Stormwater Drainage Report

<u>Appendix A – Pre- and Post Development</u> <u>Hydrologic Calculations</u>



Summary for Subcatchment E1: To Park St

Runoff =	0.02 cfs @	15.38 hrs, Vol	ume=	0.010 af,	Depth>	0.05"
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Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=3.00"

	A	rea (sf)	CN	D	escription						
		4,864	98	98 Paved parking, HSG A							
		97,188	39	>7	75% Ġras	s cover, Go	ood, HSG A				
		7,831	70	W	loods, Go	od, HSG C					
		6,510	96	G	ravel surfa	ace, HSG C					
*		717	65	La	andscape,	HSG C					
-	1	17,110	47	W	/eighted A	verage					
	1	12,246		95	5.85% Per	vious Area					
		4,864		4.	15% Impe	ervious Area	а				
	Тс	Length	Slop	е	Velocity	Capacity	Description				
(m	nin)	(feet)	(ft/ft	t)	(ft/sec)	(cfs)					
	0.3	20	0.035	0	1.21		Sheet Flow, Paved				
							Smooth surfaces n= 0.011 P2= 3.00"				
	6.8	80	0.035	0	0.20		Sheet Flow, Grass				
							Grass: Short n= 0.150 P2= 3.00"				
	1.1	84	0.036	0	1.33		Shallow Concentrated Flow, Grass				
							Short Grass Pasture Kv= 7.0 fps				
	5.4	226	0.010	0	0.70		Shallow Concentrated Flow, Grass				
							Short Grass Pasture Kv= 7.0 fps				
	2.9	86	0.010	0	0.50		Shallow Concentrated Flow, Woods				
							Woodland Kv= 5.0 fps				
1	6.5	496	Total								

Summary for Subcatchment E2: To Murdock Ave

Runoff = 0.53 cfs @ 12.09 hrs, Volume= 0.038 af, Depth> 1.38"

	Area (sf)	CN	Description					
	4,534	98	Paved parking, HSG C					
	9,678	74	75% Grass cover, Good, HSG C					
*	75	65	Landscape, HSG C					
	14,287	82	Weighted Average					
	9,753		68.26% Pervious Area					
	4,534		31.74% Impervious Area					

					MVOC - Winchendon	
MVOC	Winche	ndon 3	.25.21		Type III 24-hr 2-Year Rainfall=3.00'	
Prepare	d bv Ber	kshire D	esian Gra	aud	Printed 4/1/2021	
HydroCA	D® 10.00-	-15 s/n 00	0752 © 201	5 HydroCAI	D Software Solutions LLC Page 3	
Tc	Length	Slope	Velocity	Capacity	Description	
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	·	
6.0	76	0.0428	0.21		Sheet Flow, Grass	
					Grass: Short n= 0.150 P2= 3.00"	
			_			
			Summa	ry for Su	bcatchment E3: To Oak St	
Runoff	=	1.61 cfs	s@ 12.1	1 hrs, Volu	me= 0.121 af, Depth> 1.74"	
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=3.00"						
A	rea (sf)	CN D	escription			
	17,165	98 P	aved park	ing, HSG C		
	2,723	96 G	Gravel surfa	ace, HSG C		
	16,600	74 >	75% Gras	s cover, Go	bod, HSG C	
	36,488	87 V	Veighted A	verage		
	19,323	5	2.96% Pei	vious Area		
	17,165	4	7.04% Imp	pervious Ar	ea	
Тс	Length	Slope	Velocity	Capacity	Description	
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	•	
6.6	70	0.0290	0.18		Sheet Flow, Grass	
					Grass: Short n= 0.150 P2= 3.00"	
1.0	78	0.0064	1.29		Shallow Concentrated Flow, Gravel Unpaved Kv= 16.1 fps	

7.6 148 Total

Summary for Subcatchment P1A: Toward DB#1

Runoff = 0.68 cfs @ 12.13 hrs, Volume= 0.053 af, Depth> 1.51"

	Area (sf)	CN	Description			
	1,900	98	Unconnected pavement, HSG C			
	6,497	98	Water Surface, HSG C			
	7,740	74	75% Grass cover, Good, HSG C			
*	493	77	Stone Dust, HSG C			
*	1,720	65	Landscape, HSG C			
	18,350	84	Weighted Average			
	9,953		54.24% Pervious Area			
	8,397		45.76% Impervious Area			
	1,900		22.63% Unconnected			

муос	Winche	endon 3	.25.21		MVOC - Winchendon "Type III 24-hr 2-Year Rainfall=3.00
Prepare	ed by Ber	kshire D	esign Gro	bup	Printed 4/1/2021
HydroCA	D® 10.00-	-15 s/n 00	0752 © 201	15 HydroCA	D Software Solutions LLC Page 4
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	73	0.0170	0.14		Sheet Flow, Grass
					Grass: Short n= 0.150 P2= 3.00"
0.3	13	0.0165	0.82		Sheet Flow, Paved
0.1	40	0 1000	1 71		Smooth surfaces n= 0.011 P2= 3.00"
0.1	40	0.1000	4.74		Grassed Waterway Ky= 15.0 fps
8.8	126	Total			
		-			
		Sı	ummary	for Subc	atchment P1B: Toward DB#2
Runoff	=	1.70 cfs	s@ 12.1	4 hrs, Volu	me= 0.139 af, Depth> 1.66"
Dupoff k		2 20 mot		SCS Woiak	ated CNL Time Span= 0.00.24.00 brs. dt= 0.01 brs
Type III	74-hr 2-Y	(ear Rain	nou, 0n-c fall=3 00"	scs, weigi	100-24.00 ms, $00-24.00$ ms, $00-24.00$ ms, $00-100$ ms
. ype m		ear rain			
A	vrea (sf)	CN D	escription		
	5,025	98 L	Inconnecte	ed paveme	nt, HSG C
	13,429	98 F	Roofs, HSC	G C	
	4,779	98 V	Vater Surfa	ace, HSG C	;
*	15,611	/4 >	75% Gras	s cover, Go	bod, HSG C
*	534 1112	65 1	andecane		
	4,442	00 L	Anuscape,		
	43,020	00 V	6 08% Do	werage	
	20,007	5	3.02% Imr	nervious Ar	-
	5,025	2	1.63% Un	connected	
	,				
Тс	Length	Slope	Velocity	Capacity	Description
<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)	(cfs)	
10.1	100	0.0200	0.16		Sheet Flow, Grass
0.2	40	0.0500	3 35		Grass: Short h= 0.150 P2= 3.00 Shallow Concentrated Flow Grass
0.2	40	0.0500	0.00		Grassed Waterway Kv= 15.0 fps
10.3	140	Total			
			Summa	ry for Su	bcatchment P1C: To CB#8
[45] Hin	t: Runoff=	Zero		-	
[]					
Runoff	=	0.00 cfs	s@ 0.0	0 hrs, Volu	me= 0.000 af, Depth= 0.00"

MVOC - Winchendon *Type III 24-hr 2-Year Rainfall=3.00"* Printed 4/1/2021 LLC Page 5

MVOC Winchendon 3.25.21

Prepared by Berkshire Design Group HydroCAD® 10.00-15 s/n 00752 © 2015 HydroCAD Software Solutions LLC

A	rea (sf)	CN	Description		
	126	98	Unconnecte	ed pavemei	nt, HSG C
	5,038	39	>75% Gras	s cover, Go	ood, HSG A
	5,164	40	Weighted A	verage	
	5,038		97.56% Pei	rvious Area	
	126		2.44% Impe	ervious Are	а
	126		100.00% U	nconnected	l
Ŧ	1			0	Description
IC	Length	Siope	velocity	Capacity	Description
<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)	(cfs)	
10.2	94	0.0175	0.15		Sheet Flow, Grass
					Grass: Short n= 0.150 P2= 3.00"
0.8	45	0.0175	0.93		Shallow Concentrated Flow, Grass
					Short Grass Pasture Kv= 7.0 fps
11.0	139	Total			

Summary for Subcatchment P1D: To CB#4

Runoff = 0.55 cfs @ 12.07 hrs, Volume= 0.041 af, Depth> 2.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=3.00"

Ar	ea (sf)	CN	Description		
	7,805	98	Paved park	ing, HSG C	
	302	74	>75% Gras	s cover, Go	bod, HSG C
	8,107	97	Weighted A	verage	
	302		3.73% Perv	vious Area	
	7,805		96.27% Imp	pervious Ar	ea
_		~		• •	-
IC	Length	Slop	e Velocity	Capacity	Description
<u>(min)</u>	(feet)	(ft/fl) (ft/sec)	(cfs)	
5.0					Direct Entry, Min Tc

Summary for Subcatchment P1E: To CB #6

Runoff = 0.10 cfs @ 12.07 hrs, Volume= 0.008 af, Depth> 2.77"

Area (sf)	CN	Description
1,436	98	Paved parking, HSG C
1,436		100.00% Impervious Area

муос	Winche	endon 3	3.25.21				Type III 24-hi	MVOC - Winche r 2-Year Rainfall=
Prepare HydroCA	d by Ber	kshire E	Design Gr	oup 15 HydroCA	D Software	Solutions I		Printed 4/1/
IIJUIOCA		-15 3/110	0152 @ 20		Dontware			Γ¢
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Descripti	on		
5.0	(1001)	(1011)	(14000)	(010)	Direct E	ntry, Min	Тс	
			Summa	ry for Sul	bcatchm	ent P1F	: To FES#4	
[45] Hint	: Runoff=	Zero						
Runoff	=	0.00 cf	fs @ 0.0	0 hrs, Volu	ime=	0.000 a	af, Depth= 0.0	00"
Runoff b Type III 2	y SCS TI 24-hr 2-भ	R-20 met ∕ear Rair	thod, UH=: nfall=3.00"	SCS, Weigł	nted-CN, T	ime Span	= 0.00-24.00 h	nrs, dt= 0.01 hrs
А	rea (sf)	CN /	Adj Des	cription				
	525	98	Unc	onnected pa	avement, H	ISG A		
	<u>10,141</u>	39	>75 40 Wai	<u>% Grass co</u>	ver, Good,	HSG A		
	10,000	42	40 vver 95.0	18% Perviou	ige, Of Auj is Area	usied		
	525		4.92	% Impervio	us Area			
	525		100.	.00% Uncor	nnected			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Descripti	on		
11.2	114	0.0200	0.17		Sheet FI Grass: S	ow, Gras s hort n= 0	s 0.150 P2= 3.0	00"
			Summa	ary for Su	bcatchm	nent P1G	6: To CB#5	
Runoff	=	0.16 cf	fs @ 12.0)7 hrs, Volu	ime=	0.011 a	af, Depth> 2.4	45"
D (()	000 T							
Runoff b Type III 2	y SCS 11 24-hr 2-1	R-20 met /ear Rair	nfall=3.00"	SCS, Weigh	ited-CN, I	ime Span	= 0.00-24.00 h	rs, dt= 0.01 hrs
А	rea (sf)	CN [Descriptior	ı				
	2,082	98 F	Paved park	king, HSG C	;			
	310	74 >	>75% Gras	ss cover, Go	ood, HSG	C		
	2,392	95 \ 1	Veighted A	Average				
	2,082	8	37.04% Im	pervious Area	ea			
Тс	Length	Slope	Velocity	Capacity	Descripti	on		
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)			_	
5.0					Direct E	ntry, Min ˈ	TC	

Summary for Subcatchment P1H: To Park St

Runoff	=	0.00 cfs @	22.34 hrs,	Volume=	0.001 af, I	Depth> 0.01"
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Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=3.00"

A	rea (sf)	CN [Description							
	853	98 F	98 Paved parking, HSG A							
	56,917	39 >	⊳75% Ġras	s cover, Go	ood, HSG A					
	6,352	70 V	Voods, Go	od, HSG C						
	64,122	43 V	Veighted A	verage						
	63,269	ç	98.67% Pei	vious Area						
	853	1	l.33% Impe	ervious Area	а					
Тс	Length	Slope	Velocity	Capacity	Description					
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)						
8.1	100	0.0350	0.21		Sheet Flow, Grass					
					Grass: Short n= 0.150 P2= 3.00"					
1.1	84	0.0360	1.33		Shallow Concentrated Flow, Grass					
					Short Grass Pasture Kv= 7.0 fps					
5.8	245	0.0100	0.70		Shallow Concentrated Flow, Grass					
					Short Grass Pasture Kv= 7.0 fps					
2.9	86	0.0100	0.50		Shallow Concentrated Flow, Woods					
					Woodland Kv= 5.0 fps					
17.9	515	Total								

Summary for Subcatchment P2: To Murdock Ave

Runoff	=	0.23 cfs @	12.07 hrs,	Volume=	0.016 af, Depth>	> 2.35"
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A	rea (sf)	CN	Description			
	3,356	98	Paved park	ing, HSG A	N N	
	223	39	>75% Gras	s cover, Go	ood, HSG A	
	3,579	94	Weighted A	verage		
	223		6.23% Perv	vious Area		
	3,356		93.77% Imp	pervious Ar	ea	
_				-		
Tc	Length	Slop	e Velocity	Capacity	Description	
(min)	(feet)	(ft/fl) (ft/sec)	(cfs)		
5.0					Direct Entry, Min Tc	

Summary for Subcatchment P3: To Oak St

Runoff = 0.39 cfs @ 12.08 hrs, Volume= 0.027 af, Depth> 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=3.00"

	Area (sf)	CN	Description		
	3,655	98	Paved park	ing, HSG C	C
	161	96	Gravel surfa	ace, HSG C	C
*	956	65	Landscape	, HSG C	
	4,826	74	>75% Gras	s cover, Go	bod, HSG C
	9,598	83	Weighted A	verage	
	5,943		61.92% Pe	rvious Area	ì
	3,655		38.08% Imp	pervious Are	ea
				_	
T	c Length	Slop	e Velocity	Capacity	Description
(mir	n) (feet)	(ft/f	i) (ft/sec)	(cfs)	
5.	0				Direct Entry, Min Tc

Summary for Reach CP-E1: Park St

[40] Hint: Not Described (Outflow=Inflow)

Inflow A	Area	=	2.688 ac,	4.15% Imperviou	s, Inflow Depth >	0.0	5" for 2-Y	′ear event
Inflow		=	0.02 cfs @	15.38 hrs, Volun	ne= 0.010) af		
Outflov	N	=	0.02 cfs @	15.38 hrs, Volun	ne= 0.010) af, .	Atten= 0%,	Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach CP-E2: Murdock Ave

[40] Hint: Not Described (Outflow=Inflow)

Inflow A	rea =	0.328 ac, 3	1.74% Imp	ervious,	Inflow [Depth >	1.38"	for 2-Y	'ear ever	nt
Inflow	=	0.53 cfs @	12.09 hrs,	Volume	=	0.038 a	af			
Outflow	=	0.53 cfs @	12.09 hrs,	Volume	=	0.038 a	af, Att	en= 0%,	Lag= 0.0	0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach CP-E3: Oak St

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	0.838 ac, 4	7.04% Imp	ervious,	Inflow De	epth > 1	.74" fo	or 2-Y	'ear even	nt
Inflow	=	1.61 cfs @	12.11 hrs,	Volume	=	0.121 af				
Outflow	=	1.61 cfs @	12.11 hrs,	Volume	=	0.121 af	, Atten=	= 0%,	Lag= 0.0) min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach CP-P1: To Park St

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	3.537 ac, 2	28.86% Imp	ervious,	Inflow De	epth >	0.0	0" for 2	2-Yea	r event	
Inflow	=	0.00 cfs @	22.34 hrs,	Volume	=	0.001 a	af				
Outflow	=	0.00 cfs @	22.34 hrs,	Volume	=	0.001 a	af, <i>i</i>	Atten= 09	%, La	ag= 0.0	min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach CP-P2: Murdock Ave

[40] Hint: Not Described (Outflow=Inflow)

Inflow A	vrea =	0.082 ac, 93.77% Impervious, I	nflow Depth > 2.3	5" for 2-Year event
Inflow	=	0.23 cfs @ 12.07 hrs, Volume=	0.016 af	
Outflow	=	0.23 cfs @ 12.07 hrs, Volume=	0.016 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach CP-P3: Oak St

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	0.220 ac,	38.08% Impe	ervious,	Inflow De	epth >	1.45"	for 2-Y	ear even	t
Inflow	=	0.39 cfs @	12.08 hrs,	Volume	=	0.027 a	ıf			
Outflow	=	0.39 cfs @	12.08 hrs,	Volume	=	0.027 a	if, At	ten= 0%,	Lag= 0.0) min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Pond #4: CB#4

[57] Hint: Peaked at 998.40' (Flood elevation advised)

Inflow Area	ı =	0.519 ac, 5	52.42% Impe	ervious,	Inflow Depth >	1.3	9" for 2-Y	ear event
Inflow	=	0.81 cfs @	12.07 hrs,	Volume	= 0.06) af		
Outflow	=	0.81 cfs @	12.07 hrs,	Volume	= 0.06) af, 1	Atten= 0%,	Lag= 0.0 min
Primary	=	0.81 cfs @	12.07 hrs,	Volume	= 0.06) af		-

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 998.40' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	997.90'	12.0" Round Culvert L= 186.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 997.90' / 996.50' S= 0.0075 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.81 cfs @ 12.07 hrs HW=998.40' TW=997.25' (Dynamic Tailwater) ←1=Culvert (Outlet Controls 0.81 cfs @ 3.03 fps)

Summary for Pond #5: CB#5

[57] Hint: Peaked at 998.66' (Flood elevation advised)

Inflow Are	ea =	0.055 ac, 8	37.04% Imperviou	us, Inflow De	pth > 2.45	" for 2-Y	'ear event
Inflow	=	0.16 cfs @	12.07 hrs, Volu	me=	0.011 af		
Outflow	=	0.16 cfs @	12.07 hrs, Volu	me=	0.011 af, A	tten= 0%,	Lag= 0.0 min
Primary	=	0.16 cfs @	12.07 hrs, Volu	me=	0.011 af		-

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 998.66' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	998.43'	12.0" Round Culvert L= 57.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 998.43' / 998.00' S= 0.0075 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.16 cfs @ 12.07 hrs HW=998.66' TW=998.40' (Dynamic Tailwater)

Summary for Pond #6: CB#6

[57] Hint: Peaked at 999.34' (Flood elevation advised)

Inflow Area	a =	0.278 ac,	16.20% Imp	ervious,	Inflow De	epth >	0.33"	for 2-Y	ear ever	nt
Inflow	=	0.10 cfs @	12.07 hrs,	Volume	=	0.008	af			
Outflow	=	0.10 cfs @	12.07 hrs,	Volume	=	0.008	af, Att	en= 0%,	Lag= 0.	0 min
Primary	=	0.10 cfs @	12.07 hrs,	Volume	=	0.008	af		-	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 999.34' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	999.17'	12.0" Round Culvert L= 142.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 999.17' / 998.00' S= 0.0082 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.10 cfs @ 12.07 hrs HW=999.34' TW=998.40' (Dynamic Tailwater) -1=Culvert (Outlet Controls 0.10 cfs @ 1.76 fps)

Summary for Pond CA1: Containment Area @ FES #4

Inflow Area	ı =	0.245 ac, 4	4.92% Impervious,	Inflow Depth = 0	.00" for 2-Y	ear 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
Primary	=	0.00 cfs @	0.00 hrs, Volume	= 0.000 af		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 1,000.00'@ 0.00 hrs Surf.Area= 20 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow) Center-of-Mass det. time= (not calculated: no inflow)

Volume	Inv	ert Avail	.Storage	Storage Descript	ion		
#1	1,000.0	00'	845 cf	Custom Stage D	Data (Irregular)Lis	ted below (Recalc)	
Elevatio (feet	n t)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
1,000.0 1,001.0 1,001.5	0 0 0	20 709 1,601	16.0 156.0 266.0	0 283 563	0 283 845	20 1,938 5,634	
Device	Routing	Inv	vert Outle	et Devices			
#1	Primary	999	.95' 12.0 L= 9 Inlet n= 0	Round Culvert 0.0' CPP, mitered / Outlet Invert= 99 .012, Flow Area=	d to conform to fill, 99.95' / 999.27' S 0.79 sf	Ke= 0.700 = 0.0076 '/' Cc= 0	.900

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,000.00' TW=999.17' (Dynamic Tailwater) **1=Culvert** (Passes 0.00 cfs of 0.01 cfs potential flow)

Summary for Pond CA2: Containment Area @ CB#8

Inflow Area	ı =	0.119 ac,	2.44% Impervious, Inflov	w Depth = $0.00"$	for 2-Year event
Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atte	en= 0%, Lag= 0.0 min
Discarded	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Primary	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 999.25' @ 0.00 hrs Surf.Area= 16 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow) Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	999.25'	1,384 cf	Custom Stage Data (Irregular)Listed below (Recalc)

MVOC Wi Prepared b	i nchend by Berksł	Ion 3.25 hire Desig	5.21 gn Grou	p	Type I	MVOC II 24-hr 2-Year F Prir	- Winchendon R <i>ainfall=3.00</i> nted 4/1/2021
<u>HydroCAD®</u>	10.00-15	s/n 00752	2 © 2015	HydroCAD Software	e Solutions LLC		Page 12
Elevation (feet)	Su	ırf.Area (sq-ft)	Perim (feet	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
999.25		16	16.0) 0	0	16	
1,001.00		1,931	290.0) 1,204	1,384	6,694	
Device Ro	outing	Inv	ert Ou	tlet Devices			
#1 Pr	imary	997.	70' 8.0 L= Inle n=	" Round Culvert 162.0' CPP, squa et / Outlet Invert= 99 0.012, Flow Area=	re edge headwall, 97.70' / 996.50' S : 0.35 sf	Ke= 0.500 S= 0.0074 '/' Cc=	0.900
#2 Di	scarded	999.2	25' 8.2	70 in/hr Exfiltratio	n over Surface a	irea	

Conductivity to Groundwater Elevation = 0.00'

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=9999.25' (Free Discharge) **2=Exfiltration** (Passes 0.00 cfs of 0.00 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=999.25' TW=996.50' (Dynamic Tailwater) **1=Culvert** (Passes 0.00 cfs of 1.35 cfs potential flow)

Summary for Pond DB1: Detention/ Infiltration Basin #1

Inflow Area	ı =	2.065 ac, 4	8.48% Imp	ervious, Infle	ow Depth >	1.13"	for 2-Ye	ar event
Inflow	=	2.58 cfs @	12.16 hrs,	Volume=	0.195	af		
Outflow	=	0.27 cfs @	13.06 hrs,	Volume=	0.195	af, Atte	en= 89%,	Lag= 53.9 min
Discarded	=	0.27 cfs @	13.06 hrs,	Volume=	0.195	af		-
Primary	=	0.00 cfs @	0.00 hrs,	Volume=	0.000	af		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 997.35' @ 13.06 hrs Surf.Area= 4,856 sf Storage= 3,669 cf

Plug-Flow detention time= 129.7 min calculated for 0.195 af (100% of inflow) Center-of-Mass det. time= 129.5 min (940.6 - 811.1)

Volume	Inv	ert Ava	il.Storage	Storage Description	on		
#1	996.	50'	13,617 cf	Custom Stage Da	ata (Irregular) Liste	ed below (Recalc)	
Elevatic (fee	on et)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
996.5	50	3,796	263.0	0	0	3,796	
997.0	00	4,404	283.0	2,048	2,048	4,676	
998.0	00	5,755	324.0	5,064	7,113	6,679	
998.5	50	6,497	344.0	3,061	10,174	7,755	
999.0	00	7,285	364.0	3,444	13,617	8,896	
Device	Routing	In	vert Outle	et Devices			
#1	Primary	998	3.50' 20.0 Head 2.50 Coel	' long x 5.0' bread d (feet) 0.20 0.40 3.00 3.50 4.00 4 f. (English) 2.34 2	Ith Broad-Creste 0.60 0.80 1.00 1.50 5.00 5.50 .50 2.70 2.68 2.6	d Rectangular Weir 1.20 1.40 1.60 1.80 68 2.66 2.65 2.65 2.	2.00 65

		MVOC - Wi	nchendon
MVOC Winchendon 3.25.21	Type III 24-hr	2-Year Rain	fall=3.00"
Prepared by Berkshire Design Group		Printed	4/1/2021
HydroCAD® 10.00-15 s/n 00752 © 2015 HydroCAD Software Solutions	s LLC		Page 13
265 267 266 268 270 27	7/ 279 288		

			2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88	
#2	Discarded	996.50'	2.410 in/hr Exfiltration over Surface area	
			Conductivity to Groundwater Elevation = 0.00'	Phase-In= 0.01'

Discarded OutFlow Max=0.27 cfs @ 13.06 hrs HW=997.35' (Free Discharge) **2=Exfiltration** (Controls 0.27 cfs)

Summary for Pond DB2: Detention/ Infiltration Basin #2

Inflow Area	ı =	1.643 ac, 4	9.18% Impe	ervious, I	nflow Depth >	1.4	5" for	2-Ye	ar event	
Inflow	=	2.32 cfs @	12.12 hrs,	Volume=	0.199	af				
Outflow	=	2.03 cfs @	12.18 hrs, 1	Volume=	0.198	af,	Atten=	13%,	Lag= 4.0 r	nin
Discarded	=	0.07 cfs @	12.18 hrs, 1	Volume=	0.056	af				
Primary	=	1.96 cfs @	12.18 hrs, 1	Volume=	0.142	af				

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 997.40' @ 12.18 hrs Surf.Area= 1,177 sf Storage= 732 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow) Center-of-Mass det. time= 24.1 min (834.1 - 809.9)

Volume	Inve	rt Avai	I.Storage	e Storage Description						
#1	996.50	כ'	5,448 cf	Custom Stage Da	ata (Irregular) Liste	d below (Recalc)				
Elevatio (fee	n S t)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)				
996.5 997.0 998.0 998.5 999.0	0 0 0 0 0 0	471 865 1,744 3,142 7,738	90.0 130.0 208.0 246.0 408.0	0 329 1,279 1,204 2,635	0 329 1,608 2,813 5,448	471 1,173 3,278 4,656 13,088				
Device	Routing	In	vert Outle	Outlet Devices						
#1 Primary		996.50' 18 L= In		18.0" Round Culvert L= 30.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 996.50' / 996.50' S= 0.0000 '/' Cc= 0.900						
#2	Discardeo	r ∍d 996.50' 2 (n= 0.012, Flow Area= 1.77 st 2.410 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 0.00'						

Discarded OutFlow Max=0.07 cfs @ 12.18 hrs HW=997.40' (Free Discharge) **2=Exfiltration** (Controls 0.07 cfs)

Primary OutFlow Max=1.96 cfs @ 12.18 hrs HW=997.40' TW=996.94' (Dynamic Tailwater) ☐ 1=Culvert (Barrel Controls 1.96 cfs @ 2.55 fps)

Summary for Subcatchment E1: To Park St

Runoff = 0.38 cfs @ 12.48 hrs, Volume= 0.083 af, Depth> 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=4.50"

	A	rea (sf)	CN	Description		
		4,864	98	Paved park	ing, HSG A	N Contraction of the second seco
		97,188	39	>75% Ġras	s cover, Go	ood, HSG A
		7,831	70	Woods, Go	od, HSG C	
		6,510	96	Gravel surfa	ace, HSG C	
*		717	65	Landscape,	HSG C	
	1	17,110	47	Weighted A	verage	
	1	12,246		95.85% Pei	vious Area	
		4,864		4.15% Impe	ervious Area	а
	Тс	Length	Slope	e Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)) (ft/sec)	(cfs)	
	0.3	20	0.0350) 1.21		Sheet Flow, Paved
						Smooth surfaces n= 0.011 P2= 3.00"
	6.8	80	0.0350	0.20		Sheet Flow, Grass
						Grass: Short n= 0.150 P2= 3.00"
	1.1	84	0.0360) 1.33		Shallow Concentrated Flow, Grass
						Short Grass Pasture Kv= 7.0 fps
	5.4	226	0.0100) 0.70		Shallow Concentrated Flow, Grass
						Short Grass Pasture Kv= 7.0 fps
	2.9	86	0.0100) 0.50		Shallow Concentrated Flow, Woods
						Woodland Kv= 5.0 fps
	16.5	496	Total			

Summary for Subcatchment E2: To Murdock Ave

Runoff = 1.01 cfs @ 12.09 hrs, Volume= 0.072 af, Depth> 2.63"

	Area (sf)	CN	Description
	4,534	98	Paved parking, HSG C
	9,678	74	>75% Grass cover, Good, HSG C
*	75	65	Landscape, HSG C
	14,287	82	Weighted Average
	9,753		68.26% Pervious Area
	4,534		31.74% Impervious Area

					MVOC - Winchendon
MVOC	Winche	endon 3	.25.21		Type III 24-hr 10-Year Rainfall=4.50'
Prepare	d by Ber	kshire D	esign Gro	oup	Printed 4/1/2021
<u>HydroCA</u>	D® 10.00	-15 s/n 00	0752 © 201	15 HydroCA	D Software Solutions LLC Page 15
_					
IC (min)	Length	Slope	Velocity	Capacity	Description
				(015)	Sheet Flow, Croop
0.0	70	0.0428	0.21		Sheet Flow, Grass Grass: Short $n=0.150$ P2= 3.00"
					Glass. Short II- 0.150 FZ- 5.00
			Summa	ry for Su	bcatchment E3: To Oak St
				,	
Runoff	=	2.84 cfs	s@ 12.1	1 hrs, Volu	Ime= 0.216 af, Depth> 3.09"
	000 T				
Runoff b	y SCS II	R-20 met	hod, UH=S	SCS, Weigh	nted-CN, Time Span= $0.00-24.00$ hrs, dt= 0.01 hrs
туре п	24-11 10-		10111-4.50		
А	rea (sf)	CN D	escription		
	17,165	98 P	aved park	ing, HSG C	
	2,723	96 G	Gravel surfa	ace, HSG (2
	16,600	74 >	75% Gras	s cover, Go	bod, HSG C
	36,488	87 V	Veighted A	verage	
	19,323	5	2.96% Pe	rvious Area	l
	17,165	4	7.04% Imp	pervious Ar	ea
Тс	l enath	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	Decemption
6.6	70	0.0290	0.18		Sheet Flow, Grass
					Grass: Short n= 0.150 P2= 3.00"
1.0	78	0.0064	1.29		Shallow Concentrated Flow, Gravel
					Unpaved Kv= 16.1 fps
7.6	148	Total			

Summary for Subcatchment P1A: Toward DB#1

Runoff = 1.26 cfs @ 12.12 hrs, Volume= 0.099 af, Depth> 2.81"

	Area (sf)	CN	Description
	1,900	98	Unconnected pavement, HSG C
	6,497	98	Water Surface, HSG C
	7,740	74	>75% Grass cover, Good, HSG C
*	493	77	Stone Dust, HSG C
*	1,720	65	Landscape, HSG C
	18,350	84	Weighted Average
	9,953		54.24% Pervious Area
	8,397		45.76% Impervious Area
	1,900		22.63% Unconnected

							MVC	DC - Winchendon
MVOC	Winche	endon 3	.25.21			Type III 2-	4-hr 10-Ye	ar Rainfall=4.50"
Prepare	d by Ber	kshire D	esign Gro	oup				Printed 4/1/2021
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								-
Тс	Length	Slope	Velocity	Capacity	Description	ו		
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)				
8.4	73	0.0170	0.14		Sheet Flow	w, Grass		
					Grass: Sho	ort_n= 0.150 P2	2= 3.00"	
0.3	13	0.0165	0.82		Sheet Flow	w, Paved		
0.4	10	0 4000	4 7 4		Smooth su	rfaces n= 0.011	P2= 3.00"	
0.1	40	0.1000	4.74		Shallow C	oncentrated Flo	w, Grass	
	100	Tatal			Grassed v	/aterway KV=15	b.0 fps	
8.8	120	lotal						
		Sı	ummary	for Subc	atchment	P1B: Toward	DB#2	
Runoff	=	3.04 cf	s@. 12.1	4 hrs, Volu	ıme=	0.251 af, Depth	> 3.00"	
			U	,		- , ,		
Runoff b	y SCS TF	R-20 met	hod, UH=S	SCS, Weigh	nted-CN, Tim	ne Span= 0.00-24	.00 hrs, dt=	0.01 hrs
Type III 2	24-hr 10-	Year Ra	infall=4.50	"				
٨	raa (af)) o o o rintion					
A			Description					
	5,025	98 U		ed pavemei	nt, HSG C			
	13,429	90 F 08 V	Votor Surf					
	15 611	74 >	75% Gras	s cover Go	od HSG C			
*	534	77 S	Stone Dust	HSG C				
*	4,442	65 L	andscape	HSGC				
	43,820	86 V	Veighted A	verage				
	20,587	4	6.98% Pe	rvious Area	I			
	23,233	5	3.02% Imp	pervious Ar	ea			
	5,025	2	1.63% Un	connected				
Тс	Lonath	Slone	Velocity	Canacity	Description			
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	Description	1		
10 1	100	0.0200	0.16	(010)	Sheet Flor	w Grass		
10.1	100	0.0200	0.10		Grass: Sho	ort $n = 0.150 P2$	2= 3.00"	
0.2	40	0.0500	3.35		Shallow C	oncentrated Flo	w. Grass	
					Grassed W	/aterway Kv= 15	5.0 fps	
10.3	140	Total						
			0		h a at a h :		-40	
			Summa	ry tor Su	bcatchme	ent P1C: 10 CE	5#ð	

Runoff = 0.00 cfs @ 13.85 hrs, Volume= 0.001 af, Depth> 0.14"

MVOC - Winchendon Type III 24-hr 10-Year Rainfall=4.50" Printed 4/1/2021 HydroCAD® 10.00-15 s/n 00752 © 2015 HydroCAD Software Solutions LLC Page 17

MVOC Winchendon 3.25.21 Prepared by Berkshire Design Group

A	rea (sf)	CN	Description		
	126	98	Unconnecte	ed pavemei	nt, HSG C
	5,038	39	>75% Gras	s cover, Go	bod, HSG A
	5,164	40	Weighted A	verage	
	5,038		97.56% Pei	rvious Area	
	126		2.44% Impe	ervious Are	а
	126		100.00% U	1	
Тс	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
10.2	94	0.0175	0.15		Sheet Flow, Grass
					Grass: Short n= 0.150 P2= 3.00"
0.8	45	0.0175	0.93		Shallow Concentrated Flow, Grass
					Short Grass Pasture Kv= 7.0 fps
11.0	139	Total			

Summary for Subcatchment P1D: To CB#4

Runoff = 0.84 cfs @ 12.07 hrs, Volume= 0.064 af, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=4.50"

Ar	ea (sf)	CN	Description	Description							
	7,805	98	Paved park	ing, HSG C							
	302	74	>75% Gras	s cover, Go	bod, HSG C						
	8,107	97	Weighted A	verage							
	302		3.73% Pervious Area								
	7,805	96.27% Impervious Area									
Тс	Length	Slop	e Velocity	Capacity	Description						
(min)	(feet)	(ft/f	t) (ft/sec)	(cfs)							
5.0					Direct Entry, Min Tc						
			-								

Summary for Subcatchment P1E: To CB #6

Runoff 0.15 cfs @ 12.07 hrs, Volume= 0.012 af, Depth> 4.26" =

Area (sf)	CN	Description
1,436	98	Paved parking, HSG C
1,436		100.00% Impervious Area

		-							_			M	VOC -	Winchendo
MVOC	Winche	endon	3.25	.21					Ту	pe III	24-hr	10-Y	ear R	ainfall=4.5
Prepare	d by Ber	kshire	Desi	gn Gro	pup					-			Print	ed 4/1/202
<u>HydroCA</u>	D® 10.00-	-15 s/n	00752	© 201	15 HydroC) Softwar	e Solu	itions LL	<u>.C</u>				Page 1
Tc (min)	Length (feet)	Slop (ft/ft	e Ve	elocity t/sec)	Capacit (cfs	y s)	Descrip	tion						
5.0			<u> </u>	,		,	Direct I	Entry,	, Min To	С				
			Su	mma	ry for S	ub	catchr	nent	P1F:	To Fl	ES#4			
Runoff	=	0.00	cfs @	13.8	5 hrs, Vo	olur	ne=	0	.003 af	, Dep	th> 0.	14"		
Runoff b Type III 2	y SCS TF 24-hr 10-	R-20 m Year R	ethod, lainfal	, UH=8 I=4.50	SCS, Wei "	ght	ted-CN,	Time	Span=	0.00-2	24.00 ł	nrs, dt	= 0.01	hrs
А	rea (sf)	CN	Adi	Desc	cription									
	525	98		Unco	onnected	pa	vement,	HSG	А					
	10,141	39		>75%	% Grass	cov	er, Goo	d, HS	G A					
	10,666	42	40	Weig	phted Ave	era	ge, UI A	djuste	ed					
	10,141			95.0	8% Pervi	ous	s Area							
	525 525			4.92	% Imperv 00% Unc	/10L	is Area							
	020			100.		om								
Tc (min)	Length (feet)	Slop (ft/fl	e Ve :) (f	elocity t/sec)	Capacit (cfs	:y s)	Descrip	tion						
11.2	114	0.020	0	0.17			Sheet F	low ,	Grass	150 E	2) 2) = 3 (<u>ו</u> חר		
							01000.	Short	n= 0.1	100 1	2-0.0	50		
			Su	mma	ry for S	Sub	ocatch	ment	t P1G:	To C	CB#5			
Runoff	=	0.24	cfs @	12.0	7 hrs, Vo	olur	ne=	0	.018 af	, Dep	th> 3.	92"		
Runoff b Type III :	y SCS TF 24-hr 10-	R-20 m Year R	ethod, lainfal	, UH=S I=4.50	SCS, Wei "	ght	ted-CN,	Time	Span=	0.00-2	24.00 ł	nrs, dt	= 0.01	hrs
А	rea (sf)	CN	Desc	ription										
	2,082	98	Pave	d park	ing, HSG	i C								
	310	74	>75%	6 Ġras	s cover, (God	od, HSG	С						
	2,392	95	Weig	hted A	verage									
	310		12.96	3% Pei	rvious Ar	ea								
	2,082		87.04	1% Imp	pervious	Are	a							
Тс	Lenath	Slop	e Ve	locity	Capacit	V	Descrip	tion						
(min)	(feet)	(ft/ft	:) (f	t/sec)	cfs	ś)								
5.0							Direct I	Entry,	, Min Te	С				

Summary for Subcatchment P1H: To Park St

Runoff = 0.07 cfs @ 12.61 hrs, Volume= 0.027 af, Depth> 0.22"

MVOC - Winchendon *Type III 24-hr 10-Year Rainfall=4.50"* Printed 4/1/2021 S LLC <u>Page 19</u>

MVOC Winchendon 3.25.21

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_	A	rea (sf)	CN [Description			
		853	98 F	Paved park	ing, HSG A	N	
		56,917	39 >	•75% Gras	s cover, Go	bod, HSG A	
_		6,352	70 V	Voods, Go	od, HSG C		
		64,122	43 V	Veighted A	verage		
		63,269	ç	98.67% Pei	rvious Area		
		853	1	.33% Impe	ervious Area	а	
			~		a 14	–	
	IC	Length	Slope	Velocity	Capacity	Description	
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)		
	8.1	100	0.0350	0.21		Sheet Flow, Grass	
						Grass: Short n= 0.150 P2= 3.00"	
	1.1	84	0.0360	1.33		Shallow Concentrated Flow, Grass	
						Short Grass Pasture Kv= 7.0 fps	
	5.8	245	0.0100	0.70		Shallow Concentrated Flow, Grass	
						Short Grass Pasture Kv= 7.0 fps	
	2.9	86	0.0100	0.50		Shallow Concentrated Flow, Woods	
_						Woodland Kv= 5.0 fps	
	470	<i>ГАГ</i>	Tatal				

17.9 515 Total

Summary for Subcatchment P2: To Murdock Ave

Runoff = 0.36 cfs (a) 12.07 hrs, Volume= 0.026 at, Depth	· 3.81"
--------------------------------------------------------------	---------

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=4.50"

A	rea (sf)	CN	Description							
	3,356	98	Paved parking, HSG A							
	223	39	>75% Gras	s cover, Go	bod, HSG A					
	3,579	94	Weighted A	verage						
	223		6.23% Perv	vious Area						
	3,356		93.77% Impervious Area							
То	Longth	Slop		Conocity	Description					
IC (maine)	Lengin	210p		Capacity	Description					
<u>(mn)</u>	(ieet)	(11/11) (it/sec)	(CIS)						
5.0					Direct Entry, Min Tc					

Summary for Subcatchment P3: To Oak St

Runoff = 0.73 cfs @ 12.07 hrs, Volume= 0.050 af, Depth> 2.72"

MVOC Winchendon 3.25.21

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	Area (sf)	CN	Description									
	3,655	98	Paved park	ing, HSG C								
	161	96	Gravel surfa	Gravel surface, HSG C								
*	956	65	Landscape	andscape, HSG C								
	4,826	74	>75% Gras	75% Grass cover, Good, HSG C								
	9,598	83	Weighted A	verage								
	5,943		61.92% Pervious Area									
	3,655	38.08% Impervious Area										
Т	c Length	Slop	e Velocity	Capacity	Description							
(min) (feet)	(ft/f) (ft/sec)	(cfs)								
5.	C				Direct Entry, Min Tc							

Summary for Reach CP-E1: Park St

[40] Hint: Not Described (Outflow=Inflow)

Inflow Are	a =	2.688 ac,	4.15% Imperviou	us, Inflow Depth	> 0.37	" for 10-	Year event
Inflow	=	0.38 cfs @	12.48 hrs, Volu	me= 0.08	33 af		
Outflow	=	0.38 cfs @	12.48 hrs, Volu	me= 0.08	33 af, A	tten= 0%,	Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach CP-E2: Murdock Ave

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	0.328 ac, 3	31.74% Imp	ervious,	Inflow De	epth > 2.	63" for	10-Year event
Inflow	=	1.01 cfs @	12.09 hrs,	Volume	=	0.072 af		
Outflow	=	1.01 cfs @	12.09 hrs,	Volume	=	0.072 af,	Atten= 0	%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach CP-E3: Oak St

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	0.838 ac, 4	17.04% Impe	ervious,	Inflow Dep	oth > 3.0)9" for 10	0-Year event
Inflow	=	2.84 cfs @	12.11 hrs,	Volume	= C).216 af		
Outflow	=	2.84 cfs @	12.11 hrs,	Volume	= C).216 af,	Atten= 0%	, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach CP-P1: To Park St

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	3.537 ac, 2	28.86% Impe	ervious,	Inflow De	epth > ().09"	for 10-	Year event
Inflow	=	0.07 cfs @	12.61 hrs,	Volume	=	0.027 a	f		
Outflow	=	0.07 cfs @	12.61 hrs,	Volume	=	0.027 a	f, Att	en= 0%,	Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach CP-P2: Murdock Ave

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	0.082 ac, 9	3.77% Imp	ervious,	Inflow Depth	ו <mark>> 3</mark> .8	31" for 10	-Year event
Inflow	=	0.36 cfs @	12.07 hrs,	Volume	= 0.0)26 af		
Outflow	=	0.36 cfs @	12.07 hrs,	Volume	= 0.0	026 af,	Atten= 0%	,Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach CP-P3: Oak St

[40] Hint: Not Described (Outflow=Inflow)

Inflow A	\rea =	0.220 ac, 38	8.08% Imperviou	is, Inflow Depth >	2.72"	for 10-	Year event
Inflow	=	0.73 cfs @	12.07 hrs, Volu	me= 0.050) af		
Outflow	- =	0.73 cfs @	12.07 hrs, Volu	me= 0.050) af, At	ten= 0%,	Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Pond #4: CB#4

[57] Hint: Peaked at 998.56' (Flood elevation advised)

Inflow Area	a =	0.519 ac,	52.42% Imp	ervious,	Inflow Depth >	> 2.24	4" for 10-	-Year event
Inflow	=	1.23 cfs @	12.07 hrs,	Volume	= 0.09	7 af		
Outflow	=	1.23 cfs @	12.07 hrs,	Volume	= 0.09	7 af, 7	Atten= 0%,	Lag= 0.0 min
Primary	=	1.23 cfs @	12.07 hrs,	Volume	= 0.09	7 af		-

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 998.56' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	997.90'	12.0" Round Culvert L= 186.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 997.90' / 996.50' S= 0.0075 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.23 cfs @ 12.07 hrs HW=998.56' TW=997.51' (Dynamic Tailwater) -1=Culvert (Outlet Controls 1.23 cfs @ 3.21 fps)

Summary for Pond #5: CB#5

[57] Hint: Peaked at 998.75' (Flood elevation advised)

Inflow Area	a =	0.055 ac, 8	7.04% Impe	ervious,	Inflow [Depth >	3.92"	for 10-	Year event	
Inflow	=	0.24 cfs @	12.07 hrs,	Volume	=	0.018	af			
Outflow	=	0.24 cfs @	12.07 hrs,	Volume	=	0.018	af, At	ten= 0%,	Lag= 0.0 mi	n
Primary	=	0.24 cfs @	12.07 hrs,	Volume	=	0.018	af			

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 998.75' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	998.43'	12.0" Round Culvert L= 57.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 998.43' / 998.00' S= 0.0075 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.24 cfs @ 12.07 hrs HW=998.75' TW=998.56' (Dynamic Tailwater) **1=Culvert** (Outlet Controls 0.24 cfs @ 1.64 fps)

Summary for Pond #6: CB#6

[57] Hint: Peaked at 999.38' (Flood elevation advised)

Inflow Area	=	0.278 ac,	16.20% Impe	ervious,	Inflow Dep	oth > (0.62" f	or 10-	Year ev	ent
Inflow	=	0.15 cfs @	12.07 hrs,	Volume	= ().014 a	ıf			
Outflow	=	0.15 cfs @	12.07 hrs,	Volume	= ().014 a	f, Atten	= 0%,	Lag= 0	.0 min
Primary	=	0.15 cfs @	12.07 hrs,	Volume	= 0).014 a	ıf			

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 999.38' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	999.17'	12.0" Round Culvert L= 142.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 999.17' / 998.00' S= 0.0082 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.15 cfs @ 12.07 hrs HW=999.38' TW=998.56' (Dynamic Tailwater) -1=Culvert (Outlet Controls 0.15 cfs @ 1.89 fps)

Summary for Pond CA1: Containment Area @ FES #4

Inflow Area	ı =	0.245 ac,	4.92% Impervious,	Inflow Depth >	0.14" for 10-	-Year event
Inflow	=	0.00 cfs @	13.85 hrs, Volume	= 0.003 a	af	
Outflow	=	0.00 cfs @	13.85 hrs, Volume	= 0.003 a	af, Atten= 0%,	Lag= 0.0 min
Primary	=	0.00 cfs @	13.85 hrs, Volume	= 0.003 a	af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 1,000.00' @ 13.85 hrs Surf.Area= 20 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow) Center-of-Mass det. time= 0.0 min (1,036.3 - 1,036.3)

Volume	Invert	Avail.	Storage	Storage Description	ו		
#1	1,000.00'		845 cf	Custom Stage Dat	a (Irregular)Liste	d below (Recalc)	
Elevation (feet)	Sı	urf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
1,000.00 1,001.00 1,001.50		20 709 1,601	16.0 156.0 266.0	0 283 563	0 283 845	20 1,938 5,634	
Device F	Routing	Inv	ert Outle	et Devices			
#1 F	Primary	999.9	95' 12.0' L= 90	Round Culvert 0.0' CPP, mitered to / Outlet Invert= 999	o conform to fill, 95' / 999 27' S=	Ke= 0.700 0 0076 '/' Cc= 0 9()()

n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.01 cfs @ 13.85 hrs HW=1,000.00' TW=999.23' (Dynamic Tailwater) ☐ 1=Culvert (Barrel Controls 0.01 cfs @ 0.90 fps)

Summary for Pond CA2: Containment Area @ CB#8

Inflow Area	ı =	0.119 ac,	2.44% Impervious	, Inflow Depth >	0.14" for	10-Year event
Inflow	=	0.00 cfs @	13.85 hrs, Volum	e= 0.001	af	
Outflow	=	0.00 cfs @	13.85 hrs, Volum	e= 0.001	af, Atten=	0%, Lag= 0.0 min
Discarded	=	0.00 cfs @	13.85 hrs, Volum	e= 0.000) af	
Primary	=	0.00 cfs @	13.85 hrs, Volum	e= 0.001	af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 999.25' @ 0.00 hrs Surf.Area= 16 sf Storage= 0 cf

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

Volume	Inv	ert Avai	il.Storage	Storage Descripti	on		
#1	999.:	25'	1,384 cf	Custom Stage D	ata (Irregular) List	ed below (Recalc)	
Elevatio (fee	n t)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft <u>)</u>	
999.2 1,000.0 1,001.0	25 00 00	16 603 1,931	16.0 139.0 290.0	0 179 1,204	0 179 1,384	16 1,534 6,694	
Device	Routing	In	vert Outle	et Devices			
#1	Primary	997	7.70' 8.0'' L= 1 Inlet	Round Culvert 62.0' CPP, squar / Outlet Invert= 99	e edge headwall, 7.70' / 996.50' S	Ke= 0.500 = 0.0074 '/' Cc= 0.	.900

MVOC Winchendon 3.25.21	Type III
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#2 Discarded 999.25' 8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 0.00'

Discarded OutFlow Max=0.00 cfs @ 13.85 hrs HW=999.25' (Free Discharge) **2=Exfiltration** (Passes 0.00 cfs of 0.00 cfs potential flow)

Summary for Pond DB1: Detention/ Infiltration Basin #1

Inflow Area	ı =	2.065 ac, 4	8.48% Imp	ervious, Ir	flow Depth >	2.05"	for 10-Y	ear event
Inflow	=	4.55 cfs @	12.16 hrs,	Volume=	0.352	af		
Outflow	=	0.32 cfs @	13.67 hrs,	Volume=	0.327	af, Atte	en= 93%,	Lag= 90.9 min
Discarded	=	0.32 cfs @	13.67 hrs,	Volume=	0.327	af		-
Primary	=	0.00 cfs @	0.00 hrs,	Volume=	0.000	af		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 998.02' @ 13.67 hrs Surf.Area= 5,785 sf Storage= 7,233 cf

Plug-Flow detention time= 231.3 min calculated for 0.326 af (93% of inflow) Center-of-Mass det. time= 193.8 min (1,006.4 - 812.7)

Volume	Invert	Avail.	Storage	Storage Descriptio	n				
#1	996.50	13	3,617 cf	Custom Stage Da	ta (Irregular) Listed	below (Recalc)			
Elevatio	on S	urf.Area	Perim.	Inc.Store	Cum.Store	Wet.Area			
(tee	t)	(sq-π)	(feet)	(cubic-teet)	(CUDIC-TEET)	(sq-π)			
996.5	50	3,796	263.0	0	0	3,796			
997.0	0	4,404	283.0	2,048	2,048	4,676			
998.0	00	5,755	324.0	5,064	7,113	6,679			
998.5	50	6,497	344.0	3,061	10,174	7,755			
999.0	00	7,285	364.0	3,444	13,617	8,896			
Device	Routing	Inve	ert Outle	et Devices					
#1	Primary	998.5	50' 20.0	long x 5.0' bread	th Broad-Crested	Rectangular Weir			
			Head	d (feet) 0.20 0.40 (0.60 0.80 1.00 1.2	20 1.40 1.60 1.80 2.00			
			2.50	3.00 3.50 4.00 4.	.50 5.00 5.50				
			Coet	f. (Enalish) 2.34 2.5	50 2.70 2.68 2.68	2.66 2.65 2.65 2.65			
			2.65	2.67 2.66 2.68 2	70 2.74 2.79 2.88	3			
#2	Discarded	996.5	50' 2.41	0 in/hr Exfiltration	over Surface area				
			Con	ductivity to Groundw	ater Elevation = 0.0	00' Phase-In= 0.01'			
Discard	Discarded OutFlow Max=0.32 cfs @ 13.67 hrs HW=998.02' (Free Discharge)								

12=Exfiltration (Controls 0.32 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=996.50' TW=0.00' (Dynamic Tailwater) -1=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Summary for Pond DB2: Detention/ Infiltration Basin #2

Inflow Area	ı =	1.643 ac, 4	9.18% Imper	rvious, I	nflow Depth	n > 2.5	55" for	10-Y	ear event	
Inflow	=	4.01 cfs @	12.12 hrs, \	/olume=	: 0.3	849 af				
Outflow	=	3.51 cfs @	12.18 hrs, \	/olume=	: 0.3	846 af,	Atten=	12%,	Lag= 3.5 mir	n
Discarded	=	0.10 cfs @	13.66 hrs, \	/olume=	: 0.0)93 af				
Primary	=	3.43 cfs @	12.18 hrs, \	√olume=	. 0.2	253 af				

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 998.02' @ 13.66 hrs Surf.Area= 1,796 sf Storage= 1,647 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow) Center-of-Mass det. time= 43.2 min (842.8 - 799.6)

Volume	Invei	rt Avai	I.Storage	Storage Description	on		
#1	996.50)'	5,448 cf	Custom Stage Da	ata (Irregular) Liste	ed below (Recalc)	
Elevatio	n S	Surf.Area	Perim.	Inc.Store	Cum.Store	Wet.Area	
996.5 997.0 998.0 998.5 999.0	0 0 0 0 0 0	471 865 1,744 3,142 7,738	90.0 130.0 208.0 246.0 408.0	0 329 1,279 1,204 2,635	0 329 1,608 2,813 5,448	<u>471</u> 1,173 3,278 4,656 13,088	
Device	Routing	In	vert Outl	et Devices			
#1	Primary Discarded	996 J 996	.50' 18.0 L= 3 Inlet n= 0 .50' 2.41 Con	" Round Culvert 0.0' CPP, mitered / Outlet Invert= 99 012, Flow Area= 0 in/hr Exfiltration ductivity to Ground	to conform to fill, 5.50' / 996.50' S= 1.77 sf 1 over Surface are water Elevation = 0	Ke= 0.700 0.0000 '/' Cc= 0.90 3a 0.00'	0
				,			

Discarded OutFlow Max=0.10 cfs @ 13.66 hrs HW=998.02' (Free Discharge) **2=Exfiltration** (Controls 0.10 cfs)

Primary OutFlow Max=3.41 cfs @ 12.18 hrs HW=997.71' TW=997.40' (Dynamic Tailwater) ☐ 1=Culvert (Barrel Controls 3.41 cfs @ 3.05 fps)

MVOC - Winchendon

Summary for Subcatchment E1: To Park St

Runoff = 1.90 cfs @ 12.29 hrs, Volume= 0.248 af, Depth> 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=6.40"

	A	rea (sf)	CN	Description							
_		4,864	98	Paved park	ing, HSG A						
	97,188 39 >75% Grass cover, Good, HSG A										
	7,831 70 Woods, Good, HSG C										
	6,510 96 Gravel surface, HSG C										
*		717 65 Landscape, HSG C									
	1	17,110	47	Weighted A	verage						
	1	12,246		95.85% Pei	vious Area						
		4,864		4.15% Impe	ervious Area	а					
	Тс	Length	Slope	e Velocity	Capacity	Description					
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)						
	0.3	20	0.0350) 1.21		Sheet Flow, Paved					
						Smooth surfaces n= 0.011 P2= 3.00"					
	6.8	80	0.0350	0.20		Sheet Flow, Grass					
						Grass: Short n= 0.150 P2= 3.00"					
	1.1	84	0.0360	1.33		Shallow Concentrated Flow, Grass					
						Short Grass Pasture Kv= 7.0 fps					
	5.4	226	0.0100	0.70		Shallow Concentrated Flow, Grass					
						Short Grass Pasture Kv= 7.0 fps					
	2.9	86	0.0100	0.50		Shallow Concentrated Flow, Woods					
_						Woodland Kv= 5.0 fps					
	16.5	496	Total								

Summary for Subcatchment E2: To Murdock Ave

Runoff = 1.66 cfs @ 12.09 hrs, Volume= 0.119 af, Depth> 4.35"

	Area (sf)	CN	Description
	4,534	98	Paved parking, HSG C
	9,678	74	>75% Grass cover, Good, HSG C
*	75	65	Landscape, HSG C
	14,287	82	Weighted Average
	9,753		68.26% Pervious Area
	4,534		31.74% Impervious Area

					MVOC - Winchendon					
MVOC	Winche	endon 3	.25.21		Type III 24-hr 100-Year Rainfall=6.40"					
Prepare	d by Ber	kshire D	esign Gro	oup	Printed 4/1/2021					
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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description					
6.0	76	0.0428	0.21		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.00"					
Summary for Subcatchment E3: To Oak St										
Runoff	=	4.41 cfs	s@ 12.1	0 hrs, Volu	ime= 0.342 af, Depth> 4.89"					
Runoff b Type III :	y SCS TF 24-hr 100	R-20 metl 0-Year Ra	hod, UH=S ainfall=6.4	SCS, Weigh 0"	nted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs					
A	rea (sf)	CN D	escription							
	17,165	98 P	aved park	ing, HSG C	2					
	2,723	96 G	Gravel surfa	ace, HSG (
	16,600	74 >	75% Gras	s cover, Go	bod, HSG C					
	36,488	87 V	Veighted A	verage						
	19,323	5	2.96% Pei	vious Area						
	17,165	4	7.04% Imp	pervious Ar	ea					
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description					
6.6	70	0.0290	0.18	· · ·	Sheet Flow, Grass					
					Grass: Short n= 0.150 P2= 3.00"					
1.0	78	0.0064	1.29		Shallow Concentrated Flow, Gravel Unpaved Kv= 16.1 fps					

7.6 148 Total

Summary for Subcatchment P1A: Toward DB#1

Runoff = 2.02 cfs @ 12.12 hrs, Volume= 0.160 af, Depth> 4.57"

	Area (sf)	CN	Description			
	1,900	98	Unconnected pavement, HSG C			
	6,497	98	Water Surface, HSG C			
	7,740	74	75% Grass cover, Good, HSG C			
*	493	77	Stone Dust, HSG C			
*	1,720	65	Landscape, HSG C			
	18,350	84	Weighted Average			
	9,953		54.24% Pervious Area			
	8,397		45.76% Impervious Area			
	1,900		22.63% Unconnected			

					MVOC - Winchendon
MVOC	Winche	ndon 3	.25.21		Type III 24-hr 100-Year Rainfall=6.40'
Prepare	d by Ber	kshire D	esian Gra	aud	Printed 4/1/2021
HydroCA	D® 10.00-	-15 s/n 00)752 © 201	15 HydroCAI	D Software Solutions LLC Page 28
					<u> </u>
Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
8.4	73	0.0170	0.14		Sheet Flow, Grass
					Grass: Short n= 0.150 P2= 3.00"
0.3	13	0.0165	0.82		Sheet Flow, Paved
					Smooth surfaces n= 0.011 P2= 3.00"
0.1	40	0.1000	4.74		Shallow Concentrated Flow, Grass
					Grassed Waterway Kv= 15.0 fps
8.8	126	Total			
		Si	ımmarv	for Subc	atchment P1B: Toward DB#2
		0.	, initial y		
Runoff	=	4.77 cfs	s@ 12.1	4 hrs, Volu	me= 0.401 af, Depth> 4.78"
Runoff h		2_20 meti	hod UH-9	SCS Woidh	ted_{CN} Time Span= 0.00-24.00 brs. dt= 0.01 brs
Type III (24_hr 10	λ-Year R	ainfall=6.4	0"	100-011, 11110 0part= 0.00-24.00 113, 0t= 0.01 113
rype in z			annan-0.+	0	
А	rea (sf)	CN D	escription		
	5.025	98 U	Inconnecte	ed pavemer	nt. HSG C
	13,429	98 R	oofs. HSC	G C	
	4,779	98 V	Vater Surfa	ace, HSG C	
	15,611	74 >	75% Gras	s cover, Go	bod, HSG C
*	534	77 S	tone Dust	, HSG Ć	
*	4,442	65 L	andscape,	, HSG C	
	43,820	86 V	Veighted A	verage	
	20,587	4	6.98% Pei	rvious Area	
	23,233	5	3.02% Imp	pervious Ar	ea
	5,025	2	1.63% Un	connected	
Тс	l enath	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
10.1	100	0.0200	0.16	()	Sheet Flow Grass
10.1	100	0.0200	0.10		Grass: Short $n=0.150$ P2= 3.00"
0.2	40	0.0500	3.35		Shallow Concentrated Flow. Grass
					Grassed Waterway Kv= 15.0 fps

10.3 140 Total

Summary for Subcatchment P1C: To CB#8

Runoff = 0.03 cfs @ 12.36 hrs, Volume= 0.006 af, Depth> 0.63"

MVOC - Winchendon Type III 24-hr 100-Year Rainfall=6.40" Printed 4/1/2021 ns LLC Page 29

MVOC Winchendon 3.25.21

Prepared by Berkshire Design Group HydroCAD® 10.00-15 s/n 00752 © 2015 HydroCAD Software Solutions LLC

A	rea (sf)	CN	Description									
	126	98	Unconnecte	ed pavemei	nt, HSG C							
	5,038	39	•75% Grass cover, Good, HSG A									
	5,164	40	Weighted Average									
	5,038		97.56% Pe	rvious Area								
	126		2.44% Impe	ervious Are	a							
	126		100.00% U	nconnected	1							
Тс	Length	Slope	e Velocity	Capacity	Description							
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)								
10.2	94	0.0175	0.15		Sheet Flow, Grass							
					Grass: Short n= 0.150 P2= 3.00"							
0.8	45	0.0175	0.93		Shallow Concentrated Flow, Grass							
					Short Grass Pasture Kv= 7.0 fps							
11.0	139	Total										

Summary for Subcatchment P1D: To CB#4

Runoff = 1.20 cfs @ 12.07 hrs, Volume= 0.094 af, Depth> 6.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=6.40"

Ar	ea (sf)	CN	Description							
	7,805	98	Paved park	Paved parking, HSG C						
	302	74	>75% Gras	>75% Grass cover, Good, HSG C						
	8,107	97	Weighted A	Veighted Average						
	302		3.73% Perv	3.73% Pervious Area						
	7,805		96.27% Imp	pervious Are	ea					
_		~		.	-					
Тс	Length	Slop	e Velocity	Capacity	Description					
(min)	(feet)	(ft/f	t) (ft/sec)	:) (ft/sec) (cfs)						
5.0					Direct Entry, Min Tc					
			_							

Summary for Subcatchment P1E: To CB #6

Runoff = 0.21 cfs @ 12.07 hrs, Volume= 0.017 af, Depth> 6.16"

Area (sf)	CN	Description
1,436	98	Paved parking, HSG C
1,436		100.00% Impervious Area

MVOC	Wincho	ndon	2 25	21						Type	<u>م</u> ا//	24-h	r 11	M\ ∧_∩	/OC	- Wii Rain	nchendon
Prenare	d by Ber	kshira	J.ZJ. Desia	ZI n Gro	nun					rype	5 111	24-11	1 10	/0-70	Dri	nted	4/1/2021
HydroCA	D® 10.00-	15 s/n (00752	© 201	15 Hydro	CA	D Softwar	e So	olutior	ns LL	C					mou	Page 30
		0		.,			<u> </u>										
IC (min)	Length (feet)	Slope (ft/ft	→ Vel) (ft	ocity (sec)	Capac (cf	ty s)	Descrip	otion									
5.0	(1001)	(1010	<u>/ (14</u>	000)	(0)	<u>o</u> ,	Direct	Entr	у, M	in To	;						
	Summary for Subcatchment P1F: To FES#4																
Runoff	=	0.07 c	cfs @	12.3	6 hrs, V	olu	ime=		0.01	3 af,	De	pth>	0.63	3"			
Runoff b Type III :	Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=6.40"																
А	rea (sf)	CN	Adj	Desc	cription												
	525	98		Unco	onnected	l pa	avement,	HS	GΑ								
	10,141	39		>75%	6 Grass	co	ver, Goo	d, H	SG A	4							
	10,666	42	40	Weig	hted Av	era	age, UI A	djus	ted								
	10,141 525			95.00	8% Perv % Imper		IS Area										
	525			100.0	00% Un	cor	nected										
Tc (min)	Length (feet)	Slope (ft/ft	evel ≥ Vel	ocity /sec)	Capac (cf	ty s)	Descrip	otion									
11.2	114	0.0200)	0.17			Sheet I	Flow Shou	v, Gra	ass = 0 1	50	P2=	3 00				
							01833.	ono		- 0.1	00	1 2-	0.00				
			Su	mma	ry for \$	Su	bcatch	mer	nt P	1G:	То	CB‡	#5				
Runoff	=	0.35 c	:fs @	12.0	7 hrs, V	olu	ime=		0.02	27 af,	De	pth>	5.8	1"			
Runoff b Type III :	y SCS TF 24-hr 100	R-20 me)-Year I	ethod, Rainfa	UH=S II=6.4	SCS, W∈ 0"	igł	nted-CN,	Tim	e Spa	an= (0.00	-24.0)0 hr:	s, dt=	= 0.0)1 hrs	3
A	rea (sf)	CN	Descr	iption													
	2,082	98	Paved	d park	ing, HSC	ЭC	;										
	310	74	>75%	Gras	s cover,	Go	ood, HSG	G C									
	2,392	95	Weigh	nted A	verage												
	310 2 092		12.96	% Pei % Imr	rvious A	ea ∧r											
	2,002		07.04	70 1111	Jeivious	Aľ	ed										
Тс	Length	Slope	e Vel	ocity	Capac	ty	Descrip	otion									
(min)	(feet)	(ft/ft) (ft/	/sec)	(cf	s)				<u> </u>							
5.0							Direct	Entr	°y, Mi	in To)						

Summary for Subcatchment P1H: To Park St

Runoff = 0.62 cfs @ 12.39 hrs, Volume= 0.101 af, Depth> 0.82"

MVOC - Winchendon Type III 24-hr 100-Year Rainfall=6.40" Printed 4/1/2021

MVOC Winchendon 3.25.21

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A	rea (sf)	CN I	Description							
	853	98	[⊃] aved park	ing, HSG A	N Contraction of the second seco					
	56,917	39 :	>75% Ġras	s cover, Go	bod, HSG A					
6,352 70 Woods, Good, HSG C										
	64,122	43	Neighted A	verage						
	63,269	ę	98.67% Pei	vious Area						
	853		1.33% Impe	ervious Area	а					
_										
TC	Length	Slope	Velocity	Capacity	Description					
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)						
8.1	100	0.0350	0.21		Sheet Flow, Grass					
					Grass: Short n= 0.150 P2= 3.00"					
1.1	84	0.0360	1.33		Shallow Concentrated Flow, Grass					
					Short Grass Pasture Kv= 7.0 fps					
5.8	245	0.0100	0.70		Shallow Concentrated Flow, Grass					
					Short Grass Pasture Kv= 7.0 fps					
2.9	86	0.0100	0.50		Shallow Concentrated Flow, Woods					
					Woodland Kv= 5.0 fps					
17.9	515	Total								

Summary for Subcatchment P2: To Murdock Ave

Runoff	=	0.52 cfs @	12.07 hrs,	Volume=	0.039 af,	Depth>	5.69"
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Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=6.40"

A	rea (sf)	CN	Description							
	3,356	98	Paved parking, HSG A							
	223	39	>75% Grass cover, Good, HSG A							
	3,579	94	Weighted A	Veighted Average						
	223		6.23% Pervious Area							
	3,356		93.77% Imp	pervious Ar	rea					
_				-						
Tc	Length	Slop	e Velocity	Capacity	Description					
(min)	(feet)	(ft/fl) (ft/sec)	(cfs)						
5.0					Direct Entry, Min Tc					

Summary for Subcatchment P3: To Oak St

Runoff	=	1.18 cfs @	12.07 hrs,	Volume=	0.082 af, D	epth> 4.46"
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MVOC Winchendon 3.25.21

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	Area (sf)	CN	Description						
	3,655	98	Paved park	ing, HSG C	2				
	161	96	Gravel surf	ace, HSG (C				
*	956	65	Landscape	_andscape, HSG C					
	4,826	74	>75% Gras	>75% Grass cover, Good, HSG C					
	9,598	83	Weighted A	Veighted Average					
	5,943		61.92% Pervious Area						
	3,655		38.08% Imp	pervious Ar	rea				
Т	c Length	Slop	e Velocity	Capacity	Description				
(min) (feet)	(ft/f) (ft/sec)	(cfs)					
5.0)				Direct Entry, Min Tc				

Summary for Reach CP-E1: Park St

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	2.688 ac,	4.15% Impervious,	Inflow Depth > 1.	11" for 100-Year event
Inflow	=	1.90 cfs @	12.29 hrs, Volume	e= 0.248 af	
Outflow	=	1.90 cfs @	12.29 hrs, Volume	e= 0.248 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach CP-E2: Murdock Ave

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	0.328 ac, 3	31.74% Impe	ervious,	Inflow D	epth > 4	l.35" f	or 100)-Year eve	ent
Inflow	=	1.66 cfs @	12.09 hrs,	Volume	=	0.119 a	f			
Outflow	=	1.66 cfs @	12.09 hrs,	Volume	=	0.119 a	f, Atten	= 0%,	Lag= 0.0	min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach CP-E3: Oak St

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	0.838 ac, 4	17.04% Impe	ervious,	Inflow De	epth > 4	.89" for	100-Year event	
Inflow	=	4.41 cfs @	12.10 hrs,	Volume	=	0.342 af			
Outflow	=	4.41 cfs @	12.10 hrs,	Volume	=	0.342 af	, Atten= (0%, Lag= 0.0 mir	٦

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach CP-P1: To Park St

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[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	3.537 ac,	28.86% Impe	ervious,	Inflow De	pth > 0.8	54" for 100)-Year event
Inflow	=	1.50 cfs @	12.61 hrs,	Volume	=	0.159 af		
Outflow	=	1.50 cfs @	12.61 hrs,	Volume	=	0.159 af,	Atten= 0%,	Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach CP-P2: Murdock Ave

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	0.082 ac, 9	3.77% Imp	ervious,	Inflow	Depth >	5.69	" for	100-	Year e	vent
Inflow	=	0.52 cfs @	12.07 hrs,	Volume	=	0.039	af				
Outflow	=	0.52 cfs @	12.07 hrs,	Volume	=	0.039	af, A	tten= 0	%, L	_ag= 0	.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach CP-P3: Oak St

[40] Hint: Not Described (Outflow=Inflow)

Inflow Are	ea =	0.220 ac, 🕻	38.08% Impervious,	Inflow Depth > 4.4	46" for 100-Year event
Inflow	=	1.18 cfs @	12.07 hrs, Volume	= 0.082 af	
Outflow	=	1.18 cfs @	12.07 hrs, Volume	= 0.082 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Pond #4: CB#4

[57] Hint: Peaked at 998.78' (Flood elevation advised)

Inflow Area	a =	0.519 ac, 5	52.42% Imp	ervious,	Inflow Depth	> 3.47	7" for 100)-Year event
Inflow	=	1.78 cfs @	12.07 hrs,	Volume	= 0.1	50 af		
Outflow	=	1.78 cfs @	12.07 hrs,	Volume	= 0.1	50 af, <i>I</i>	Atten= 0%,	Lag= 0.0 min
Primary	=	1.78 cfs @	12.07 hrs,	Volume	= 0.1	50 af		-

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 998.78' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	997.90'	12.0" Round Culvert L= 186.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 997.90' / 996.50' S= 0.0075 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.77 cfs @ 12.07 hrs HW=998.77' TW=997.86' (Dynamic Tailwater) **1=Culvert** (Outlet Controls 1.77 cfs @ 3.25 fps)

Summary for Pond #5: CB#5

[57] Hint: Peaked at 998.90' (Flood elevation advised)

Inflow Area	a =	0.055 ac, 8	37.04% Impe	ervious,	Inflow De	pth >	5.81'	for 1	00-Year	event
Inflow	=	0.35 cfs @	12.07 hrs,	Volume	=	0.027	af			
Outflow	=	0.35 cfs @	12.07 hrs,	Volume	=	0.027	af, A	tten= 0%	5, Lag=	0.0 min
Primary	=	0.35 cfs @	12.07 hrs,	Volume	=	0.027	af		-	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 998.90' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	998.43'	12.0" Round Culvert L= 57.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 998.43' / 998.00' S= 0.0075 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.35 cfs @ 12.07 hrs HW=998.89' TW=998.77' (Dynamic Tailwater) **1=Culvert** (Outlet Controls 0.35 cfs @ 1.44 fps)

Summary for Pond #6: CB#6

[57] Hint: Peaked at 999.44' (Flood elevation advised)

Inflow Area	ı =	0.278 ac,	16.20% Impe	ervious,	Inflow Depth	> 1.28	8" for 1	00-Year event
Inflow	=	0.22 cfs @	12.08 hrs,	Volume	= 0.0	30 af		
Outflow	=	0.22 cfs @	12.08 hrs,	Volume	= 0.0	30 af, 7	Atten= 0%	6, Lag= 0.0 min
Primary	=	0.22 cfs @	12.08 hrs,	Volume	= 0.0	30 af		-

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 999.44' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	999.17'	12.0" Round Culvert L= 142.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 999.17' / 998.00' S= 0.0082 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.22 cfs @ 12.08 hrs HW=999.44' TW=998.78' (Dynamic Tailwater) **1=Culvert** (Outlet Controls 0.22 cfs @ 1.93 fps)

Summary for Pond CA1: Containment Area @ FES #4

Inflow Area	ı =	0.245 ac,	4.92% Impervious,	Inflow Depth > (0.63" for 100-Year event
Inflow	=	0.07 cfs @	12.36 hrs, Volume	= 0.013 a	f
Outflow	=	0.07 cfs @	12.37 hrs, Volume	= 0.013 a	f, Atten= 0%, Lag= 0.7 min
Primary	=	0.07 cfs @	12.37 hrs, Volume	= 0.013 a	f

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 1,000.09' @ 12.36 hrs Surf.Area= 41 sf Storage= 3 cf

Plug-Flow detention time= 0.3 min calculated for 0.013 af (100% of inflow) Center-of-Mass det. time= 0.3 min (941.4 - 941.0)

Volume	Inve	rt Avail.	Storage	Storage Description	on		
#1	1,000.0	0'	845 cf	Custom Stage Da	ata (Irregular)List	ed below (Recalc)	
Elevation (feet)		Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
1,000.00 1,001.00 1,001.50		20 709 1,601	16.0 156.0 266.0	0 283 563	0 283 845	20 1,938 5,634	
Device F	Routing	Inv	ert Outle	et Devices			
#1 F	Primary	999.	95' 12.0 L= 9 Inlet	" Round Culvert 0.0' CPP, mitered / Outlet Invert= 999	to conform to fill, 9.95' / 999.27' S=	Ke= 0.700 = 0.0076 '/' Cc= 0.90	00

n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.07 cfs @ 12.37 hrs HW=1,000.09' TW=999.38' (Dynamic Tailwater) ☐ 1=Culvert (Outlet Controls 0.07 cfs @ 1.68 fps)

Summary for Pond CA2: Containment Area @ CB#8

Inflow Area	ı =	0.119 ac,	2.44% Imper	vious, Inflow	Depth >	0.63" for	100-Year event
Inflow	=	0.03 cfs @	12.36 hrs, V	′olume=	0.006 a	af	
Outflow	=	0.03 cfs @	12.36 hrs, V	′olume=	0.006 a	af, Atten=	0%, Lag= 0.0 min
Discarded	=	0.00 cfs @	12.40 hrs, V	′olume=	0.000 a	af	-
Primary	=	0.03 cfs @	12.36 hrs, V	′olume=	0.006 a	af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 999.25' @ 0.00 hrs Surf.Area= 16 sf Storage= 0 cf

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

Volume	Inv	ert Avai	il.Storage	Storage Descripti	on		
#1	999.2	25'	1,384 cf	Custom Stage D	ata (Irregular) List	ed below (Recalc)	
Elevatio (feet	n t)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft <u>)</u>	
999.2 1,000.0 1,001.0	5 0 0	16 603 1,931	16.0 139.0 290.0	0 179 1,204	0 179 1,384	16 1,534 6,694	
Device	Routing	In	vert Outle	et Devices			
#1	Primary	997	7.70' 8.0'' L= 1 Inlet	Round Culvert 62.0' CPP, squar / Outlet Invert= 99	e edge headwall, 7.70' / 996.50' S	Ke= 0.500 = 0.0074 '/' Cc= 0	.900

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MVOC - Winchendon

#2 Discarded 999.25' 8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 0.00'

Discarded OutFlow Max=0.00 cfs @ 12.40 hrs HW=999.25' (Free Discharge) **2=Exfiltration** (Passes 0.00 cfs of 0.00 cfs potential flow)

Summary for Pond DB1: Detention/ Infiltration Basin #1

Inflow Area	ı =	2.065 ac, 4	8.48% Imp	ervious, Inf	low Depth >	3.18"	for 100-	Year event
Inflow	=	6.03 cfs @	12.12 hrs,	Volume=	0.547	af		
Outflow	=	1.39 cfs @	12.63 hrs,	Volume=	0.455	af, Atte	en= 77%,	Lag= 30.6 min
Discarded	=	0.37 cfs @	12.63 hrs,	Volume=	0.396	af		-
Primary	=	1.02 cfs @	12.63 hrs,	Volume=	0.058	af		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 998.58' @ 12.63 hrs Surf.Area= 6,617 sf Storage= 10,687 cf

Plug-Flow detention time= 231.9 min calculated for 0.455 af (83% of inflow) Center-of-Mass det. time= 163.0 min (960.2 - 797.2)

Volume	Inve	ert Avai	I.Storage	Storage Description	on	
#1	996.5	0'	13,617 cf	Custom Stage Da	ata (Irregular)Listeo	d below (Recalc)
Elevatio	n	Surf.Area	Perim.	Inc.Store	Cum.Store	Wet.Area
(fee	et)	(sq-ft)	(feet)	(cubic-feet)	(cubic-feet)	<u>(sq-ft)</u>
996.5	50	3,796	263.0	0	0	3,796
997.0	00	4,404	283.0	2,048	2,048	4,676
998.0	00	5,755	324.0	5,064	7,113	6,679
998.5	50	6,497	344.0	3,061	10,174	7,755
999.0	00	7,285	364.0	3,444	13,617	8,896
Device	Routing	In	vert Outle	et Devices		
#1	Primary	998	5.50' 20.0 Head 2.50 Coel 2.65	' long x 5.0' bread d (feet) 0.20 0.40 3.00 3.50 4.00 4 f. (English) 2.34 2 2.67 2.66 2.68 2	Ith Broad-Crested 0.60 0.80 1.00 1. 4.50 5.00 5.50 5.50 .50 2.70 2.68 2.68 2.70 2.74 2.79 2.8	Rectangular Weir .20 1.40 1.60 1.80 2.00 8 2.66 2.65 2.65 2.65
#2	Discarde	d 996	5.50' 2.41 Con	0 in/hr Exfiltration ductivity to Ground	over Surface area	a .00' Phase-In= 0.01'

Discarded OutFlow Max=0.37 cfs @ 12.63 hrs HW=998.58' (Free Discharge) **2=Exfiltration** (Controls 0.37 cfs)

Summary for Pond DB2: Detention/ Infiltration Basin #2

Inflow Area	ı =	1.643 ac, 4	9.18% Impervious,	Inflow Depth >	4.07" fo	r 100-Year event
Inflow	=	6.19 cfs @	12.12 hrs, Volume	= 0.557	af	
Outflow	=	4.12 cfs @	12.13 hrs, Volume	= 0.539	af, Atten=	33%, Lag= 0.6 min
Discarded	=	0.22 cfs @	12.60 hrs, Volume	= 0.152	af	
Primary	=	4.01 cfs @	12.13 hrs, Volume	= 0.387	af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 998.60' @ 12.60 hrs Surf.Area= 3,894 sf Storage= 3,162 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow) Center-of-Mass det. time= 42.5 min (834.0 - 791.5)

Volume	Inve	rt Avai	I.Storage	Storage Description	on		
#1	996.50	כ'	5,448 cf	Custom Stage Da	ata (Irregular)Liste	ed below (Recalc)	
Elevatio	on S	Surf.Area	Perim. (feet)	Inc.Store	Cum.Store	Wet.Area	
996.5 997.0 998.0 998.5 998.5	50 90 90 50 90	471 865 1,744 3,142 7,738	90.0 130.0 208.0 246.0 408.0	0 329 1,279 1,204 2,635	0 329 1,608 2,813 5,448	<u>471</u> 1,173 3,278 4,656 13,088	
Device	Routing	In	vert Outl	et Devices			
#1	Primary Discarded	996 1 996	5.50' 18.0 L= 3 Inlet n= 0 5.50' 2.41 Con	" Round Culvert 0.0' CPP, mitered / Outlet Invert= 990 .012, Flow Area= ^ 0 in/hr Exfiltration ductivity to Ground	to conform to fill, 5.50' / 996.50' S= 1.77 sf • over Surface are water Elevation = (Ke= 0.700 0.0000 '/' Cc= 0.90 3a).00'	0

Discarded OutFlow Max=0.22 cfs @ 12.60 hrs HW=998.60' (Free Discharge) **2=Exfiltration** (Controls 0.22 cfs)

Primary OutFlow Max=4.01 cfs @ 12.13 hrs HW=998.09' TW=997.80' (Dynamic Tailwater) ☐ 1=Culvert (Inlet Controls 4.01 cfs @ 2.27 fps)

Appendix B – Soils Information



USDA Natural Resources Conservation Service Web Soil Survey National Cooperative Soil Survey



Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
365B	Skerry fine sandy loam, 3 to 8 percent slopes	C/D	7.5	100.0%
Totals for Area of Intere	st	7.5	100.0%	

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition Component Percent Cutoff: None Specified

USDA



Winchendon, MA: 07.28.2020

Deep Hole Number TP-	1	Date <u>1/28/21</u>	Time am	Weather <u>Clo</u>	udy 20/30
Location (identify on site pla	n				_
Land Use <u>developed</u>		_Slope (%)	0-2 % Surface Stones	no	_
Vegetation grass		Landfo	rm		_
Position on landscape (sketc	h on back)_				
Distances from:					
Open Water Body	500' +	feet	Drainage Way	NA	feet
Possible Wet Area	100' +	feet	Property Line	20' +/-	feet
Drinking Water Well	NA	feet	Other		_feet

	DEEP OBSERVATION HOLE LOG*					
Depth from	Soil	Soil Texture	Soil Color	Soil Mottling	Other (Structure, Stones, Boulders,	
0 - 36"	Fill	Loam/Sandy Loam	(Muliseli)	Motting	trace wood, ash	
36 – 46″	В	Sandy Loam	10YR-5/8		slightly disturbed	
46 -58″	C1	Loamy Sand	10YR-6/4		medium to fine, trace gravel	
58 – 67″	C ₂	Sand	2.5Y-7/3		medium to fine	
67 – 132″	C ₃	Loamy Sand	2.5Y-7/2	67″	medium to fine, trace gravel	

*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Witnessed By:

		Depth to Bedrock:	NA
the Hole:	120″	Weeping from Pit Face:	67″
67″			
	the Hole: 67"	the Hole: <u>120"</u> 67"	Depth to Bedrock: the Hole: <u>120"</u> Weeping from Pit Face: 67"

	Percolation Test*
Date:	Time:
Observation Hole #	
Depth of Perc	
Start Pre-soak	
End Pre-soak	
Time at 12"	
Time at 9"	
Time at 6"	
Time (9"-6")	
Rate Min./Inch *Minimum of 1 percolation test m	nust be performed in both the primary area AND reserve area.
Site failed:	

Deep Hole Number TP-2	_	Date <u>1/28/21</u>	Time am	Weather Clo	<u>udy 20/30</u>
Location (identify on site plan_					_
Land Use <u>developed</u>		Slope (%)	0-2 % Surface Stones	<u>no</u>	_
Vegetation grass		Landfor	ʻm		_
Position on landscape (sketch o	n back)				
Distances from:					
Open Water Body	500' +	feet	Drainage Way	NA	_feet
Possible Wet Area	100' +	feet	Property Line	20' +/-	_feet
Drinking Water Well	NA	feet	Other		feet

	DEEP OBSERVATION HOLE LOG*					
Depth from	Soil	Soil Texture	Soil Color	Soil	Other (Structure, Stones, Boulders,	
Surface	Horizon	(USDA)	(Munsell)	Mottling	Consistency, % gravel)	
0 - 20″	Fill	Loam/Sandy Loam				
20 – 28″	Α	Silt Loam	10YR-2/2			
28 – 38″	В	Sandy Loam	10YR-5/8			
38 - 60″	C ₁	Loamy Sand	10YR-6/4		medium to fine, trace gravel	
60 - 78″	C ₂	Sand	2.5Y-7/2	72″	medium to fine	
78 – 132″	C ₃	Loamy Sand	2.5Y-7/2		medium to fine, trace gravel	

*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Witnessed By:

Parent Material (geologic) <u>Till / Outwash</u>			Depth to Bedrock:	NA
Depth to Groundwater: Standing Water in t	he Hole:	120″	_Weeping from Pit Face:	78″
Estimated Seasonal High Ground Water:	72″			

	Percolation Test*
Date:	Time:
Observation Hole #	
Depth of Perc	
Start Pre-soak	
End Pre-soak	
Time at 12"	
Time at 9"	
Time at 6"	
Time (9"-6")	
Rate Min./Inch *Minimum of 1 percolation test m	nust be performed in both the primary area AND reserve area.
ite passed: Site failed:	nolds SE2029

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Deep Hole Number TP-3	Date <u>1/28/21</u>	Time am	Weather Cloudy 20/30
Location (identify on site plan			
Land Use <u>developed</u>	Slope (%)0-	-2 % Surface Stones	no
Vegetation grass	Landform		
Position on landscape (sketch on ba	ck)		
Distances from:			
Open Water Body 500	<u>' +</u> feet	Drainage Way	<u>NA</u> feet
Possible Wet Area 100	<u>' + </u> feet	Property Line	<u>20' +/-</u> feet
Drinking Water Well <u>NA</u>	feet	Other	feet

	DEEP OBSERVATION HOLE LOG*					
Depth from	Soil	Soil Texture	Soil Color	Soil Mottling	Other (Structure, Stones, Boulders,	
0 - 30"	Fill	Sand/Loamy Sand	(Muliseli)	Mottillig	gravel, cobbles	
30 - 40″	А	Silt Loam	10YR-2/2			
40 - 46″	В	Sandy Loam	7.5YR-5/6	41″	medium to fine, 20% gravel	
46 - 120″	С	Sandy Loam	2.5Y-6/2		coarse to fine, 15% gravel	

*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Witnessed By:

Parent Material (geologic) Till / Outwash		_	Depth to Bedrock:	NA
Depth to Groundwater: Standing Water in	the Hole:	120″	_Weeping from Pit Face:	68″
Estimated Seasonal High Ground Water:	41″			

	Percolation Test*
Date:	Time:
Observation Hole #	
Depth of Perc	
Start Pre-soak	
End Pre-soak	
Time at 12"	
Time at 9"	
Time at 6"	
Time (9"-6")	
Rate Min./Inch *Minimum of 1 percolation test m	nust be performed in both the primary area AND reserve area.
Site passed: Site failed:	

Deep Hole Number TP-4	Date <u>1/28/21</u>	Timeam	Weather <u>Cloudy 20/30</u>
Location (identify on site plan			
Land Use <u>developed</u>	Slope (%)	<u>0-2 %</u> Surface Stones	no
Vegetation grass	Landfo	rm	
Position on landscape (sketch on	back)		
Distances from:			
Open Water Body	<u>500' + feet</u>	Drainage Way	NA feet
Possible Wet Area	<u>100' + f</u> eet	Property Line	<u>20' +/-</u> feet
Drinking Water WellI	NA feet	Other	feet

DEEP OBSERVATION HOLE LOG*					
Depth from	Soil	Soil Texture	Soil Color	Soil	Other (Structure, Stones, Boulders,
Surface	Horizon	(USDA)	(Munsell)	Mottling	Consistency, % gravel)
0 – 54″	Fill	Sand/Loamy Sand			gravel, cobbles, bricks
					encountered concrete slab
					at 4.5 ft. Could not advance
					another hole in this area due
					to asphalt and frozen
					conditions

*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Witnessed By:

Parent Material (geologic) <u>Till / Outwash</u>			Depth to Bedrock:	NA
Depth to Groundwater: Standing Water in t	he Hole:	120″	Weeping from Pit Face:	68″
Estimated Seasonal High Ground Water:	41″			

	Percolation Test*
Date:	Time:
Observation Hole #	
Depth of Perc	
Start Pre-soak	
End Pre-soak	
Time at 12"	
Time at 9"	
Time at 6"	
Time (9"-6")	
Rate Min./Inch *Minimum of 1 percolation test m	nust be performed in both the primary area AND reserve area.
Site passed: Site failed:	
Performed by: <u>Steve Rey</u>	noias sezuzy

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Deep Hole Number TP-5	Date <u>1/28/21</u>	Time <u>am</u>	Weather <u>Cloudy 20/30</u>
Location (identify on site plan			
Land Use <u>developed</u>	Slope (%)	0-2 % Surface Stones	no
Vegetation grass	Landfo	orm	
Position on landscape (sketch on ba	ck)		
Distances from:			
Open Water Body 500	<u>' + f</u> eet	Drainage Way	<u>NA</u> feet
Possible Wet Area 100	<u>' + f</u> eet	Property Line	<u>20' +/-</u> feet
Drinking Water Well NA	feet	Other	feet

DEEP OBSERVATION HOLE LOG*					
Depth from	Soil	Soil Texture	Soil Color	Soil	Other (Structure, Stones, Boulders,
Surface	Horizon	(USDA)	(Munsell)	Mottling	Consistency, % gravel)
0 - 20″	Fill	Loam/Sandy Loam			
20 - 60″	C ₁	Loamy Sand	7.5YR-7/6	40″	medium to fine, 20% gravel
50 – 120″	C ₂	Sandy Loam	2.5Y-6/2		coarse to fine, 15% gravel
					C ₁ thickness varies

*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Witnessed By:

		Depth to Bedrock:	NA
Hole:	120″	_Weeping from Pit Face:	64″
40″			
	Hole: 40"	Hole: <u>120"</u> 40"	Depth to Bedrock: Hole: 120" Weeping from Pit Face: 40"

	Percolation Test*
Date:	Time:
Observation Hole #	
Depth of Perc	
Start Pre-soak	
End Pre-soak	
Time at 12"	
Time at 9"	
Time at 6"	
Time (9"-6")	
Rate Min./Inch *Minimum of 1 percolation test m	hust be performed in both the primary area AND reserve area.
ite passed: Site failed: erformed By: Steve Reyr	nolds SE2029

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Stormwater Drainage Report

<u>Appendix C – Proposed Stormwater Management</u> <u>System Operation & Maintenance Plan</u>

Stormwater Drainage Report

Proposed Operation & Maintenance Plan *Stormwater Management*

During Construction

The Contractor shall be responsible for inspection and maintenance during construction.

At all times, siltation fabric fencing, stakes and hay bales sufficient to construct a sedimentation control barrier a minimum of 50 feet long will be stockpiled on the site in order to repair established barriers which may have been damaged or breached.

An inspection of all erosion control and stormwater management systems shall be conducted by the Contractor at least once a week and during all rain storms until the completion of construction. In case of any noted breach or failure, the Contractor shall immediately make appropriate repairs to any erosion control system and notify the engineer of any problems involving stormwater management systems.

A rain storm shall be defined as all or one of the following:

- Any storm in which rain is predicted to last for twelve consecutive hours or more.
- Any storm for which a flash flood watch or warning is issued.
- Any single storm predicted to have a cumulative rainfall of greater than 1/2 inch.
- Any storm not meeting the previous three thresholds but which would mark a third consecutive day of measurable rainfall.

The Contractor shall also inspect the erosion control and stormwater management systems at times of significant increase in surface water runoff due to rapid thawing when the risk of failure of erosion control measures is significant.

In such instances as remedial action is necessary, the Contractor shall repair any and all significant deficiencies in erosion control systems within two days.

The Winchendon Conservation Commission shall be notified of any significant failure of stormwater management systems & erosion and sediment control measures and shall be notified of any release of pollutants to a water body (stream, brook, pond, etc.).

The Contractor shall remove the sediment from behind the face of the sedimentation control barrier when the accumulated sediment has reached one-half of the original installed height of the barrier.

This project requires a NPDES General Permit for Stormwater Discharges from Constriction Activities. Contractor and Owner are responsible for finalizing a Stormwater Pollution Prevention Plan (SWPPP) and filing for the NDPES permit prior to the start of construction. All clearing, grading, drainage, construction, and development shall be conducted in strict accordance with the SWPPP.

Stormwater Drainage Report

Post-Construction

Stormwater Management System Owner:

Montachusett Veterans Outreach Center 268 Central Street Gardner, Massachusetts 01440 (978) 632-9601

Party Responsible for Operation & Maintenance:

Montachusett Veterans Outreach Center 268 Central Street Gardner, Massachusetts 01440 (978) 632-9601

Inspection & Maintenance Schedule:

1) **Detention Ponds**

(The following recommendations follow the MADEP Stormwater Policy guidelines.)

Inspections

- Initial six months of use: Inspect infiltration basins after every major storm event. Examine for stabilization and function, including determination of the duration of water standing in the basin, any sediment erosion, excessive compaction of soils, or low spots.
- b. Twice per year: Examine basin for the following: differential settlement, cracking, erosion, leakage, or tree growth on embankments, condition of riprap, sediment accumulation, and health of turf.

Any adverse conditions noted during any inspections shall be addressed by repair or reconsideration of design components.

Mowing and General Maintenance

Occasional mowing (1-2 times per year min.) shall be performed on the side slopes and basin bottom. Accumulated grass clippings and/or organic matter and trash and debris shall be removed. Any clogged surface areas can be loosened by deep tilling; tilled areas must be immediately re-vegetated. Tilling may be used in this manner for no more than two consecutive maintenance periods. Thereafter, sediment in the clogged areas shall be removed, liner material replaced, and vegetation re-established.

Stormwater Drainage Report

Dredging/Sediment Removal

Accumulated sediment shall be removed from the basin at five (5) year intervals, or as required to maintain the function of the stormwater management system as designed. During this process and until the disturbed sediment has settled, the outlet pipe shall be sealed so as to minimize the risk of conveying sediment beyond the basin

2) Stormwater Treatment Chamber

The Stormwater Treatment Chamber, shall be inspected and maintained according the manufacturer's specifications. Maintenance be completed on the structures at least once per year, but the units should be checked once every three months during the first year to determine the rate of sediment and oil accumulation and to establish an appropriate maintenance schedule. The rate at which the system collects pollutants will depend on site activities. Maintenance or cleaning shall be performed when the stored volume reaches 15% of the capacity, when oil (hydrocarbon) has accumulated to 1 inch or greater depth, or immediately in the event of a fuel or oil spill according the manufacturer's specifications. All material removed from the chamber shall be disposed in accordance with applicable local, state, and federal guidelines and regulations

3) Hooded Catch Basin with Sump

Oil and water separators should be inspected at least four times per year and cleaned annually or more often if required. Oil and sediments should be removed and disposed of when sediment deposits are greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin, and should be disposed of in accordance with local, state and federal guidelines and regulations. In the case of an oil or bulk pollutant release, the system must be cleaned immediately following the spill and the proper authorities notified. Remove oils if any visible sheen observed.