ///
Oue Head, Combined Rezervoir	$Q_1 \approx R_1 \times 16.22$	2+4(+ 10+C + 21 (21)
One Head, Inner Reservoir	Q1 a K3 × 2.86	De .: " (2711; + na C1) o + 2111,
		$a_1 = a_2 + a_3 + a_4 + a_5 $
Two Head	Q1 = K1 × 35.22	$\theta_1 = \frac{\mu_1 C_1}{\pi (2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$
Combined Reservoir	Q = R = 35.20	$E_{f_f} \approx G_{\tau}Q_{\tau} \sim G_{\tau}Q_{\tau}$
- TATAL BORGORANON CONTRACTOR OF THE CONTRACTOR	and and advantage of the later	$G_3 \approx \frac{(2H_1^2 H_2^2 H_3^2 + a^2 C_3)C_3}{2\pi (2H_1^2 H_3^2 H_3^2 + H_3^2 H_3^2 C_3^2 + a^2 C_3^2)}$
Two Head	Q1 = K1 × 2.16	$G_{1} = \frac{(2H_{1}^{2} + x^{2}C_{1})C_{1}}{2\pi(2H_{1}H_{1}^{2})H_{1}^{2} - H_{1}^{2} + x^{2}(H_{1}C_{1}^{2} - H_{2}C_{1}^{2})}$
	St. 20 15 10 CT.	φ × 6,0, · · 6,0.

Conseased gravely sands; sacy also include some highly structured soils with large and/or numerous cracks, macro pores, etc.

0.36

C; 10 (1074 + 0.093 (12/4)) C1 = (2.07: +0.093(A(/D) Most structured soils from clays through leasure, also includer matinerared medium and fise woods. The cut-gory mest frequently applicable for agricultural soils.

0.12

 $\frac{c_{1} = \left(\frac{H_{1/d}}{2.074 + 0.093(H_{1/d})}\right)^{C_{1}}}{\frac{H_{1/d}}{2.074 + 0.093(H_{1/d})}}$ $c_{2} = \left(\frac{H_{1/d}}{2.074 + 0.093(H_{1/d})}\right)^{C_{2}}$

Soils which are both five textured (clayey or rily) and unstructured; may also include some fire rands.

0.01

 $C_{2} = \left(\frac{H_{1/a}}{1.992 + 0.091(H_{1/a})} \right)^{1/a}$ $C_{2} = \left(\frac{H_{2/a}}{1.992 + 0.091(H_{1/a})} \right)^{1/a}$

I'wo Head Method

Reservoir Type (enter "1" for Combined and "2" for inner reservoir): Enter the first water Head Height ("H1" in cm): Enter the second water Head Height ("H2" in cm): Enter the Borehole Radius ("a" in cm):

of texture-structure category (enter one of the below numbers);

Ф. 1.75E-02 (10/212)

- landfel caps and liners, lacustrine or maine sectiments, etc. Compacted, Structure-less, charge or sity materials such as
- structured, may also include above fine sands Solls which are both fore testined fileger or sity) and
- 3. Most structured sads from clays through knains; sive includes unstructured mediam and too sands. The category most finquents
- eruntund solls wathlege acidén numerous marks, macropors, etc usplicatide for agricultural sods.
- Course and gravely sands; may also extende where highly

Steady State Rate of Water Level Change ("R1" in cin/min): 4,4500 " - 0.36 CAL

Steady State Rate of Water Level Change ("R2" in cm/min): [8,3996] 195 $Q_1 = -0.1602$

 $G_2 = 0.00397$ 6; = 0.00496 ्रः 1,28754 S 0,80315 0.1908

4.31E-03

 $G_{j} = 0.05569$ G, = 0.02415

HERMERA CITTED SARAMENT CITTED

Guelph Permeameter Data Sheet

Investigator:	-HQ/RF	36	*************		Date: <u>6/16/21</u>
Location: 1222	shist.	- Flores	<u>EG</u> 'h	Test Id:	Profession Contraction
Depth of hole:_	401	Radius:	energy Sept. Les	(4	(standard calcs assume 3 cm radius)
Reservoirs used	during test (check one)): Com	bined:	Inner only:
Reservoir const	ant used:	55, 2	Schools .		

	Water I	evel in we	ell = 5 cn	n
Time t (min)	D <i>t</i> (min)	Water level in reservoir h (cm)	D <i>h</i> (cm)	Rate of change Dh/ Dt
Ø		Em Cog		
/39	0.65	ZS	CESS	9. 3
1:35	0,93	30	Marketon Ma	5/4
z/34	0,33	35	gestropis Greensen Stanton	5,1
3;40	1.10	40	gorst Registra etimossi	4,5
4:42	40.3	45	Albania Arragan Arragan	4.8
5748	1,/0	SD	Carrier Carrier Carrier	4,5
9,00	0511		tant named	4.72
8:08	1/13	60	horiza horizad hazarid	44
9:18	1.17	65	Est. Lancas	
10134	1.20	70	5	3,9
11:40	1, 23			4,1
Steady rai	te for 3 conse	ecutive readin	igs (R ₁):	4.45

	Water	level in w	vell = 10 cm	l
Time t (min)	D <i>t</i> (min)	Water level in reservoi r	D <i>h</i> (cm)	Rate of change Dh/ Dt
0		17		
d the state of the	0.55	20	23	5,5
1/28	0,92	2 5	Grania Grania Security	E. S.
2:25	0,95	30	Land Carried Carried	5,3
3/1/23	0.85	3.5	45	5,7
4:16	091	40	Los	E. E.
5,12	0,93	45	Lower Lower Land	5,4
6106	0.93	50	post Militar School	5,4
7.02	0.93	43		5,4
8:00	2.93	60	Entitle Landes	5.2
8/58	0,97	6 5	gastrin Les _{extens} Les _{extens}	5,6
9,55	0,95	70	ES.	
10151	9,93	Final States	Estato Kuralist	for his
ranion de la constante de la c				

Steady rate for 3 consecutive readings (R_2) :

Comments:

Kg = 0. 149 in Luin = 8.94 in/Am

GP FIELD DATA SHEET	_ 1	SECTION 1: SITE INFORMATION
Date <u>Chrisi</u> Investigat	or <u>048/86</u>	:
Site Location	h mid Fr	auklin
Site Location	Willes Bon L	mercial Established
Site Map:	Soil Prof	ile Description (horizon depth, structure, color, etc.):
PT-6	Depth	Description
	B' - B	5.1-104R 3/3 51-7,84R 4/4
	961	5aw + Gard 2574/4
Presence of special soi induration, compacted I	l conditions (mo	ottling, water table depth, hardpan
Comments and Notes (top	ography, slope,	vegetation, etc.):
	A 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	



Head #1

Reservoir Type (enter "1" for Combined and "2" for inver reservoid); 1 Enter water Head Height ("H" in om); 5 Enter the Borehole Radus ("a" in om); 3 Enter the soil

Reservoir Type (enter "1" for Combined and "2" for inner reservoit):

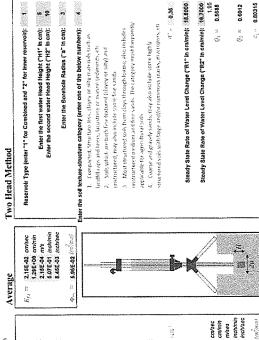
Support, eligiscimosture,com

Result Input

Enter the Borehole Radius ("a" in cm); 3

Enter the first water Head Height ("H1" in cm): 5 Enter the second water Head Height ("H2" in cm); 10

Mer one of the bi layer or self-math or marking self-math one fell-agent or si myst through dear ords. The celegion Reservoir Type (anter "1" for Combined and "2" for I Enter water Head Hot Enter the Borehole Rac aks indude s umerous graz evel Change Head #2



1. Comparion, Structure New, Livys or silv materials such an intelliging an intelliging and intelliging and intelliging and intelliging and intelliging and intelliging an administration of motive control for such a most returned mode or some fine such a most returned mode or some fine such as most returned modern and roles and yet to only be analyses most foregone. In considerate most comparing the species of the control for such sides and the return to the control for such as a fine such as a fine such as a return and only side but and or numerous starks, my controls, etc.

Steady State Rate of Water Level Change ("R1" in cm/min): 16.3000

Steady State Rate of Water Level Change ("R2" in cmimin): 146,7000 1.90 Q; 0.5088

0.6012

a E

C. 0.80315 C. 1,28754 $G_1 = -0.00496$

is there is one deed set two shed methods. Where θ is issurprised for of fall of ware in persecut adjustment of the constraint of the c

Oue Head, Combined Reservoir	Q, # R, x 35.22	No 2018 + 10 16 1 20 (2)
One Head, inner Reserveir	0, = R, < 2.16	$\Phi_{m-m} = (2\pi H_f^2 + \pi n^2 C_5) n^2 + 2\pi H_f$
		$G_{p} = \frac{H_{2}G_{p}}{\pi(2H_{1}H_{2}(H_{2}-H_{1})+\phi^{2}(H_{1}G_{1}-H_{2}G_{2}))}$
Twy Head,	Q1 = R1 × 35.22	$G_i = \pi(2H_iH_i, (H_i - H_i) + \sigma^2(H_iC_i - H_iC_i))$
The latest Controlled	Q, v R, x 35.22	$K_{i,a} = G_{i}Q_{i,a} - G_{i}Q_{i}$
		$G_{\ell} = \frac{(2\pi i) + \pi^{2}C_{2}Q_{2}}{2\pi (2\pi i) H_{2}(H_{2} - H_{3}) + \pi^{2}(H_{4}C_{3} - H_{2}C_{4}))}$
Two Head,	Q1 = P3 × 236	$G_{i} = \frac{(2H_{i}^{2} + a^{2}C_{i})C_{i}}{2\pi(2H_{i}H_{i}^{2}H_{i} - H_{i}) + a^{2}(H_{i}C_{i} - H_{i}C_{i}))}$
IDDEC RESCHARE	Q: to R: x 2.16	<

\$27.0

 $C_{1} = \left(\frac{H_{1/\alpha}}{1.992 + 0.091(^{H_{1/\alpha}})}\right)^{6.4}$ $C_{2} = \left(\frac{H_{2/\alpha}}{1.992 + 0.091(^{H_{1/\alpha}})}\right)^{6.4}$

0.04

Soils which are both fare textured (clayer or silty) and unstructured, nay also includs some fire sands.

4.724

 $\mathcal{L}_{1} = \left(\frac{H_{1/4}}{2.074 + 0.093(H_{1/6})}\right)^{2}$ $\mathcal{L}_{2} = \left(\frac{H_{2/6}}{2.074 + 0.093(H_{1/6})}\right)^{2}$

0.12

Most structured solir from citys through boans: also includes unstructured medium and fine tands. The caregory most frequently applicable for agricultural folis.

 $\zeta_1 = \left(\frac{H_{1/q}}{3.074 + 0.093(H_{1/q})}\right)^{2r}$ $\zeta_2 = \left(\frac{H_{1/q}}{3.074 + 0.093(H_{1/q})}\right)^{2r}$

0.35

Coesse and gravely sands; may also include some highly structured soils with large ancion immerous crincks, mosto potes, etc.

N. c. saddadda cnvlac saddadda cnvmn spanares nites saddadda notes saddadda notes

63 to 0,05569 6, ~ 0.02418

6, ≈ 0.00397

O. 172E.02 (110)/25:31

<i>H</i> _{f,2} ≈ 2.15E-02 cm/sec 1.28E-06 cm/min 2.15E-04 m/s 6.07E-01 inch/min 8.45E-03 inch/sec	9 5.96E-02 (calma)			~							107
t Inner reservoir): 1 seight ("H" in cm); 10 adus ("a" in cm); 3 below numbors); 4	atemas such as	aday and	saling sin graphs	eny most frequently	some regitiy	ako, marroporo, etr	e ("R" in cal/min): 16,7000	10, c. 0036 See 1	€ 1.28764 ₽ ∞ 9.8029	6/1 = 1.50E-02 cm/sec 0.02E-01 cm/sec 1.02E-04 m/sec 2.58E-01 mc/m/sec 5.58E-01 mc/m/sec	4. 20 4.18E.02 (m)min

1. Comparined, Structure bess, change or slift materials such as comparined, Structure bess, change or slift materials such as changed as compared or such and contractured prince and contractured pr	ses buder ans, etc	1 Compacted, Sciustion Rev., Idea Burdfle God, Martine Core, Idea Burdfle God, and Andrein Core, Idea Burdfle God, Andrein Core, I. Scientifica Andrein Core, Indiana also includes common 3. Motor Intergrated Studies Core Core, Indiana Core
Steady State Rate of Water Level Change ("R" in cm/min): 18.8880	nin): (15.8880	Steady State Rate of Water L.
	_	1000 A
	Ç ≈ 9.2746	
70 S	Kr. = 2,79E-02 cm/sec	
	2.79E-04 m/sec	
	1.10E-02 inchisec	
*	(may 175E.02 (mymm)	y W

	[cm-1] Skane Factor
section bead of water established	A court of the control of the contro
knigh parameter (from Table 2	i or and decided, decided to be decided by the decided by the control bust. C. sald de per decided a family of 1. salve.
(can's), K,, is Son saturated by	ioni, o a describe actor income and in a activatory oper explicit bases which is devoted discriminate to the indirectivation constants of the first discriminated discriminated of
CARCELLOS DESCRIPTOR A	THE STREET AND THE PROPERTY OF

0.825

 $C_{1} = \left(\frac{H_{1/\alpha}}{2.102 + 0.118(^{H_{1/\alpha}})}\right)^{0.6}$ $C_{2} = \left(\frac{H_{2/\alpha}}{2.102 + 0.118(^{H_{2/\alpha}})}\right)^{0.6}$

9.03

Compacted, smemre-leas, clayers or sity materials such as landfill caps, and liners, facustrine or marine sediments, etc.

-	One Bead, Combined Reservoir	Q, a R, x 35.22	$K_{f,f} = \frac{1}{2\pi K_{f}^{2}} + \pi \sigma^{2}(\xi_{f} + 2\pi (\frac{R_{f}}{\sigma}))$ $G \times \Omega$
	One Head, laner Reserveir	Q1 = R1 × 2.16	$\Phi^{ab} \stackrel{a}{=} (2\pi H_1^2 + \pi R^2 U_1^2) a^2 + 42\pi H_1$
			$G_i = \frac{H_i G_i}{\pi (2H_i H_i (H_i - H_i) + \alpha^2 (H_i G_i - H_i G_i))}$
	Two Head,	Q1 = R1 × 35.22	$G_1 = \pi(2H_1(H_1 - H_1) + a^2(H_1C_1 - H_1C_1))$
	Contoured Reserves	Q. = R. × 35.22	F1 6 15 Q2 - 61 Q1
			$G_{V} = 2\pi \left(2H_{1}H_{1}(H_{1}-H_{1}) + a^{2}C_{2}G_{1} + H_{1}C_{1} + H_{2}C_{1} \right)$
	Two Head, frame Reservois	Q1 = B1 × 2.16	$G_{i} = \frac{(2H_{1}^{2} + a^{2}Q_{i})C_{i}}{2\pi(2H_{i}H_{2}^{2}(H_{1} - H_{1}) + a^{2}(H_{1}C_{1} - H_{2}C_{1}))}$
		017 × 57 a 57	4., = 630, - 640;

Guelph Permeameter Data Sheet

Time

Investigator: CAR/ERG	Date: 5/16/51
Location: 10000 Sto Frank	Test Id:
Depth of hole: 24" Radius: 3	(standard calcs assume 3 cm radius)
Reservoirs used during test (check one):	Combined: Inner only:
Reservoir constant used:	

	Water le	evel in we	ll = 5 cm	
Time t (min)	D <i>t</i> (min)	Water level in reservoir h (cm)	D <i>h</i> (cm)	Rate of change Dh/ Dt
0		20		
110	6.3	T Cas	E. Comment	16.3.
135	1.28	30	Grand Grand Land	17.6
154	0.37		Constitution of the Consti	15.8
11/2	0,3	40	parisis Paris Com	16,3
1:30	0.3	45	Estate Land	16.7
1119	032	50	forest forest turned	194
8/08	0,32	E. C.	Section Section Section Section	15,8
2723		60 60	galianis Morting No. 11 M	15.8
6,04	029	63	pecial R _{icing} Latin B	17,6
	0.50	762	Angel Production Company	16,7
tony : And)	0,32	95	A CONTRACTOR OF THE CONTRACTOR	15,8
Steady ra	ite for 3 cons	ecutive readi	ngs (R_1) :	15.8

t (min)	D <i>t</i> (min)	level in reservoi r	D <i>h</i> (cm)	change Dh/ Dt
J.				
:/10	0.17	25	gara. Ring garan	30.O
125	0,25	32	and Property Property	20,0
142	0.3	35	guide Carried	16,9
1102	0.32	40		/s.6
1118	0,77	4.5	grafin Mary Programmer and the second	18.8
1126	0,53	53	guerti Transport	15,0
115	5,28		Artor Brings Hepting	19,6
8715	0.33	60	Con cond	15,0
2/3/3	0.30		gastina Estang Basinis	16,7
2/5%	0.32	1770		
3/10	0.30	9.6	ggadh Roos Loosh	16,7

Steady rate for 3 consecutive readings (R_2) :

Water level in well = 10 cm

Rate of

16,7

Comments:

Kg = 0.500 in/min = 50.4 in/am

Date of Investigator Address Frances Site Location Frances Dominant Soil Type(s) Frances Soil Profile Description (horizon depth, texture, structure, color, etc.): Depth Description Description Description Presence of special soil conditions (mottling, water table depth, hardpar induration, compacted layers, etc.): Comments and Notes (topography, slope, vegetation, etc.):	pominant Soil Type(s) Soil Profile Description (horizon depth, texture, structure, color, etc.): Depth Description Soil Profile Description Description Description Sold Profile Description (horizon depth, texture, structure, color, etc.): Depth Description Sold Profile Description (horizon depth, texture, structure, color, etc.):	GP FIELD DATA SHEET	SECTION	1: SITE INFORMATION
Site Location Frankling Dominant Soil Type(s) History Soil Profile Description (horizon depth, texture, structure, color, etc.): Depth Description SL-10/R 3/3 SL-7,5/R 4/L Saudificated 25 4 4/4 Presence of special soil conditions (mottling, water table depth, hardpar induration, compacted layers, etc.):	pominant Soil Type(s) Soil Profile Description (horizon depth, texture, structure, color, etc.): Depth Description Soil Profile Description Description Description Sold Profile Description (horizon depth, texture, structure, color, etc.): Depth Description Sold Profile Description (horizon depth, texture, structure, color, etc.):	Date <u>6/11/21</u> Investi	gator <u>040/846</u>	
Soil Profile Description (horizon depth, texture, structure, color, etc.): Depth Description SL-10 /R 3/3 SL-7,5 /R 4/4 Sand Gard 2.5 4 4/4 Presence of special soil conditions (mottling, water table depth, hardpar induration, compacted layers, etc.):	Soil Profile Description (horizon depth, texture, structure, color, etc.): Depth Description SL- 10 /R 3/3 SL- 7.5 /R 4/4 Saw 46 and 25 / 4/4 Presence of special soil conditions (mottling, water table depth, hardpan and a compacted layers, etc.):	Site Location	13 Franklin	
Soil Profile Description (horizon depth, texture, structure, color, etc.): Depth Description SL-10 /R 3/3 SL-7,5 /R 4/4 Sand Gard 2.5 4 4/4 Presence of special soil conditions (mottling, water table depth, hardpar induration, compacted layers, etc.):	Soil Profile Description (horizon depth, texture, structure, color, etc.): Depth Description SL- 10 /R 3/3 SL- 7.5 /R 4/4 Saw 46 and 25 / 4/4 Presence of special soil conditions (mottling, water table depth, hardpan and a compacted layers, etc.):	Dominant Soil Type(s)	Hindron Some Cu	Las A
Presence of special soil conditions (mottling, water table depth, hardparinduration, compacted layers, etc.):	Presence of special soil conditions (mottling, water table depth, hardpaninduration, compacted layers, etc.):	Site Map:	Soil Profile Description	on (horizon depth,
Presence of special soil conditions (mottling, water table depth, hardpar induration, compacted layers, etc.):	Presence of special soil conditions (mottling, water table depth, hardpan induration, compacted layers, etc.):	PT=7	Depth De	escription
induration, compacted layers, etc.):	induration, compacted layers, etc.):		$\begin{array}{c c} & & & & & & & \\ & & & & & & \\ & & & & &$	1R 4/4
		induration, compacte	d layers, etc.):	





Head #1

the soil texture-structure category (enter one of the below numbers); A 3. Most structured spils from clays through loans, also netudes Compacted, Shockers less, seep on course sediments, etc.
landfill cups and heavy, lacustrine or numers sediments, etc.
comments and seep gradients. 2. Such subich are both fine textured (chapes or siky) and instructured, may also include some tine sands.

4. Coarse and gravely sands; may also include some highly stretured sels with large and for numerous starks, macropers, so applicable for agricultural soils.

endrugnered pendian and the sands. The category most beggerds

Steady State Rate of Water Level Change ("R" in cm/min); 23,3000

o. 0.36 '.m' C ≈ 0,80318 Ç ≈ 13,6771

Result Input

Support af@solmostate.com

Head #2

Two Head Method

Average

Enter the soil texture-structure category (anter one of the below numbers): Reservoir Type (onter "1" for Combined and "2" for inner reservair).
Enter water Head Height ("H" in cm):
Enter the Borehole Radius ("a" in cm): Coaster and gravity sands, may also include some highly attributed tolk with large and for remercias tracks, macroports, etc. Most structures such francials through bases; also mislides audited total amoltom parifiem saids. The category most frequently. 1. Compacted, Structure few, dayer or sity materials rech still raps and brees, lassastine or marine sediments, etc. Soft which are both fore textured (chayey or sity) and unstructured; may also include some time sands. applicable for agin official softs.

Steady State Rate of Water Level Change ("R" in cm/min); 28.7000

Kr. = 2.48E-02 cmtesc patients contror 2.58E-04 mtess 6.11E-01 inchmin 1.02E-02 inchisec 4... 7.18E-027700 970 C ≈ 1,26754 Q ≈ 18.8469

Calculation formulas related to enclosed and two-dood carefoods. Where it is intrody-state ent of fall of water in retrivest (cost), it, it is fall sourced hydracks conductorst (cost), it, it is fall sourced hydracks conductorst (cost), it is in the fall to the parameter (cost). The 2, it is included (cost) for it is fall to the fall to have only an except to the cost of the

$R_{II} \approx \frac{c_{I} \times Q_{I}}{2\pi H_{I} + \pi a^{2}C_{I} + 2\pi \left(\frac{R_{I}}{n}\right)}$	on " (2011 + 2022) 10 + 20 H	$G_1 = \pi_1(2H_1H_2/H_2 - H_1) + G^2(H_1G_2 - H_2G_1)$	$G_{i} = \pi(M_{i}H_{i}(H_{i} - H_{i}) + a^{2}(H_{i}C_{i} - H_{i}C_{i}))$	2 - 61Q1	$G_1 = \frac{(2H_1^2 + a^2C_2)C_1}{2\pi(3H_1)!(H_2 - H_1) + a^2(H_1C_1 - H_1C_1)}$	$G_{4} \stackrel{\text{in}}{=} \frac{(2H_{1}^{2} + a^{2}C_{1})C_{1}}{(2H_{1}H_{2}^{2}(H_{1}C_{2} + H_{1}) + a^{2}(H_{1}C_{2} + H_{2}C_{1}))}$, ~ 6, 9,
		6 = =(27	ε, π.(3)	$K_{f,g} = G_2Q_2 = G_1Q_3$	6, = 2π(3	6, 10 In (2)	$\Phi_{m} \approx G_{2}Q_{1} \sim G_{4}Q_{2}$
Q1 = R1 × 35.22	0, v Ř, × Z.16		Q(= K) × 35.23	Q1 = K2 × 35.22		Q1 = K3 × 2.16	V2 4 M2 > 4-160
One Head, Combined Reservoir	One Head. lance Reservoir		Two Head, Combined Bearcafe			Two Head, inner Reservoir	Marketon a bert

No. of Westward Conviction Convic

Gz = 0.02415

692500 - 757

C. 0.60315

C: 1,26754

Q: = 1.0332

6y == 0.0049G

€; ≈ 0.00397

o 2,168,02 (m)/mm!

Enter the Borehote Radius ("a" in cm): 3 Reservoir Type (enter "1" for Combined and "2" for inner reservoir); Enter the first water Head Height ("Hi" in cm); 6 Enter the second water Head Height ("Hi" in cm); 10 the soil texture-structure category (enter one of the below numbers): Steady State Rate of Water Level Change ("R1" in cm/min): 23.3000 Steady State Rate of Water Level Change ("R2" in cm/min); 28.7000 1.95 Q₁ > 0.8366 d. Course and gravely rands, and also and ade espensingly by estimates and cooks, managed, est onstantined medium and her wands. The category risks find sently 3. Most structured scals from slaps through barvist also patholes. 1. Compacted, Steechie less, thymp in sity materials sade in Suis which are both few fextured telayer or sifty) and contretioned, may also include some fine sands. faultificaps and liners, becastine or marine sedements, etc. appleable for agreculteral spen. X₇₂ = 3.35E.02 cm/sec 2.01E-06 cm/min 3.35E-04 m/s 7.91E-01 inch/min 1.32E-02 inch/sec 9.30E-02 (77)

	Catastan founds meted to mape faces (C, Whee R) which there is to the deepst (m), Mustan recond even tooking it can, a benefic when they and it is interrupting a apple in Magh interruption to allocate company to the other interruption. For one how mention that they have been been about another the supplicitient of the for we had not been been about an about the supplicitient when the sup
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1,148.01 ((27/1)2)

Satt Terture-Structure Category	(L. (C. 13)	Shape Factor
Conpared Sructure-lets, clayey or sily materials such as landfill caps, and lister, incustrate or motive sediment, etc.	***************************************	$C_1 = \left(\frac{H_{1/2}}{2.102 + 0.119 (^{H_{1/2}})}\right)^{0.533}$ $C_2 = \left(\frac{H_{2/2}}{2.102 + 0.119 (^{H_{2/2}})}\right)$
Solb, which are both fine textured (clayey on silty) and capturestred; may also include some fine small.	0.01	$C_1 = \left(\frac{H_{1/q}}{1.392 + 0.091 \ell^{1/q}}\right)^{0.013}$ $C_2 = \left(\frac{H_{1/q}}{1.992 + 0.091 (H_{1/q})}\right)$
Most trescured peds from clays through loams, sho herbakes usermented neckum and fine monds. The extressy most frequently applicable for agricultural polific.	g	$C_1 = \left(\frac{H_{1/2}}{2.074 + 0.093(H_{1/2})}\right)^{2.134}$ $C_2 \approx \left(\frac{H_{2/2}}{2.974 + 0.093(H_{2/2})}\right)$
Coarse and gavely tands; may also include some highly instituted scela with lergy and or manerous crocke, mayors pores, etc.	97.0	$C_{1} = \left(\frac{H_{1/6}}{2.074 + 0.093 (^{11}/6)}\right)^{1/62}$ $C_{2} = \left(\frac{H_{1/6}}{2.074 + 0.093 (^{11}/6)}\right)^{1/62}$

GP FIELD DATA SHEET		SECTION 1: SITE INFORMATION
Date 6/11/01 Investigator.	adQ/p_i	Carolina de la companya della companya della companya de la companya de la companya della compan
Site Location 13 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	man 1	auklin
Site Location Type(s)	10600 any .	Contract to the Contract of
Site Map:	Soil Pro	file Description (horizon depth, structure, color, etc.):
P7-8	Depth	Description
	onditions (m	5, L-10 1/R 3/3 5.L 7, 5 7/R 4/4 Sanda Grace 2,544/4 ottling, water table depth, hardpan,
Comments and Notes (topogra	phy, slope,	vegetation, etc.):

Guelph Permeameter Data Sheet

Investigator:	2500 /2±20	<u> 6</u>			Date: 6/6/2/
Location: Wa	26. S	for France	illia		
Depth of hole:_	1-211	Radius:	<u> 3 Qu</u>	<u> </u>	(standard calcs assume 3 cm radius)
Reservoirs used	during test	(check one	e): Com	bined:_	Inner only:
Reservoir consta					VAAAA SAA AA A

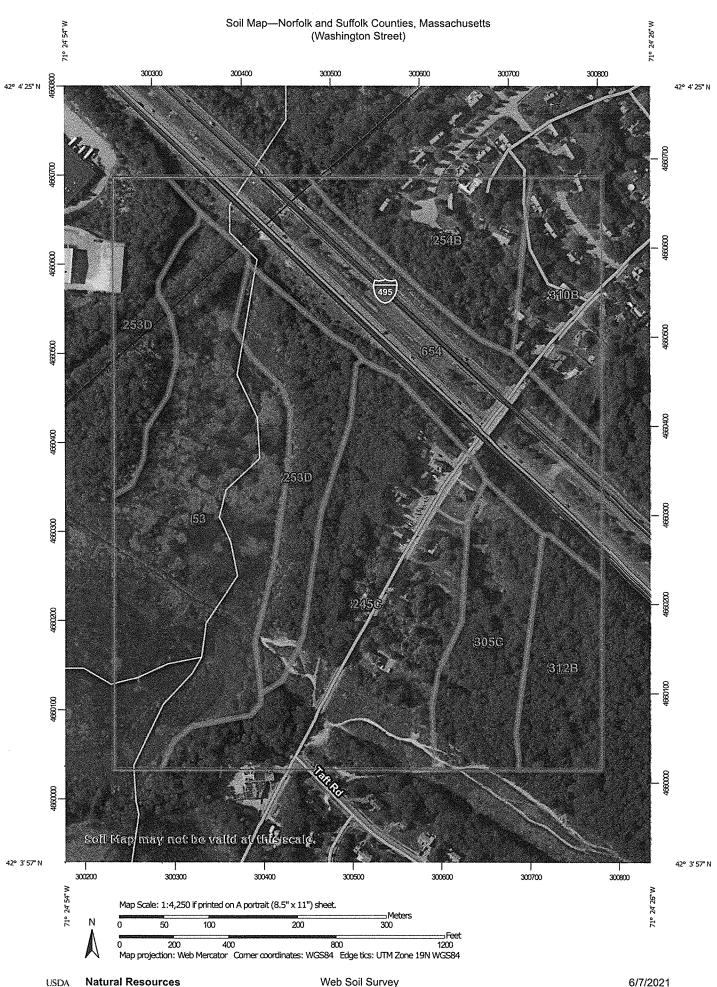
	Water l	level in w	ell = 5 cr	n
Time t (min)	Dt (min)	Water level in reservoir h (cm)	D <i>h</i> (cm)	Rate of change Dh/ Dt
0		20		
108	6/3	6.5	egy prod Selection Lances	37.5
418	0,12	30	egener to-col	30.0
128	0.19	35	george Garage Samuel	30,0
139	01/8	40		27.3
192	0.2%	45	C.	and and a
1:26	933	50	San	21,4
1113	0.310	American Spring	100 M	25,0
1133	0.22	60	Contract Con	
(14)	0.25	6-5	Marines con Telescopes	70.0°
	0,20		en er	25.0
2:11	0.80	74	Errania Errang Security	
Steady rate	e for 3 conse	cutive reading	es (R ₁):	23,23

	Water	level in v	vell = 10 cn	n
Time t (min)	Dt (min)	Water level in reservoi r	D <i>h</i> (cm)	Rate of change Dh/ Dt
0		2.0		
<u> </u>	0.08		March March Congression	60.0
110	0,/2	30	4900 1000 1000	48,9
1 600 19	2/5	35	gista Proprint Proprint	37,5
1531	018	4.0	green keng	San Janaan
140	5.45	45	Alleria September	33.3
150	013	50		320
1/0/	0,18		Marin Consti	24,3
1///	0.12	60	egissis Vicense	So, o
1122	5.1B	(a 5	gets Smill	23,3
1/32	0,/2			30.0
1243	0.18	75	gan Constitution of the Constitution of the Co	72.3

Steady rate for 3 consecutive readings (\mathbb{R}_2) :

Comments:

Ks = 0.79/14/w/w = 47,5 in/9-



MAP LEGEND

Spoil Area	Stony Spot	Very Stony Spot	Wet Spot	△ Other	Special Line Features	Water Features	Streams and Canals	ortat	Interstate Highways	US Routes		Local Roads	Background	Aerial Photography								
Area of Interest (AOI)	Area of Interest (AOI)	Soil Man I lait Dolygons	Soil Man Unit Lines	Soil Man Unit Points	0 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	special rount realules	Borrow Pit	Clay Spot	Closed Depression	Gravel Pit	Gravelly Spot	Landfill	Lava Flow	Marsh or swamp	Mine or Quarry	Miscellaneous Water	Perennial Water	Rock Outcrop	Saline Spot	Sandy Spot	Severely Eroded Spot	
Area of Int		Soils		} [Special) 🗵	l X		X	8 %		~	-1	K	(3)	0	>		* *	Ů.	

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts Survey Area Data: Version 16, Jun 11, 2020

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

Date(s) aerial images were photographed: Jul 5, 2019—Jul 8, 2019

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

Slide or Slip Sodic Spot

圈

Sinkhole

0 4

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
53	Freetown muck, ponded, 0 to 1 percent slopes	20.1	22.2%
245C	Hinckley loamy sand, 8 to 15 percent slopes	19.0	21.0%
253D	Hinckley loamy sand, 15 to 35 percent slopes	12.1	13.4%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	6.8	7.5%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	6.5	7.2%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	5.7	6.3%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	5.1	5.7%
654	Udorthents, loamy	15.1	16.7%
Totals for Area of Interest		90.4	100.0%

Norfolk and Suffolk Counties, Massachusetts

245C—Hinckley loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svm9

Elevation: 0 to 1,480 feet

Mean annual precipitation: 36 to 71 inches Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 240 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Hinckley and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of

the mapunit.

Description of Hinckley

Setting

Landform: Outwash deltas, kame terraces, outwash plains, kames,

eskers, moraines, outwash terraces

Landform position (two-dimensional): Shoulder, toeslope, footslope,

backslope

Landform position (three-dimensional): Nose slope, side slope,

crest, head slope, riser

Down-slope shape: Convex, concave, linear

Across-slope shape: Concave, linear, convex

Parent material: Sandy and gravelly glaciofluvial deposits derived

from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 8 inches: loamy sand

Bw1 - 8 to 11 inches: gravelly loamy sand

Bw2 - 11 to 16 inches: gravelly loamy sand

BC - 16 to 19 inches: very gravelly loamy sand

C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 8 to 15 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water

(Ksat): Moderately high to very high (1.42 to 99.90 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm) Available water capacity: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: A

Ecological site: F144AY022MA - Dry Outwash

Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent

Landform: Eskers, moraines, outwash terraces, outwash plains,

kames

Landform position (two-dimensional): Shoulder, backslope,

footslope, toeslope

Landform position (three-dimensional): Side slope, head slope,

nose slope, crest, riser Down-slope shape: Convex Across-slope shape: Convex Hydric soil rating: No

Windsor

Percent of map unit: 5 percent

Landform: Moraines, kame terraces, outwash plains, outwash

terraces, outwash deltas, kames, eskers

Landform position (two-dimensional): Shoulder, backslope,

footslope, toeslope

Landform position (three-dimensional): Nose slope, side slope,

crest, head slope, riser

Down-slope shape: Convex, linear, concave Across-slope shape: Linear, convex, concave

Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent

Landform: Outwash terraces, kame terraces, outwash plains,

moraines, outwash deltas

Landform position (two-dimensional): Backslope, footslope

Landform position (three-dimensional): Base slope, tread

Down-slope shape: Concave, linear Across-slope shape: Linear, concave

Hydric soil rating: No

Data Source Information

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts

Survey Area Data: Version 16, Jun 11, 2020

Norfolk and Suffolk Counties, Massachusetts

253D—Hinckley loamy sand, 15 to 35 percent slopes

Map Unit Setting

National map unit symbol: 2svmd

Elevation: 0 to 860 feet

Mean annual precipitation: 36 to 71 inches Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 240 days

Farmland classification: Not prime farmland

Map Unit Composition

Hinckley and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of

the mapunit.

Description of Hinckley

Setting

Landform: Outwash plains, kames, eskers, moraines, outwash

terraces, outwash deltas, kame terraces Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Crest, nose slope, side

slope, head slope, riser

Down-slope shape: Concave, convex, linear Across-slope shape: Linear, convex, concave

Parent material: Sandy and gravelly glaciofluvial deposits derived

from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 8 inches: loamy sand

Bw1 - 8 to 11 inches: gravelly loamy sand Bw2 - 11 to 16 inches: gravelly loamy sand BC - 16 to 19 inches: very gravelly loamy sand

C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 15 to 35 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water

(Ksat): Moderately high to very high (1.42 to 99.90 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm) Available water capacity: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: A

Ecological site: F144AY022MA - Dry Outwash

Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 10 percent

Landform: Moraines, kame terraces, outwash plains, outwash

terraces, outwash deltas, kames, eskers Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Nose slope, crest, side

slope, head slope, riser

Down-slope shape: Convex, linear, concave Across-slope shape: Convex, linear, concave

Hydric soil rating: No

Merrimac

Percent of map unit: 3 percent

Landform: Kames, eskers, moraines, outwash terraces, outwash

plains, kame terraces

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope, crest, head

slope, nose slope, riser

Down-slope shape: Convex, concave, linear

Across-slope shape: Concave, convex, linear

Hydric soil rating: No

Sudbury

Percent of map unit: 2 percent

Landform: Moraines, outwash terraces, kame terraces, outwash

plains, outwash deltas

Landform position (two-dimensional): Backslope, footslope,

toeslope

Landform position (three-dimensional): Base slope, tread

Down-slope shape: Linear, concave Across-slope shape: Concave, linear

Hydric soil rating: No

Data Source Information

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts

Survey Area Data: Version 16, Jun 11, 2020

APPENDIX G

9/13/2021

Hydrograph for Pond 1P: POND 1 (continued)

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
20.80	0.10	0.000	249.81	0.10	0.10	0.00
21.00	0.10	0.000	249.81	0.10	0.10	0.00
21.00	0.10	0.000	249.81	0.10	0.10	
21.40	0.10	0.000	249.81	0.10	0.10	0.00 0.00
21.40	0.10	0.000	249.81	0.10	0.10	
21.80	0.10	0.000	249.81	0.10	0.10	0.00 0.00
22.00	0.10	0.000	249.81	0.10	0.10	0.00
22.20	0.09	0.000	249.81	0.09	0.09	0.00
22.40	0.09	0.000	249.81	0.09	0.09	0.00
22.40	0.09	0.000	249.81	0.09	0.09	0.00
22.80	0.09	0.000	249.81	0.09	0.09	0.00
23.00	0.03	0.000	249.81	0.08	0.03	0.00
23.20	0.08	0.000	249.81	0.08	0.08	0.00
23.40	0.08	0.000	249.81	0.08	0.08	0.00
23.60	0.08	0.000	249.80	0.08	0.08	0.00
23.80	0.08	0.000	249.80	0.08	0.08	0.00
24.00	0.07	0.000	249.80	0.07	0.03	0.00
24.20	0.00	0.000	249.80	0.07	0.07	0.00
24.40	0.00	0.000	249.80	0.00	0.00	0.00
24.60	0.00	0.000	249.80	0.00	0.00	0.00
24.80	0.00	0.000	249.80	0.00	0.00	0.00
25.00	0.00	0.000	249.80	0.00	0.00	0.00
25.20	0.00	0.000	249.80	0.00	0.00	0.00
25.40	0.00	0.000	249.80	0.00	0.00	0.00
25.60	0.00	0.000	249.80	0.00	0.00	0.00
25.80	0.00	0.000	249.80	0.00	0.00	0.00
26.00	0.00	0.000	249.80	0.00	0.00	0.00
26.20	0.00	0.000	249.80	0.00	0.00	0.00
26.40	0.00	0.000	249.80	0.00	0.00	0.00
26.60	0.00	0.000	249.80	0.00	0.00	0.00
26.80	0.00	0.000	249.80	0.00	0.00	0.00
27.00	0.00	0.000	249.80	0.00	0.00	0.00
27.20	0.00	0.000	249.80	0.00	0.00	0.00
27.40	0.00	0.000	249.80	0.00	0.00	0.00
27.60	0.00	0.000	249.80	0.00	0.00	0.00
27.80	0.00	0.000	249.80	0.00	0.00	0.00
28.00	0.00	0.000	249.80	0.00	0.00	0.00
28.20	0.00	0.000	249.80	0.00	0.00	0.00
28.40	0.00	0.000	249.80	0.00	0.00	0.00
28.60	0.00	0.000	249.80	0.00	0.00	0.00
28.80	0.00	0.000	249.80	0.00	0.00	0.00
29.00	0.00	0.000	249.80	0.00	0.00	0.00
29.20	0.00	0.000	249.80	0.00	0.00	0.00
29.40	0.00	0.000	249.80	0.00	0.00	0.00
29.60	0.00	0.000	249.80	0.00	0.00	0.00
29.80	0.00	0.000	249.80	0.00	0.00	0.00
30.00	0.00	0.000	249.80	0.00	0.00	0.00
30.20	0.00	0.000	249.80	0.00	0.00	0.00
30.40 30.60	0.00	0.000	249.80	0.00 0.00	0.00	0.00
	0.00	0.000	249.80		0.00	0.00
30.80 31.00	0.00 0.00	0.000	249.80	0.00 0.00	0.00	0.00
\$1.00	0.00	0.000	249.80	0.00	0.00	0.00

9/13/2021

Hydrograph for Pond 2P: POND 2 (continued)

Time	Inflow	Ctorogo	Elevation	Outflow	Diagondad	Duine au .
Time (hours)	Inflow (cfs)	(cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
20.80	0.31	19	247.16	0.31	0.31	0.00
21.00	0.30	19	247.16	0.31	0.31	0.00
21.20	0.30	19	247.16	0.30	0.30	0.00
21.40	0.29	18	247.16	0.29	0.29	0.00
21.60	0.29	18	247.16	0.29	0.29	0.00
21.80	0.28	18	247.16	0.28	0.28	0.00
22.00	0.28	17	247.16	0.28	0.28	0.00
22.20	0.27	17	247.16	0.27	0.27	0.00
22.40	0.27	17	247.16	0.27	0.27	0.00
22.60	0.26	16	247.16	0.26	0.26	0.00
22.80	0.26	16	247.16	0.26	0.26	0.00
23.00	0.25	16	247.16	0.25	0.25	0.00
23.20	0.25	15	247.16	0.25	0.25	0.00
23.40	0.24	15	247.16	0.24	0.24	0.00
23.60 23.80	0.23 0.23	15 14	247.16 247.16	0.23 0.23	0.23 0.23	0.00
24.00	0.23	14	247.16	0.23	0.23	0.00 0.00
24.20	0.22	2	247.10	0.22	0.22	0.00
24.40	0.02	0	247.15	0.00	0.00	0.00
24.60	0.00	······································	247.15	0.00	0.00	0.00
24.80	0.00	Ō	247.15	0.00	0.00	0.00
25.00	0.00	Ō	247.15	0.00	0.00	0.00
25.20	0.00	0	247.15	0.00	0.00	0.00
25.40	0.00	0	247.15	0.00	0.00	0.00
25.60	0.00	0	247.15	0.00	0.00	0.00
25.80	0.00	0	247.15	0.00	0.00	0.00
26.00	0.00	0	247.15	0.00	0.00	0.00
26.20	0.00	0	247.15	0.00	0.00	0.00
26.40	0.00	0	247.15	0.00	0.00	0.00
26.60	0.00	0	247.15	0.00	0.00	0.00
26.80	0.00	0	247.15	0.00	0.00	0.00
27.00	0.00	0	247.15	0.00	0.00	0.00
27.20	0.00	0	247.15	0.00	0.00	0.00
27.40 27.60	0.00 0.00	0	247.15 247.15	0.00 0.00	0.00 0.00	0.00 0.00
27.80	0.00	0	247.15	0.00	0.00	0.00
28.00	0.00	0	247.15	0.00	0.00	0.00
28.20	0.00	Ö	247.15	0.00	0.00	0.00
28.40	0.00	ő	247.15	0.00	0.00	0.00
28.60	0.00	Ō	247.15	0.00	0.00	0.00
28.80	0.00	0	247.15	0.00	0.00	0.00
29.00	0.00	0	247.15	0.00	0.00	0.00
29.20	0.00	0	247.15	0.00	0.00	0.00
29.40	0.00	0	247.15	0.00	0.00	0.00
29.60	0.00	0	247.15	0.00	0.00	0.00
29.80	0.00	0	247.15	0.00	0.00	0.00
30.00	0.00	0	247.15	0.00	0.00	0.00
30.20	0.00	0	247.15	0.00	0.00	0.00
30.40	0.00	0	247.15	0.00	0.00	0.00
30.60	0.00	0	247.15	0.00	0.00	0.00
30.80	0.00	0	247.15	0.00	0.00	0.00
31.00	0.00	Ü	247.15	0.00	0.00	0.00

Page 26 9/13/2021

Hydrograph for Pond 3P: POND 2 (continued)

Time	Inflow	Storage	Elevation	Outflow	Discarded	Primary
(hours)	(cfs)	(cubic-feet)	(feet)	(cfs)	(cfs)	<u>(cfs)</u>
20.80	0.05	1,834	250.24	0.17	0.17	0.00
21.00	0.05	1,745	250.16	0.17	0.17	0.00
21.20	0.05	1,655	250.09	0.17	0.17	0.00
21.40	0.05	1,564	250.01	0.17	0.17	0.00
21.60	0.05	1,473	249.93	0.17	0.17	0.00
21.80	0.04	1,381	249.85	0.17	0.17	0.00
22.00	0.04	1,288	249.77	0.17	0.17	0.00
22.20	0.04	1,195	249.68	0.17	0.17	0.00
22.40	0.04	1,102	249.60	0.17	0.17	0.00
22.60	0.04	1,007	249.51	0.17	0.17	0.00
22.80	0.04	912	249.41	0.17	0.17	0.00
23.00	0.04	816	249.32	0.17	0.17	0.00
23.20	0.04	720	249.22	0.17	0.17	0.00
23.40	0.04	623	249.11	0.17	0.17	0.00
23.60	0.04	526	248.99	0.17	0.17	0.00
23.80	0.04	427	248.85	0.17	0.17	0.00
24.00	0.03	329	248.70	0.17	0.17	0.00
24.20	0.00	216	248.53	0.17	0.17	0.00
24.40	0.00	92	248.35	0.17	0.17	0.00
24.60	0.00	6	248.22	0.03	0.03	0.00
24.80	0.00	0	248.21	0.00	0.00	0.00
25.00	0.00	0	248.21	0.00	0.00	0.00
25.20	0.00	0	248.21	0.00	0.00	0.00
25.40	0.00	0	248.21	0.00	0.00	0.00
25.60	0.00	0	248.21	0.00	0.00	0.00
25.80	0.00	0	248.21	0.00	0.00	0.00
26.00	0.00	0	248.21	0.00	0.00	0.00
26.20	0.00	0	248.21	0.00	0.00	0.00
26.40	0.00	0	248.21	0.00	0.00	0.00
26.60	0.00	0	248.21	0.00	0.00	0.00
26.80	0.00	0	248.21	0.00	0.00	0.00
27.00	0.00	0	248.21	0.00	0.00	0.00
27.20	0.00	0	248.21	0.00	0.00	0.00
27.40	0.00	0	248.21	0.00	0.00	0.00
27.60	0.00	0	248.21	0.00	0.00	0.00
27.80	0.00	0	248.21	0.00	0.00	0.00
28.00	0.00	0	248.21	0.00	0.00	0.00
28.20	0.00	0	248.21	0.00	0.00	0.00
28.40	0.00	0	248.21	0.00	0.00	0.00
28.60	0.00	0	248.21	0.00	0.00	0.00
28.80	0.00	0	248.21	0.00	0.00	0.00
29.00	0.00	0	248.21	0.00	0.00	0.00
29.20	0.00	Ō	248.21	0.00	0.00	0.00
29.40	0.00	Ō	248.21	0.00	0.00	0.00
29.60	0.00	Ö	248.21	0.00	0.00	0.00
29.80	0.00	Ö	248.21	0.00	0.00	0.00
30.00	0.00	ő	248.21	0.00	0.00	0.00
30.20	0.00	ő	248.21	0.00	0.00	0.00
30.40	0.00	ő	248.21	0.00	0.00	0.00
30.60	0.00	ő	248.21	0.00	0.00	0.00
30.80	0.00	0	248.21	0.00	0.00	0.00
31.00	0.00	0	248.21	0.00	0.00	0.00
51.00	0.00	U	۱ ۲۵۰۸	0.00	0.00	0.00

APPENDIX H

CHECKLIST FOR DESIGNERS

GOALS and NEEDS addressed:

- 1. Create a visually appealing community
- 2. Stabilize and increase property values
- 3. Encourage low impact development
- 4. Preserve the Town's historic and cultural heritage
- 5. Protect Franklin's natural environment, including habitat, water resources, and ecosystem services

FRANKLIN POLICY:

Subdivision plans and site plans for all forms of development shall adhere to the principles of environmental and aesthetic compatibility and energy-efficient design.

BEST DEVELOPMENT PRACTICES	Incorporated into Project?
The site plan should be designed to address the following to the maximum extent practicable	
Unique natural features have been preserved (the development program should either avoid altering or showcase significant natural features)	
Native vegetation planted in disturbed areas as needed to enhance or restore habitat	9
Historic and cultural resources have been preserved (the development program should either avoid altering or showcase significant historic and cultural features)	U NA
Clearing, grading, and building placement consider viewsheds	
Cut and fill have been minimized	
Buildings blend into the natural topography	2
Buildings are oriented to the sun and wind for maximum energy	and the same of th
efficiency	
Vegetated protection from northwest (winter) winds is provided	
Deciduous species planted or retained close to the East, South and West building edges	
Conforms to §185-31 of the Town of Franklin Zoning Code and/ or Chapter 300 of the Town of Franklin Subdivision Regulations	3/

w/waiver repress

GOALS and NEEDS addressed:

- 1. Protect local and regional wetlands and water bodies
- 2. Maximize groundwater recharge to retain a viable local groundwater supply
- 3. Minimize pollutants in stormwater runoff

FRANKLII	N POLICIES:
(A) All new	development and redevelopment projects in Franklin shall meet the following stormwater
management	performance standards.
i.	Post-development peak discharge rates and volumes from the site shall not exceed pre-
•	development peak discharge rates and volumes from the site.
ii.	The stormwater management system shall remove at least 80% of the average
•	annual load of total suspended solids (TSS), at least 80% of the phosphorus loading, and at least
•	60% of nitrogen loading from the post-development stormwater created on site.
iii.	All drainage facilities proposed shall utilize best management practices as outlined
	in the Massachusetts Stormwater Management Standards.
iv.	All sites will have an Operation and Maintenance plan to insure future compliance.
(B) Non-stru	actural stormwater management systems should be used wherever site conditions allow.

BEST DEVELOPMENT PRACTICES The site plan should be designed to address the following to the maximum extent practicable	Incorporated into Project?
Vegetated swales (recommended to convey runoff from roadways & parking lots)	
Vegetated filter strips (recommended to filter and infiltrate runoff from roadways, parking lots, and driveways; use along roadsides and parking lots)	
Constructed wetlands (preferred method for stormwater retention & pollutant removal)	
Bioretention cells (rain gardens) (recommended on residential lots and parking lot islands)	
Pervious paving surfaces (recommended in overflow parking and low-traffic areas)	
Sediment Forebays (use in combination with other BDP)	
Roof gardens (encouraged on flat or gently sloped commercial and industrial rooftops)	
Retention/Detention basins (may be used in series with other practices to provide pre-treatment)	4
Recharge Systems (suitable for all areas of development)	
Drain pipe/catch basin systems (as required to collect runoff when other systems are not practical)	
If utilizing drain pipe and/or catch basin systems, have you documented that other systems are infeasible?	Ġ

Erosion and Sedimentation Control

GOALS and NEEDS addressed:

- 1. Minimize clearing and regrading;
- 2. Prevent erosion and sedimentation.

FRANKLIN POLICIES:

- (A) Any proposed project on a previously undeveloped site shall accommodate the development program in a way that minimizes clearing and re-grading, especially in areas of steep slopes, erosion-prone soils, or sensitive vegetation. For redevelopment projects, the site plan shall concentrate development in previously-disturbed areas to the extent possible.
- (B) As a condition of approval, every proposed project shall submit and adhere to an erosion control plan that addresses soil stabilization, sediment retention, perimeter protection, construction scheduling, traffic area stabilization and dust control.
- (C) If the proposed project is in an area under conservation jurisdiction, the project will require permitting deemed appropriate by the Conservation Commission.

BEST DEVELOPMENT PRACTICES The site plan should be designed to address the following to the maximum extent practicable.	Incorporated into Project?
Clearing and re-grading have been minimized	Ġ
Plan identifies sensitive areas to be protected and areas that are suitable for development	
Conservation Permits have been obtained (when applicable)	a file
The erosion and sedimentation control plan addresses:	
• Soil stabilization	
(cover or stabilize erodible surfaces not in immediate use)	
Sediment retention	
(runoff interceptors and sediment traps/ponds)	
Perimeter protection (vegetated buffers, compost socks or straw wattles at limit of work)	4
Construction scheduling	TO C
(minimize disturbed area at any given time)	
Traffic area stabilization	4
(crushed rock or similar at construction vehicle entrance and parking areas)	
• Dust control	
(plan for stabilizing dry, dust-prone surfaces when necessary)	
• Vegetation	
(preserve existing vegetation and/or identify areas to be revegetated including proposed	
planting species, quantity and planting specifications)	

Landscape Design

Checklist for Designers

GOALS and NEEDS addressed:

- 1. Stabilize water use at a sustainable level
- 2. Create landscapes that minimize habitat destruction and maximize habitat value
- 3. Encourage the development of landscapes that provide environmental quality and visual relief through the planting of native or naturalized species

FRANKLIN POLICIES:

- (A) Site plans and landscape plans for all proposed projects shall take appropriate steps, as outlined in the
- Guidebook, to minimize water use for irrigation and to allow for natural recharge of groundwater.
- Landscape plans shall follow the guidelines in the Guidebook for selecting species that are most appropriate to the site conditions.
- (B) Native and habitat-creating species shall be used in all landscape plans to the maximum extent possible while still meeting the site's landscaping needs. Invasive species may not be planted in Franklin under any
- condition. Refer to the Massachusetts Prohibited Plant list for more information.
- (C) Actively promote the Town of Franklin's Water Conservation Measures.

BEST DEVELOPMENT PRACTICES The site plan must address all of the following principles.	Incorporated into Project?
Retain and Recharge water on site (install bio-retention cells, vegetated filter strips and minimize lawn areas where feasible)	
Preserve natural vegetation to the maximum extent practicable	a
Irrigation system is water efficient (if an in-ground irrigation system is proposed, it is a water efficient system with timers and automatic sensors to prevent overwatering)	
Preserve soil permeability (minimize disturbing existing landscapes. Prepare new planting beds in accordance to the Planting Bed Guidelines on p. 13, and install 1-2" of shredded pine bark mulch on new planting areas)	3
Minimize the use of turf grass (when applicable, reduce the size of the lawn area; instead, plant a bio-retention cell, use alternative, drought tolerant groundcover)	4
Specify variety of native and naturalized species (species from the plant list have been incorporated into the landscape design, and no invasive species are used. Refer to the Plant Species Section and the Massachusetts Prohibited Plant List)	g
Species are appropriate to the soil, site, and microclimate conditions (select appropriate species from the plant list in this guidebook)	

APPENDIX I



Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.





A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals. This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



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Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and edevelopment?
New development New development
Redevelopment
Mix of New Development and Redevelopment



Checklist for Stormwater Report

CI	necklist (continued)
en۱	Measures: Stormwater Standards require LID measures to be considered. Document what vironmentally sensitive design and LID Techniques were considered during the planning and design of project:
	No disturbance to any Wetland Resource Areas
	Site Design Practices (e.g. clustered development, reduced frontage setbacks)
	Reduced Impervious Area (Redevelopment Only)
\boxtimes	Minimizing disturbance to existing trees and shrubs
	LID Site Design Credit Requested:
	☐ Credit 1
	Credit 2
	☐ Credit 3
	Use of "country drainage" versus curb and gutter conveyance and pipe
	Bioretention Cells (includes Rain Gardens)
	Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
	Treebox Filter
	Water Quality Swale
	Grass Channel
	Green Roof
	Other (describe):
Sta	ndard 1: No New Untreated Discharges
\boxtimes	No new untreated discharges
\boxtimes	Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
\boxtimes	Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Sta	andard 2: Peak R	Rate Attenuation	
	Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding. Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.		
	Calculations provided to show that post-development peak discharge rates do not exceed pre- development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24- hour storm.		
Sta	ındard 3: Recharç	ge	
\boxtimes	Soil Analysis prov	vided.	
\boxtimes	Required Recharg	ge Volume calculation provide	d.
	Required Recharg	ge volume reduced through us	e of the LID site Design Credits.
\boxtimes	Sizing the infiltration, BMPs is based on the following method: Check the method used.		
	⊠ Static	☐ Simple Dynamic	☐ Dynamic Field¹
\boxtimes	Runoff from all im	npervious areas at the site disc	harging to the infiltration BMP.
	Runoff from all impervious areas at the site is <i>not</i> discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.		
Recharge BMPs have been sized to infiltrate the Required Recharge Volume.			Required Recharge Volume.
	Recharge BMPs have been sized to infiltrate the Required Recharge Volume <i>only</i> to the maximum extent practicable for the following reason:		
	☐ Site is comprised solely of C and D soils and/or bedrock at the land surface		
	☐ M.G.L. c. 21E	sites pursuant to 310 CMR 40	0.0000
	☐ Solid Waste L	andfill pursuant to 310 CMR 1	9.000
	Project is other practicable.	erwise subject to Stormwater M	lanagement Standards only to the maximum extent
\boxtimes	Calculations show	ving that the infiltration BMPs w	vill drain in 72 hours are provided.
	Property includes	a M.G.L. c. 21E site or a solid	waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Checklist for Stormwater Report

C	hecklist (continued)
Sta	andard 3: Recharge (continued)
	The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
	Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.
Sta	andard 4: Water Quality
	e Long-Term Pollution Prevention Plan typically includes the following: Good housekeeping practices; Provisions for storing materials and waste products inside or under cover; Vehicle washing controls; Requirements for routine inspections and maintenance of stormwater BMPs; Spill prevention and response plans; Provisions for maintenance of lawns, gardens, and other landscaped areas; Requirements for storage and use of fertilizers, herbicides, and pesticides; Pet waste management provisions; Provisions for operation and management of septic systems; Provisions for solid waste management; Snow disposal and plowing plans relative to Wetland Resource Areas; Winter Road Salt and/or Sand Use and Storage restrictions; Street sweeping schedules; Provisions for prevention of illicit discharges to the stormwater management system; Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL; Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan; List of Emergency contacts for implementing Long-Term Pollution Prevention Plan. A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent. Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge: is within the Zone II or Interim Wellhead Protection Area is near or to other critical areas. is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
	The Required Water Quality Volume is reduced through use of the LID site Design Credits.
\boxtimes	Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if

applicable, the 44% TSS removal pretreatment requirement, are provided.



Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued) Standard 4: Water Quality (continued) The BMP is sized (and calculations provided) based on: The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume. The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs. A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided. Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs) ☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report. The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted prior to the discharge of stormwater to the post-construction stormwater BMPs. The NPDES Multi-Sector General Permit does *not* cover the land use. LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan. All exposure has been eliminated. All exposure has *not* been eliminated and all BMPs selected are on MassDEP LUHPPL list. ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent. Standard 6: Critical Areas The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area. Critical areas and BMPs are identified in the Stormwater Report.



Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Sta ext	The	ard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum practicable e project is subject to the Stormwater Management Standards only to the maximum Extent acticable as a:
		Limited Project
		Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area. Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
		Bike Path and/or Foot Path
		Redevelopment Project
		Redevelopment portion of mix of new and redevelopment.
	The imp in V the and	tain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an alanation of why these standards are not met is contained in the Stormwater Report. Project involves redevelopment and a description of all measures that have been taken to rove existing conditions is provided in the Stormwater Report. The redevelopment checklist found folume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) roves existing conditions.
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Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning:
- Site Development Plan;
- Construction Sequencing Plan:
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule:
- Maintenance Schedule;
- Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

C	Checklist (continued)
S	tandard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control
	The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has <i>not</i> been included in the Stormwater Report but will be submitted <i>before</i> land disturbance begins.
	The project is <i>not</i> covered by a NPDES Construction General Permit.
	The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
\boxtimes	The SWPPP will be submitted BEFORE land disturbance begins.
St	andard 9: Operation and Maintenance Plan
\boxtimes	The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
	☑ Name of the stormwater management system owners;
	☑ Party responsible for operation and maintenance;
	⊠ Schedule for implementation of routine and non-routine maintenance tasks;
	☑ Plan showing the location of all stormwater BMPs maintenance access areas;
	□ Description and delineation of public safety features;
	□ Estimated operation and maintenance budget; and
	☑ Operation and Maintenance Log Form.
	The responsible party is not the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
	A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
	A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.
Sta	ndard 10: Prohibition of Illicit Discharges
\boxtimes	The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
	An Illicit Discharge Compliance Statement is attached;
	NO Illicit Discharge Compliance Statement is attached but will be submitted <i>prior to</i> the discharge of any stormwater to post-construction BMPs.

APPENDIX J

Operation and Maintenance Plan

Good House Keeping Measures

- 1. The parking area and driveway will receive the minimum amount of sand and salt. Snow will be stored at the locations shown on the site plan.
- 2. The site consists of mulch with trees, turf lawn, conservation and wildlife planting areas and existing wooded areas. These areas will be assessed by the owner's landscape professional to determine the minimum amounts of fertilizers, herbicides and pesticides necessary and shall only apply the minimums necessary.
- 3. The site will be stabilized with landscaped areas with mulch, conservation and wildlife areas and turf lawn. This will improve the existing site coverage.

Long Term Pollution Prevention Plan

The owner shall employ good housekeeping measures, which include removing trash and debris from the site, keeping trash in receptacles and complying with the long term operation and maintenance plan. The owner does not plan to store materials or waste products on the site.

The owner will not allow vehicles to be washed on site.

The owner will have routine inspections and maintenance completed for the Storm-water BMP's. See sheet 6 for details and schedule.

The owner will hire a licensed company to deal with any spills that may occur on the site.

The owner will employ a landscape professional to determine and apply the minimum amounts of fertilizers, herbicides and pesticides.

The site is serviced by Town water.

An onsite septic system has been proposed which will be designed and installed in compliance with Title V.

Floor drains are proposed and will b connected to Industrial Waste Water Holding Tanks.

The owner will apply the minimum amount of sand and salt necessary. The parking area will be swept immediately following the last winter sanding.

Sand piles will not be stored on site.

Operation and Maintenance Plan

An operation and maintenance schedule for the construction period and the post-development period has been provided on sheet6.

During the construction period and after completion the Owner, shall be responsible for the operation and maintenance of the site and the drainage system.

Upon completion of the construction work the property owner shall be responsible for the maintenance of the drainage facilities.

The yearly estimated operation and maintenance budget is \$4,500.00

Yearly Inspection and Maintenance Log

Page 1

Panther Way Franklin, Massachusetts

Parking Lot Sweeping - Annua	<u>illy</u>	
Date:	Performed By:	
Notes:		
Catch Basin Sumps – Inspect 4 Remove sediment when it read Remove hydrocarbons and deb	ches a depth of two feet.	
Remove hydrocarbons and det	ons when discovered.	
Date:	Performed By:	
Date:	Performed By:	***************************************
Date:	Performed By:	
Date:	Performed By:	
Notes:		
CDS Units – Inspect 4 Times property Remove sediment when it read Remove hydrocarbons and del	ches 75% capacity in the isolation sump	
itomo, o my droom oom on one		
Date:	Performed By:	
Notes:		

Remov	ceptor — Inspect 4 Times per year ve sediment when it reaches a depth of eight inches. ve hydrocarbons and debris when discovered.
Date: Date:	Performed By: Performed By: Performed By: Performed By: Performed By: S:
	ground Pond 1 – 4 times per year enance Preventative Maintenance – twice a year Inspect to insure proper functioning – after major storm events for three months after completion of construction, twice per year thereafter and when there is a discharge through the high outlet. Inspect and clean pre-treatment devices – twice per year and after major storm events.
Date:	Performed By: Performed By: Performed By: Performed By: Performed By: Performed By:
<u>Pond</u>	2 – 4 times per year Maintenance Preventative Maintenance – twice a year Inspect to insure proper functioning – after major storm events for three months after completion of construction, twice per year thereafter and when there is a discharge through the high outlet. Mow the buffer area, side slopes, remove trash and debris, remove grass clippings and accumulated organic matter – twice per year Inspect and clean pre-treatment devices – twice per year and after major storm events.
Date: Date:	Performed By: Performed By: Performed By: Performed By: Performed By:

Pond 3 – 4 times per year

- Maintenance Preventative Maintenance twice a year
- <u>Inspect to insure proper functioning after major storm events for three months after completion of construction, twice per year thereafter and when there is a discharge through the high outlet.</u>
- Mow the buffer area, side slopes, remove trash and debris, remove grass clippings and accumulated organic matter twice per year
- <u>Inspect and clean pre-treatment devices twice per year and after major storm events.</u>

Date:	Performed By:	
Date:	Performed By:	
Date:	Performed By:	
Date:	Performed By:	
Notes:		
Landscape Area Inspection – 4 time	s per year	
Date:	Performed By:	
Notes:		•

APPENDIX K

In Compliance with DEP Storm-water Management Standard 10

Washington Street – Franklin MA Map 304 Parcel 64

No Illicit discharges to the storm-water management system, including wastewater discharges and discharges of storm-water contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease are proposed and shall not be allowed.

The site map located in Appendix I shall be part of this Illicit Discharge Compliance Statement.

Franklin Flex Space, LLC, owner, will be the responsible party.

Authorize Signatory Franklin Flex Space, LLC,

APPENDIX L