159 Beach Road Salisbury, Massachusetts **CIVIL DESIGN** Consultants, Inc.

Survey - Design - Permitting - Construction Administration 344 North Main Street Andover, MA 01810-2611

Tel: (978) 416-0920



OWNER: Edward Foote Jr. & Joanne F. Blais **123 Central Street** Salisbury, MA 01952

APPLICANT:

Larkin Real Estate Group, Inc 383 Main Street Medfield, MA 02052

SUBMITTED TO:

Salisbury Planning Board **5 Beach Road** Salisbury, MA 01952

ISSUED:

June 14, 2022 Revised: August 3, 2022

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159 Beach Road Salisbury, Massachusetts

TAB 1

159 Beach Road Salisbury, Massachusetts

PROJECT DESCRIPTION

The applicant proposes to re-develop 159 Beach Road in Salisbury, MA into a 14-lot residential development, with 13 developable lots. The parcel totals approximately 30,310-SF and contains an existing ice cream stand with paved parking and associated appurtenances. The project consists of construction of 23 units, consisting of 10 duplex dwellings and 3 single family dwellings, along with associated infrastructure including driveways, landscaping, drainage facilities, and utilities. Project plans entitled *Site Development Plans for 159 Beach Road*, last revised August 2, 2022, have been prepared by this office and provided for your review. These plans illustrate the proposal in detail including zoning, easements, construction details, and provisions for utilities. Drainage will be collected and routed through best management practices sized to address the MADEP Stormwater Management Standards.

SITE DESCRIPTION

The total lot area of the project site is approximately 30,310-SF and provides frontage on Beach Road and Old County Road. The site is generally flat, with an elevation ranging between 10-FT and 14-FT across the site.

According to the Natural Resource Conservation Service Soil Survey for Middlesex County, Massachusetts soils on the site are mapped as containing Wareham Loamy Sand and Windsor Loamy Sand, both in Hydrologic Soil Group A.

SURFACE DRAINAGE

Pre-Development Condition

The pre-development condition consists of two watershed areas contributing to two design points. Design Point #1 (DP-1) receives runoff from drainage area EWA-1 and consists of overland flow to the south towards Beach Road. Design Point #2 (DP-2) receives runoff from drainage area EWA-2 and consists of overland flow to the north and east, towards the abutting properties along Old County Road and Beach Road. Contributing areas to the Design Points are detailed in the following Table 1.

DESIGN	AREA NAME	AREA	Тс	CN						
POINT		(SF)	(min.)							
DP-1	EWA-1	15,898	14.4	73						
DP-2	EWA-2	14,413	16.0	30						

TABLE 1: EXISTING WATERSHED DESIGN POINT DETAILS

Post-Development Condition

The proposed project includes the construction of 10 duplex dwellings and 3 single-family dwellings. Other components include construction of a new driveways along with landscaping, drainage, utilities, and associated appurtenances. The development is less than one acre, therefore, the system has been designed to meet the requirements of the Town of Salisbury Planning Board Rules and Regulations Section III.c.5 – Drainage.

Drainage will be routed through infiltration trenches sized to capture and infiltrate runoff from roofs and driveways. Individual trenches have been designed to infiltrate roof and driveway runoff for up to and including the 100-year storm event. The drainage design results in all impervious area being captured and treated except for 835-SF. This provides a net benefit compared to the existing condition, which had approximately 10,000-SF of untreated impervious area.

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The proposed construction results in two watersheds discharging to two Design Points. DP-1 receives flow from PWA-1, which consists of overland flow towards Beach Road. DP-2 receives flow from PWA-2, which consists of overland flow towards Old County Road. The design points are summarized in Table 2 below.

TABLE 2. TROPOSED WATERSHED DESIGN FORM DETAILS										
DESIGN	AREA NAME	AREA	Тс	CN						
POINT		(SF)	(min.)							
DP-1	PWA-1	9,237	6.0	44						
DP-2	PWA-2	7,802	6.0	39						

TABLE 2: PROPOSED WATERSHED DESIGN POINT DETAILS

Peak Discharge Comparison

As illustrated in the following tables, the impact of the proposed improvements has been mitigated through the use of infiltration trenches for up to and including the 100-year, 24-hour storm event.

Design Point #1

Peak Flow:

	2-YR	10-YR	25-YR	50-YR	100-YR
	(3.1-IN)	(4.5-IN)	(5.3-IN)	(5.9-IN)	(6.5-IN)
	CFS	CFS	CFS	CFS	CFS
Pre-Development	0.3	0.6	0.8	1.0	1.1
Post-Development	0.0	0.0	0.0	0.1	0.1

Design Point #2

Peak Flow:

	2-YR	10-YR	25-YR	50-YR	100-YR
	(3.1-IN)	(4.5-IN)	(5.3-IN)	(5.9-IN)	(6.5-IN)
	CFS	CFS	CFS	CFS	CFS
Pre-Development	0.0	0.0	0.0	0.0	0.0
Post-Development	0.0	0.0	0.0	0.0	0.0

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METHODOLOGY

Drainage calculations were performed using the computer program HydroCAD by HydroCAD Software Solutions, LLC based upon Technical Release 20 (TR-20), developed by the NRCS, formerly the Soils Conservation Service. Drainage calculations were prepared for the 2-YR, 10-YR, 25-YR, 50-YR, and 100-YR Type III 24-hour storm events. Rainfall data corresponds with National Weather Service Technical Paper 40 (TP-40) used in Technical Release 55 (TR-55). Curve numbers were generated using the information provided in TR-55 and the SCS Soils Survey.

159 Beach Road Salisbury, Massachusetts

TAB 2



Project Notes

Rainfall events imported from "19-6813 Pre-Development.hcp"

21-10254 - Pre			Туре	III 24-hr 2-`	Year Rainfa	all=3.10"
Prepared by Civil Desig	n Consultants, Ind	C.			Printed 8	3/3/2022
HydroCAD® 9.10 s/n 0643	5 © 2011 HydroCAE	Software Solution	is LLC			Page 3
Reach rout	Time span=0.00 Runoff by S ting by Stor-Ind+Tr	-36.00 hrs, dt=0.0 SCS TR-20 metho ans method - Po	05 hrs, 721 po od, UH=SCS ond routing by	oints y Stor-Ind m	nethod	
SubcatchmentEWA-1:	Flow Length=130'	Runoff Area=15,8 Slope=0.0200 '/'	398 sf 62.93% Tc=14.4 min	b Impervious CN=73 Ru	Runoff Dept inoff=0.3 cfs	th=0.92" 0.028 af
SubcatchmentEWA-2:	Flow Length=200'	Runoff Area=14, Slope=0.0200 '/'	,413 sf 0.00% Tc=16.0 min	6 Impervious CN=30 Ru	Runoff Dept inoff=0.0 cfs	th=0.00" 0.000 af
Total Ru	noff Area = 0.696	ac Runoff Volu	me = 0.028 a	of Average	e Runoff Dei	oth = 0.48

0.696 ac Runoff Volume = 0.028 af Average Runoff Depth = 0.48" 67.00% Pervious = 0.466 ac 33.00% Impervious = 0.230 ac

Summary for Subcatchment EWA-1:

Runoff = 0.3 cfs @ 12.22 hrs, Volume= 0.028 af, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 2-Year Rainfall=3.10"

_	A	rea (sf)	CN	Description		
		1,234	39	>75% Gras	s cover, Go	bod, HSG A
		1,869	98	Roofs, HSC	θA	
		8,135	98	Paved park	ing, HSG A	N N N N N N N N N N N N N N N N N N N
		4,660	30	Woods, Go	od, HSG A	
		15,898	73	Weighted A	verage	
		5,894		37.07% Pe	rvious Area	
		10,004		62.93% Imp	pervious Ar	ea
	Тс	Length	Slope	e Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)) (ft/sec)	(cfs)	
	12.5	50	0.0200	0.07		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.10"
	1.9	80	0.0200	0.71		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
_	14.4	130	Total			

Subcatchment EWA-1:



Summary for Subcatchment EWA-2:

[45] Hint: Runoff=Zero

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

A	rea (sf)	CN E	Description						
	299	39 >	75% Gras	s cover, Go	bod, HSG A				
	0 98 Roofs, HSG A								
	0	98 F	aved park	ing, HSG A	N				
	14,114	30 V	Voods, Go	od, HSG A					
	14,413	30 V	Veighted A	verage					
	14,413	1	00.00% P	ervious Are	a				
-				o "					
	Length	Slope	Velocity	Capacity	Description				
(min)	(feet)	(ft/ft)	(ft/sec)	(CIS)					
12.5	50	0.0200	0.07		Sheet Flow,				
0.5	450	0 0000	0.74		Woods: Light underbrush n= 0.400 P2= 3.10"				
3.5	150	0.0200	0.71		Shallow Concentrated Flow,				
		.			woodland KV= 5.0 lps				
16.0	200	lotal							
Subcatchment EWA-2:									
Hydrograph									
					Type III 24-hr 2-Year				
		i i i	i i i i i		Kailiali-3.10				



21-10254 - Pre			Type II.	l 24-hr 10-	Year Rainfall=4.50"				
Prepared by Civil Design	Consultants, Inc	C.			Printed 8/3/2022				
HydroCAD® 9.10 s/n 06435	© 2011 HydroCAD	Software Solution	ns LLC		Page 6				
Reach routi	Time span=0.00 Runoff by S ng by Stor-Ind+Tr	-36.00 hrs, dt=0.0 SCS TR-20 metho ans method - Pe	05 hrs, 721 p od, UH=SCS ond routing b	oints y Stor-Ind n	nethod				
SubcatchmentEWA-1:	Flow Length=130'	Runoff Area=15,8 Slope=0.0200 '/'	398 sf 62.93% Tc=14.4 min	6 Impervious CN=73 Rเ	Runoff Depth=1.90" unoff=0.6 cfs 0.058 af				
SubcatchmentEWA-2:	Flow Length=200'	Runoff Area=14 Slope=0.0200 '/'	,413 sf 0.00% Tc=16.0 min	6 Impervious CN=30 Rเ	Runoff Depth=0.00" unoff=0.0 cfs 0.000 af				
Total Runoff Area = 0.696 ac_Runoff Volume = 0.058 af_Average Runoff Depth = 0.99									

0.696 ac Runoff Volume = 0.058 af Average Runoff Depth = 0.99" 67.00% Pervious = 0.466 ac 33.00% Impervious = 0.230 ac

Summary for Subcatchment EWA-1:

Runoff = 0.6 cfs @ 12.21 hrs, Volume= 0.058 af, Depth= 1.90"

_	A	rea (sf)	CN	Description		
		1,234	39	>75% Gras	s cover, Go	bod, HSG A
		1,869	98	Roofs, HSG	θA	
		8,135	98	Paved park	ing, HSG A	N
		4,660	30	Woods, Go	od, HSG A	
		15,898	73	Weighted A	verage	
		5,894		37.07% Pei	rvious Area	
		10,004		62.93% Imp	pervious Ar	ea
	Тс	Length	Slope	e Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft) (ft/sec)	(cfs)	
	12.5	50	0.0200	0.07		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.10"
	1.9	80	0.0200	0.71		Shallow Concentrated Flow,
_						Woodland Kv= 5.0 fps
	14.4	130	Total			



Summary for Subcatchment EWA-2:

[45] Hint: Runoff=Zero

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

A	rea (sf)	CN D	escription						
299 39 >75% Grass cover, Good, HSG A									
	0 98 Roofs, HSG A								
	0	98 P	aved park	ing, HSG A	N Contraction of the second seco				
	14,114	30 V	Voods, Go	od, HSG A					
	14,413	30 V	Veighted A	verage					
	14,413	1	00.00% P	ervious Are	a				
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description				
12.5	50	0.0200	0.07		Sheet Flow,				
					Woods: Light underbrush n= 0.400 P2= 3.10"				
3.5	150	0.0200	0.71		Shallow Concentrated Flow,				
					Woodland Kv= 5.0 fps				
16.0	200	lotal							
Subcatchment EWA-2:									
				Hydro	graph				
1					Type III 24-hr 10-Year Rainfall=4.50'' Runoff Area=14.413 sf				



21-10254 - Pre			Type III 2	24-hr 25-Y	ear Rainfall=5.30"				
Prepared by Civil Desig	n Consultants, Ind	Э.			Printed 8/3/2022				
HydroCAD® 9.10 s/n 0643	5 © 2011 HydroCAE	Software Solutions	LLC		Page 9				
Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points Runoff by SCS TR-20 method, UH=SCS Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method									
SubcatchmentEWA-1:	Flow Length=130'	Runoff Area=15,898 Slope=0.0200 '/' T	8 sf 62.93% ˈc=14.4 min 0	mpervious CN=73 Rur	Runoff Depth=2.52" noff=0.8 cfs_0.077 af				
SubcatchmentEWA-2:	Flow Length=200'	Runoff Area=14,47 Slope=0.0200 '/' T	13 sf 0.00% l c=16.0 min 0	mpervious CN=30 Rur	Runoff Depth=0.02" noff=0.0 cfs_0.000 af				
Total Ru	noff Area = 0.696	ac Runoff Volum 67.00% Pervious :	ne = 0.077 af = 0.466 ac	Average 33.00% In	Runoff Depth = 1.33' npervious = 0.230 ac				

Summary for Subcatchment EWA-1:

Runoff = 0.8 cfs @ 12.21 hrs, Volume= 0.077 af, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 25-Year Rainfall=5.30"

	A	rea (sf)	CN	Description		
		1,234	39	>75% Gras	s cover, Go	bod, HSG A
		1,869	98	Roofs, HSC	θA	
		8,135	98	Paved park	ing, HSG A	N N N N N N N N N N N N N N N N N N N
_		4,660	30	Woods, Go	od, HSG A	
		15,898	73	Weighted A	verage	
		5,894		37.07% Pe	rvious Area	
		10,004		62.93% Imp	pervious Ar	ea
	Tc	Length	Slope	e Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft) (ft/sec)	(cfs)	
	12.5	50	0.0200	0.07		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.10"
	1.9	80	0.0200	0.71		Shallow Concentrated Flow,
_						Woodland Kv= 5.0 fps
_	14.4	130	Total			

Subcatchment EWA-1:



Summary for Subcatchment EWA-2:

Runoff = 0.0 cfs @ 22.16 hrs, Volume= 0.000 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 25-Year Rainfall=5.30"

Area	a (sf)	CN	Description		
	299	39	>75% Gras	s cover, Go	bod, HSG A
	0	98	Roofs, HSC	βA	
	0	98	Paved park	ing, HSG A	
14	4,114	30	Woods, Go	od, HSG A	
14	4,413	30	Weighted A	verage	
14	4,413		100.00% P	ervious Are	a
Tc L	_ength	Slope	e Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
12.5	50	0.0200	0.07		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.10"
3.5	150	0.0200	0.71		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
16.0	200	Total			

Subcatchment EWA-2:



21-10254 - Pre			Type III	24-hr 50-Ye	ear Rainfall=5.9)0"
Prepared by Civil Design (Consultants, Inc	2.			Printed 8/3/202	22
HydroCAD® 9.10 s/n 06435 @	2011 HydroCAD	Software Solution	s LLC		Page [·]	12
Reach routing	Time span=0.00- Runoff by S g by Stor-Ind+Tra	-36.00 hrs, dt=0.0 SCS TR-20 metho ans method - Pc)5 hrs, 721 po od, UH=SCS ond routing by	ints Stor-Ind me	ethod	
SubcatchmentEWA-1:	low Length=130'	Runoff Area=15,8 Slope=0.0200 '/'	98 sf 62.93% Tc=14.4 min	Impervious CN=73 Run	Runoff Depth=3.0 ² off=1.0 cfs 0.091 a	l" af
SubcatchmentEWA-2:	low Length=200'	Runoff Area=14, Slope=0.0200 '/'	413 sf 0.00% Tc=16.0 min	Impervious CN=30 Run	Runoff Depth=0.06 off=0.0 cfs 0.002 a	3" af
Total Runo	ff Area = 0.696 a	ac Runoff Volu	me = 0.093 at	f Average	Runoff Depth = ²	1.61"

67.00% Pervious = 0.466 ac 33.00% Impervious = 0.230 ac

Summary for Subcatchment EWA-1:

Runoff = 1.0 cfs @ 12.20 hrs, Volume= 0.091 af, Depth= 3.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 50-Year Rainfall=5.90"

Area	a (sf)	CN	Description		
1	,234	39	>75% Gras	s cover, Go	bod, HSG A
1	,869	98	Roofs, HSC	θA	
8	,135	98	Paved park	ing, HSG A	N
4	,660	30	Woods, Go	od, HSG A	
15	,898	73	Weighted A	verage	
5	,894	:	37.07% Pe	rvious Area	
10	,004	(62.93% Im	pervious Ar	ea
Tc L	ength	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
12.5	50	0.0200	0.07		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.10"
1.9	80	0.0200	0.71		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps

14.4 130 Total

Subcatchment EWA-1:



Summary for Subcatchment EWA-2:

Runoff = 0.0 cfs @ 15.79 hrs, Volume= 0.002 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN I	Description		
299	39 :	>75% Gras	s cover, Go	ood, HSG A
0	98	Roofs, HSG	βA	
0	98	Paved park	ing, HSG A	N Contraction of the second
14,114	30	Woods, Go	od, HSG A	
14,413	30	Weighted A	verage	
14,413		100.00% Pe	ervious Are	а
Tc Length	Slope	Velocity	Capacity	Description
(min) (feet)	(ft/ft)	(ft/sec)	(cfs)	
12.5 50	0.0200	0.07		Sheet Flow,
				Woods: Light underbrush n= 0.400 P2= 3.10"
3.5 150	0.0200	0.71		Shallow Concentrated Flow,
				Woodland Kv= 5.0 fps
16.0 200	Total			

Subcatchment EWA-2:



21-10254 - Pre			Type III	24-hr 100-	Year Rainf	<i>'all=6.50"</i>
Prepared by Civil Design	n Consultants, Ind	С.			Printed	8/3/2022
HydroCAD® 9.10 s/n 06435	5 © 2011 HydroCAE	O Software Solution	ns LLC			Page 15
Reach rout	Time span=0.00 Runoff by S ting by Stor-Ind+Tr	-36.00 hrs, dt=0.0 SCS TR-20 metho ans method - Po	05 hrs, 721 p od, UH=SCS ond routing b	oints y Stor-Ind r	nethod	
SubcatchmentEWA-1:	Flow Length=130'	Runoff Area=15,8 Slope=0.0200 '/'	398 sf 62.93% Tc=14.4 min	6 Impervious CN=73 R	s Runoff Dep unoff=1.1 cfs	oth=3.51" 0.107 af
SubcatchmentEWA-2:	Flow Length=200'	Runoff Area=14 Slope=0.0200 '/'	,413 sf 0.00% Tc=16.0 min	6 Impervious CN=30 R	s Runoff Dep unoff=0.0 cfs	oth=0.13" 0.004 af
Total Ru	noff Area = 0 696	ac Runoff Volu	me = 0.110 <i>;</i>	af Averad	e Runoff De	enth = 1.90

Total Runoff Area = 0.696 acRunoff Volume = 0.110 afAverage Runoff Depth = 1.90"67.00% Pervious = 0.466 ac33.00% Impervious = 0.230 ac

Summary for Subcatchment EWA-1:

Runoff = 1.1 cfs @ 12.20 hrs, Volume= 0.107 af, Depth= 3.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 100-Year Rainfall=6.50"

_	A	rea (sf)	CN	Description						
		1,234	39	39 >75% Grass cover, Good, HSG A						
		1,869	98	Roofs, HSC	θA					
		8,135	98	Paved park	ing, HSG A	N				
		4,660	30	Woods, Go	od, HSG A					
		15,898	73	Weighted A	verage					
		5,894		37.07% Pe	rvious Area					
		10,004		62.93% Imp	pervious Ar	ea				
	Тс	Length	Slope	e Velocity	Capacity	Description				
_	(min)	(feet)	(ft/ft)) (ft/sec)	(cfs)					
	12.5	50	0.0200	0.07		Sheet Flow,				
						Woods: Light underbrush n= 0.400 P2= 3.10"				
	1.9	80	0.0200	0.71		Shallow Concentrated Flow,				
_						Woodland Kv= 5.0 fps				
	14.4	130	Total							

130 Total

Subcatchment EWA-1:



Summary for Subcatchment EWA-2:

0.0 cfs @ 15.06 hrs, Volume= Runoff 0.004 af, Depth= 0.13" =

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 100-Year Rainfall=6.50"

	Ai	rea (sf)	CN	Description		
		299	39	>75% Gras	s cover, Go	bod, HSG A
		0	98	Roofs, HSC	θA	
		0	98	Paved park	ing, HSG A	N
_		14,114	30	Woods, Go	od, HSG A	
		14,413	30	Weighted A	verage	
		14,413		100.00% P	ervious Are	a
	Тс	Length	Slope	e Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	12.5	50	0.0200	0.07		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.10"
	3.5	150	0.0200	0.71		Shallow Concentrated Flow,
_						Woodland Kv= 5.0 fps
	16.0	200	Total			

Subcatchment EWA-2:



159 Beach Road Salisbury, Massachusetts

TAB 3



Project Notes

Rainfall events imported from "19-6813 Pre-Development.hcp"

21-10254 - Post-R1	Type III 24-hr 2-Year Rainfall=3.10"
Prepared by Civil Design Consultants, Ir	nc. Printed 8/3/2022
HydroCAD® 9.10 s/n 06435 © 2011 HydroCA	D Software Solutions LLC Page 3
Time span=0.00 Runoff by Reach routing by Stor-Ind+T	0-36.00 hrs, dt=0.05 hrs, 721 points SCS TR-20 method, UH=SCS frans method - Pond routing by Stor-Ind method
SubcatchmentPWA-1:	Runoff Area=9,237 sf 9.04% Impervious Runoff Depth=0.02" Tc=6.0 min CN=44 Runoff=0.0 cfs 0.000 af
SubcatchmentPWA-2:	Runoff Area=7,802 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=39 Runoff=0.0 cfs 0.000 af
SubcatchmentTyp. Roof:	Runoff Area=1,300 sf 100.00% Impervious Runoff Depth=2.87" Tc=6.0 min CN=98 Runoff=0.1 cfs 0.007 af
Pond Infiltration Trench:	Peak Elev=8.89' Storage=0.001 af Inflow=0.1 cfs 0.007 af Outflow=0.0 cfs 0.007 af
Total Runoff Area = 0.421	ac Runoff Volume = 0.008 af Average Runoff Depth = 0.21" 88.36% Pervious = 0.372 ac 11.64% Impervious = 0.049 ac

Summary for Subcatchment PWA-1:

Runoff = 0.0 cfs @ 17.04 hrs, Volume= 0.000 af, Depth= 0.02"



Summary for Subcatchment PWA-2:

[45] Hint: Runoff=Zero

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"



Summary for Subcatchment Typ. Roof:

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 0.007 af, Depth= 2.87"



Summary for Pond Infiltration Trench:

Inflow Area	=	0.030 ac,10	0.00% Impei	rvious,	Inflow De	epth =	2.87"	for 2	2-Year	event	
Inflow	=	0.1 cfs @	12.09 hrs,	Volume) =	0.007	af				
Outflow	=	0.0 cfs @	12.38 hrs,	Volume) =	0.007	af, Att	en= 6	7%, L	ag= 17.4 min	I
Discarded	=	0.0 cfs @	12.38 hrs,	Volume) =	0.007	af				

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Peak Elev= 8.89' @ 12.38 hrs Surf.Area= 0.003 ac Storage= 0.001 af

Plug-Flow detention time= 7.9 min calculated for 0.007 af (100% of inflow) Center-of-Mass det. time= 7.9 min (765.0 - 757.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	8.00'	0.004 af	3.21'W x 42.00'L x 3.21'H Field A
			0.010 af Overall - 0.001 af Embedded = 0.009 af x 40.0% Voids
#2A	9.00'	0.001 af	ADS N-12 12 x 2 Inside #1
			Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
			Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		0.004 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices				
#1	Discarded	8.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 0.00'				
Rissandad OutFlow May 0.0 of a 20.00 km 100/000 (Ence Discharge)							

Discarded OutFlow Max=0.0 cfs @ 12.38 hrs HW=8.89' (Free Discharge) **1=Exfiltration** (Controls 0.0 cfs)

Pond Infiltration Trench: - Chamber Wizard Field A

Chamber Model = ADS N-12 12

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 0.0" Spacing = 14.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' + 12.0" End Stone x 2 = 42.00' Base Length 1 Rows x 14.5" Wide + 12.0" Side Stone x 2 = 3.21' Base Width 12.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.21' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage 2 Chambers x 20.9 cf = 41.9 cf Displacement

432.5 cf Field - 41.9 cf Chambers = 390.6 cf Stone x 40.0% Voids = 156.2 cf Stone Storage

Stone + Chamber Storage = 188.6 cf = 0.004 af

2 Chambers 16.0 cy Field 14.5 cy Stone

Pond Infiltration Trench:



21-10254 - Post-R1	Type III 24-hr 10-Year Rainfall=4.50"
Prepared by Civil Design Consultants, Inc.	Printed 8/3/2022
HydroCAD® 9.10 s/n 06435 © 2011 HydroCAD Softw	vare Solutions LLC Page 10
Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points Runoff by SCS TR-20 method, UH=SCS Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method	
SubcatchmentPWA-1: Ru	noff Area=9,237 sf 9.04% Impervious Runoff Depth=0.26" Tc=6.0 min CN=44 Runoff=0.0 cfs 0.005 af
SubcatchmentPWA-2: Ru	noff Area=7,802 sf 0.00% Impervious Runoff Depth=0.11" Tc=6.0 min CN=39 Runoff=0.0 cfs 0.002 af
SubcatchmentTyp. Roof: Runo	ff Area=1,300 sf 100.00% Impervious Runoff Depth=4.26" Tc=6.0 min CN=98 Runoff=0.1 cfs 0.011 af
Pond Infiltration Trench:	Peak Elev=9.65' Storage=0.002 af Inflow=0.1 cfs 0.011 af Outflow=0.0 cfs 0.011 af
Total Runoff Area = 0.421 ac Runoff Volume = 0.017 af Average Runoff Depth = 0.48" 88.36% Pervious = 0.372 ac 11.64% Impervious = 0.049 ac	

Summary for Subcatchment PWA-1:

Runoff = 0.0 cfs @ 12.40 hrs, Volume= 0.005 af, Depth= 0.26"


Summary for Subcatchment PWA-2:

Runoff = 0.0 cfs @ 14.71 hrs, Volume= 0.002 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 10-Year Rainfall=4.50"

	Area (sf)	CN [Description						
	7,802	39 >	75% Gras	s cover, Go	bod, HSG A				
	0	0 98 Roofs, HSG A 0 98 Paved parking HSG A							
	0	98 F 30 \	Paved park Noods Go	ING, HSG A					
	7.802	39 \	Veighted A	verade					
	7,802		00.00% P	ervious Are	a				
	Ta law with	Olana	Valasita.	0 :tr -	Description				
(m	in) (feet)	Siope (ft/ft)	(ft/sec)	Capacity (cfs)	Description				
	6.0	(1010)	(14000)	(010)	Direct Entry, 6				
				Outract	above and DWA O				
				Subcat	ichment PWA-2:				
				Hydro	9graph				
						Runoff			
	0.003			0.0 cfs					
	0.003				i ype iii 24-nr i u-rear				
	0.002								
	0.002				Runoff Area=7,802 sf				
		+ - + - +			Runoff Volume=0.002 af				
cfs)	0.002				Runoff Depth=0 11"				
Ň	0.001		· _ L _ l l l l 						
Ĕ	0.001	+-+		+					
	0.001				CN≡39				
	0.001	++++++							
	0.001								
	0.000								
	0.000								
	0								
	0123	4567	8 9 10 11 1	12 13 14 15 16 Tir	17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 ne (hours)				

Summary for Subcatchment Typ. Roof:

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 0.011 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 10-Year Rainfall=4.50"



Summary for Pond Infiltration Trench:

Inflow Area	a =	0.030 ac,100.00	% Impervious, Inflow [Depth = 4.26" for 10-Year event
Inflow	=	0.1 cfs @ 12.	09 hrs, Volume=	0.011 af
Outflow	=	0.0 cfs @ 12.	47 hrs, Volume=	0.011 af, Atten= 76%, Lag= 22.8 min
Discarded	=	0.0 cfs @ 12.	47 hrs, Volume=	0.011 af
Routing by Peak Elev	/ Stor-Ind = 9.65' @	method, Time S 12.47 hrs Surf	pan= 0.00-36.00 hrs, d Area= 0.003 ac Stora	t= 0.05 hrs ge= 0.002 af
Plug-Flow Center-of-	detentior Mass det	n time= 16.1 min . time= 16.1 min	calculated for 0.011 af (765.9 - 749.8)	(100% of inflow)
Volume	Inver	t Avail.Storag	e Storage Description	I
#1A	8.00	' 0.004 a	f 3.21'W x 42.00'L x 0.010 af Overall - 0.	3.21'H Field A 001 af Embedded = 0.009 af x 40.0% Void

		0.00	0.001 41	
				0.010 af Overall - 0.001 af Embedded = 0.009 af x 40.0% Voids
	#2A	9.00'	0.001 af	ADS N-12 12 x 2 Inside #1
				Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
_				Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
			0.004 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 0.00'
<u>.</u>			

Discarded OutFlow Max=0.0 cfs @ 12.47 hrs HW=9.65' (Free Discharge) **1=Exfiltration** (Controls 0.0 cfs)

Pond Infiltration Trench: - Chamber Wizard Field A

Chamber Model = ADS N-12 12

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 0.0" Spacing = 14.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' + 12.0" End Stone x 2 = 42.00' Base Length 1 Rows x 14.5" Wide + 12.0" Side Stone x 2 = 3.21' Base Width 12.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.21' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage 2 Chambers x 20.9 cf = 41.9 cf Displacement

432.5 cf Field - 41.9 cf Chambers = 390.6 cf Stone x 40.0% Voids = 156.2 cf Stone Storage

Stone + Chamber Storage = 188.6 cf = 0.004 af

2 Chambers 16.0 cy Field 14.5 cy Stone

Pond Infiltration Trench:



21-10254 - Post-R1	Type III 24-hr 25-Year Rainfall=5.30"
Prepared by Civil Design Consultants, Inc.	Printed 8/3/2022
HydroCAD® 9.10 s/n 06435 © 2011 HydroCAD Sol	tware Solutions LLC Page 17
Time span=0.00-36. Runoff by SCS Reach routing by Stor-Ind+Trans	00 hrs, dt=0.05 hrs, 721 points TR-20 method, UH=SCS method - Pond routing by Stor-Ind method
SubcatchmentPWA-1:	Runoff Area=9,237 sf 9.04% Impervious Runoff Depth=0.49" Tc=6.0 min CN=44 Runoff=0.0 cfs 0.009 af
SubcatchmentPWA-2:	Runoff Area=7,802 sf 0.00% Impervious Runoff Depth=0.26" Tc=6.0 min CN=39 Runoff=0.0 cfs 0.004 af
SubcatchmentTyp. Roof: Run	noff Area=1,300 sf 100.00% Impervious Runoff Depth=5.06" Tc=6.0 min CN=98 Runoff=0.2 cfs 0.013 af
Pond Infiltration Trench:	Peak Elev=10.08' Storage=0.003 af Inflow=0.2 cfs 0.013 af Outflow=0.0 cfs 0.013 af
Total Runoff Area = 0.421 ac 88.3	Runoff Volume = 0.025 af Average Runoff Depth = 0.72" 6% Pervious = 0.372 ac 11.64% Impervious = 0.049 ac

Summary for Subcatchment PWA-1:

Runoff = 0.0 cfs @ 12.29 hrs, Volume= 0.009 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 25-Year Rainfall=5.30"



0.006

0.005 0.004 0.003 0.002 0.001 0**CN=39**

Summary for Subcatchment PWA-2:

Runoff 0.0 cfs @ 12.43 hrs, Volume= 0.004 af, Depth= 0.26" =

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 25-Year Rainfall=5.30"

	Area (sf)	CN	Description							
	7,802	39	>75% Gras	s cover, Go	bod, HSG A					
0 98 Roofs, HSG A										
	0	98	Paved park	ing, HSG A	N					
	7 902	30	Woightad A	UU, HOGA						
	7,002	39		arvious Δre	2					
	7,002		100.007010		а 					
,	Tc Length	Slope	e Velocity	Capacity	Description					
(m	in) (feet)	(ft/ft) (ft/sec)	(cfs)						
	5.0				Direct Entry, 6					
				Subcat	chment PWA-2					
				Cubcut						
	/''-		<u> </u>		ograph					
	0.014	 - + - + -	 +	 <u> - + -</u> + -		Runoff				
	0.013	 - + -		1.0 cfs	Type III 24-br 25-Year					
	0.012									
	0.011	· · · ·								
	0.01	 - - + - + -	$\begin{array}{cccccccccccccccccccccccccccccccccccc$		Runoff Area=7,802 sf					
	0.009	 			Runoff Volume=0.004 af					
(cfs)	0.008				Runoff Depth=0.26"					
٥	0.007				Tc=6 0 min					
	a a a a T									

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 Time (hours)

Summary for Subcatchment Typ. Roof:

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 0.013 af, Depth= 5.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 25-Year Rainfall=5.30"



Summary for Pond Infiltration Trench:

Inflow Area	ı =	0.030 ac,10	0.00% Impe	ervious,	Inflow	Depth =	5.06"	for	25-Ye	ear event	
Inflow	=	0.2 cfs @	12.09 hrs,	Volume	e=	0.013	af				
Outflow	=	0.0 cfs @	12.50 hrs,	Volume	e=	0.013	af, At	ten=	79%,	Lag= 24.	6 min
Discarded	=	0.0 cfs @	12.50 hrs,	Volume	==	0.013	af				

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Peak Elev= 10.08' @ 12.50 hrs Surf.Area= 0.003 ac Storage= 0.003 af

Plug-Flow detention time= 21.2 min calculated for 0.013 af (100% of inflow) Center-of-Mass det. time= 21.2 min (768.3 - 747.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	8.00'	0.004 af	3.21'W x 42.00'L x 3.21'H Field A
			0.010 af Overall - 0.001 af Embedded = 0.009 af x 40.0% Voids
#2A	9.00'	0.001 af	ADS N-12 12 x 2 Inside #1
			Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
			Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		0.004 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 0.00'

Discarded OutFlow Max=0.0 cfs @ 12.50 hrs HW=10.08' (Free Discharge) **1=Exfiltration** (Controls 0.0 cfs)

Pond Infiltration Trench: - Chamber Wizard Field A

Chamber Model = ADS N-12 12

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 0.0" Spacing = 14.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' + 12.0" End Stone x 2 = 42.00' Base Length 1 Rows x 14.5" Wide + 12.0" Side Stone x 2 = 3.21' Base Width 12.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.21' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage 2 Chambers x 20.9 cf = 41.9 cf Displacement

432.5 cf Field - 41.9 cf Chambers = 390.6 cf Stone x 40.0% Voids = 156.2 cf Stone Storage

Stone + Chamber Storage = 188.6 cf = 0.004 af

2 Chambers 16.0 cy Field 14.5 cy Stone

Pond Infiltration Trench:



21-10254 - Post-R1	Type III 24-hr 50-Year Rainfall=5.90"
Prepared by Civil Design Consultants, Inc.	Printed 8/3/2022
HydroCAD® 9.10 s/n 06435 © 2011 HydroCAD Softwar	e Solutions LLC Page 24
Time span=0.00-36.00 h Runoff by SCS TR- Reach routing by Stor-Ind+Trans met	rs, dt=0.05 hrs, 721 points 20 method, UH=SCS nod - Pond routing by Stor-Ind method
SubcatchmentPWA-1: Runo	ff Area=9,237 sf 9.04% Impervious Runoff Depth=0.70" Tc=6.0 min CN=44 Runoff=0.1 cfs 0.012 af
SubcatchmentPWA-2: Runo	ff Area=7,802 sf 0.00% Impervious Runoff Depth=0.42" Tc=6.0 min CN=39 Runoff=0.0 cfs 0.006 af
SubcatchmentTyp. Roof: Runoff	Area=1,300 sf 100.00% Impervious Runoff Depth=5.66" Tc=6.0 min CN=98 Runoff=0.2 cfs 0.014 af
Pond Infiltration Trench: Pea	k Elev=10.52' Storage=0.003 af Inflow=0.2 cfs 0.014 af Outflow=0.0 cfs 0.014 af
Total Runoff Area = 0.421 ac Rur 88.36%	off Volume = 0.033 af Average Runoff Depth = 0.93" Pervious = 0.372 ac 11.64% Impervious = 0.049 ac

Summary for Subcatchment PWA-1:

Runoff = 0.1 cfs @ 12.15 hrs, Volume= 0.012 af, Depth= 0.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 50-Year Rainfall=5.90"

A	rea (sf)	CN D	escription								
	8,402	39 >	75% Gras	s cover, Go	bod, HSG A						
	0	98 F	loofs, HSG	βA							
	835	98 P	aved park	ing, HSG A	A						
	0	30 V	Voods, Go	od, HSG A							
	9,237	44 V	Veighted A	verage							
	8,402	9	0.96% Pei	rvious Area	1						
	835	9	.04% Impe	ervious Are	a						
Тс	Lonath	Slope	Velocity	Canacity	Description						
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	Description						
6.0	()	(1211)	(14)	()	Direct Entry, 6						
					•						
	Subcatchment PWA-1:										
Hydrograph											
0.1-		-+-+- 		+-+-+							
0.095		, , , , , , , , , , , , , , , , , , , ,		rfe		Runoff					
0.09					Type III 24-hr 50-Year						
0.085											
0.08		iiii	т - т - с		Rainfaii=5.90						
0.075		<u>, </u>			Runoff Area=9,237 sf						
0.065					Pupoff Volumo-0.012 of						
0.06	/ _ <u></u>	, 									
5 0.055											
8 0.05											
⊑ ^{0.043} 0.04-		· + + +									
0.035		 ++	 + - + -		CN=44						
0.03		 -+-+-	 + - + - + -		+ - + - + - + + - + - + - + - + + - + - + - + +						
0.025			+ - + - +		· · · · · · · · · · · · · · · · · · ·						
0.02		 - + - + -	+ - + - + - + - + - + - + - + - + - + -		+ + - + - +						
0.015	Ĩ, <u> </u>	, _ , _ , _ , _ , _ , _ , _ ,									
0.01		i - i - i - i -									
0.000											

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 Time (hours)

Summary for Subcatchment PWA-2:

Runoff = 0.0 cfs @ 12.36 hrs, Volume= 0.006 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 50-Year Rainfall=5.90"



Summary for Subcatchment Typ. Roof:

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 0.014 af, Depth= 5.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 50-Year Rainfall=5.90"





Summary for Pond Infiltration Trench:

Inflow Area	ı =	0.030 ac,100	0.00% Impe	rvious,	Inflow	Depth =	5.66"	for	50-Ye	ar event	
Inflow	=	0.2 cfs @	12.09 hrs,	Volume	e=	0.014	af				
Outflow	=	0.0 cfs @	12.51 hrs,	Volume	e=	0.014	af, Att	en= 8	30%, I	Lag= 25.	5 min
Discarded	=	0.0 cfs @	12.51 hrs,	Volume	e=	0.014	af			-	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Peak Elev= 10.52' @ 12.51 hrs Surf.Area= 0.003 ac Storage= 0.003 af

Plug-Flow detention time= 25.1 min calculated for 0.014 af (100% of inflow) Center-of-Mass det. time= 25.0 min (770.4 - 745.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	8.00'	0.004 af	3.21'W x 42.00'L x 3.21'H Field A
			0.010 af Overall - 0.001 af Embedded = 0.009 af x 40.0% Voids
#2A	9.00'	0.001 af	ADS N-12 12 x 2 Inside #1
			Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
			Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		0.004 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices						
#1	Discarded	8.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 0.00'						
	Seconded OutFlow Move 0.0 of a 12 51 hrs. LIV/-10 511 (Free Discharge)								

Discarded OutFlow Max=0.0 cfs @ 12.51 hrs HW=10.51' (Free Discharge) **1=Exfiltration** (Controls 0.0 cfs)

Pond Infiltration Trench: - Chamber Wizard Field A

Chamber Model = ADS N-12 12

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 0.0" Spacing = 14.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' + 12.0" End Stone x 2 = 42.00' Base Length 1 Rows x 14.5" Wide + 12.0" Side Stone x 2 = 3.21' Base Width 12.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.21' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage 2 Chambers x 20.9 cf = 41.9 cf Displacement

432.5 cf Field - 41.9 cf Chambers = 390.6 cf Stone x 40.0% Voids = 156.2 cf Stone Storage

Stone + Chamber Storage = 188.6 cf = 0.004 af

2 Chambers 16.0 cy Field 14.5 cy Stone

Pond Infiltration Trench:



21-10254 - Post-R1	Type III 24-hr 100-Year Rainfall=6.50"
Prepared by Civil Design Consultants, Inc.	Printed 8/3/2022
HydroCAD® 9.10 s/n 06435 © 2011 HydroCAD Sc	ftware Solutions LLC Page 31
Time span=0.00-36 Runoff by SCS Reach routing by Stor-Ind+Trans	.00 hrs, dt=0.05 hrs, 721 points 5 TR-20 method, UH=SCS 5 method - Pond routing by Stor-Ind method
SubcatchmentPWA-1:	Runoff Area=9,237 sf 9.04% Impervious Runoff Depth=0.94" Tc=6.0 min CN=44 Runoff=0.1 cfs 0.017 af
SubcatchmentPWA-2:	Runoff Area=7,802 sf 0.00% Impervious Runoff Depth=0.60" Tc=6.0 min CN=39 Runoff=0.0 cfs 0.009 af
SubcatchmentTyp. Roof: Ru	noff Area=1,300 sf 100.00% Impervious Runoff Depth=6.26" Tc=6.0 min CN=98 Runoff=0.2 cfs 0.016 af
Pond Infiltration Trench:	Peak Elev=10.95' Storage=0.004 af Inflow=0.2 cfs 0.016 af Outflow=0.0 cfs 0.016 af
Total Runoff Area = 0.421 ac 88.	Runoff Volume = 0.041 af Average Runoff Depth = 1.17" 36% Pervious = 0.372 ac 11.64% Impervious = 0.049 ac

Summary for Subcatchment PWA-1:

Runoff = 0.1 cfs @ 12.12 hrs, Volume= 0.017 af, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description							
8,402	39	>75% Gras	s cover, Go	bod, HSG A					
0	98	Roofs, HSG	βA						
835	98	Paved park	aved parking, HSG A						
0	30	Woods, Go	od, HSG A						
9,237	44	Weighted A	verage						
8,402		90.96% Per	vious Area						
835		9.04% Impe	ervious Area	а					
Tc Length	n Slop	e Velocity	Capacity	Description					
(min) (feet)) (ft/f	t) (ft/sec)	(cfs)						
6.0				Direct Entry, 6					
Subcatchment PWA-1									
	Hydrograph								



Summary for Subcatchment PWA-2:

Runoff = 0.0 cfs @ 12.29 hrs, Volume= 0.009 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN Description								
7,802	302 39 >75% Grass cover, Good, HSG A								
0	0 98 Roofs, HSG A 0 98 Paved parking HSG A								
0	30 Woods, Good, H	ISG A							
7,802	39 Weighted Average	ge							
7,802	100.00% Pervio	us Area							
Tc Length	Slope Velocity Cap	pacity Description							
(min) (feet)	(ft/ft) (ft/sec)	(Cfs) Direct Entry 6							
0.0		Direct Entry, 6							
	Su	ubcatchment PWA-2:							
		Hydrograph							
			Runoff						
0.05		Type III 24-br 100-Vear							
0.045	+								
0.04									
		Runoff Volume=0.009 af							
(Classifier Constraints)		Runoff Depth=0.60"							
6 0.025		Tc=6.0 min							
0.02		CN=39							
0.015									
0.01									
0.005	+ - + - + - + - + - + - + - + - + - + -								
0		funtententententententententententententen							
0 1 2 3	5 4 5 6 / 8 9 10 11 12 13 14	4 או 17 או 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 Time (hours)							

Summary for Subcatchment Typ. Roof:

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 0.016 af, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Type III 24-hr 100-Year Rainfall=6.50"



Summary for Pond Infiltration Trench:

Inflow Area	ı =	0.030 ac,100	0.00% Impe	ervious,	Inflow	Depth =	6.26	for	100-Y	∕ear e∖	/ent
Inflow	=	0.2 cfs @	12.09 hrs,	Volume	e=	0.016	af				
Outflow	=	0.0 cfs @	12.52 hrs,	Volume	e=	0.016	af, /	Atten=	81%,	Lag= 2	26.2 min
Discarded	=	0.0 cfs @	12.52 hrs,	Volume	e=	0.016	af				

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs Peak Elev= 10.95' @ 12.52 hrs Surf.Area= 0.003 ac Storage= 0.004 af

Plug-Flow detention time= 28.8 min calculated for 0.016 af (100% of inflow) Center-of-Mass det. time= 28.8 min (772.8 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	8.00'	0.004 af	3.21'W x 42.00'L x 3.21'H Field A
			0.010 af Overall - 0.001 af Embedded = 0.009 af x 40.0% Voids
#2A	9.00'	0.001 af	ADS N-12 12 x 2 Inside #1
			Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
			Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		0.004 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 0.00'
. .		000	

Discarded OutFlow Max=0.0 cfs @ 12.52 hrs HW=10.94' (Free Discharge) **1=Exfiltration** (Controls 0.0 cfs)

Pond Infiltration Trench: - Chamber Wizard Field A

Chamber Model = ADS N-12 12

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 0.0" Spacing = 14.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' + 12.0" End Stone x 2 = 42.00' Base Length 1 Rows x 14.5" Wide + 12.0" Side Stone x 2 = 3.21' Base Width 12.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.21' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage 2 Chambers x 20.9 cf = 41.9 cf Displacement

432.5 cf Field - 41.9 cf Chambers = 390.6 cf Stone x 40.0% Voids = 156.2 cf Stone Storage

Stone + Chamber Storage = 188.6 cf = 0.004 af

2 Chambers 16.0 cy Field 14.5 cy Stone

Pond Infiltration Trench:



DRAINAGE REPORT

159 Beach Road Salisbury, Massachusetts

TAB 4



USDA Natural Resources Conservation Service

MAP	LEGEND	MAP INFORMATION
Area of Interest (AOI)	Spoil Area	The soil surveys that comprise your AOI were mapped at
Area of Interest (AOI)	A Stony Spot	1:15,800.
Soils	M Very Stony Spot	Warning: Soil Map may not be valid at this scale.
Soil Map Unit Polygons	Wet Spot	Enlargement of maps beyond the scale of mapping can ca
Soil Map Unit Lines	Other	misunderstanding of the detail of mapping and accuracy o
Soil Map Unit Points		contrasting soils that could have been shown at a more de
Special Point Features	Special Line Features	scale.
OBlowout	Streams and Canals	Please rely on the bar scale on each map sheet for map
Borrow Pit		measurements.
💥 Clay Spot	Rails	Source of Map: Natural Resources Conservation Service
Closed Depression	Interstate Highways	Web Soil Survey URL: Coordinate System: Web Mercator (EPSG:3857)
Gravel Pit	US Routes	Mans from the Web Soil Survey are based on the Web Me
Gravelly Spot	Major Roads	projection, which preserves direction and shape but distort
🙆 Landfill		distance and area. A projection that preserves area, such
👗 Lava Flow	Beckennend	accurate calculations of distance or area are required.
Marsh or swamp	Aerial Photography	This product is generated from the USDA-NRCS certified
Mine or Quarry		of the version date(s) listed below.
Miscellaneous Water		Soil Survey Area: Essex County, Massachusetts, Northe
Boroppial Water		
		Soli map units are labeled (as space allows) for map scale 1:50,000 or larger.
		Date(s) aerial images were photographed: May 22, 2020
- Saline Spot		25, 2020
Sandy Spot		The orthophoto or other base map on which the soil lines
Severely Eroded Spot		compiled and digitized probably differs from the backgrour imagery displayed on these maps. As a result, some mino
Sinkhole		shifting of map unit boundaries may be evident.
Slide or Slip		
g Sodic Spot		

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
32A	Wareham loamy sand, 0 to 3 percent slopes	1.0	20.2%
255B	Windsor loamy sand, 3 to 8 percent slopes	3.0	58.5%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	0.9	17.5%
639B	Urban land-Hooksan complex, 0 to 8 percent slopes	0.2	3.7%
Totals for Area of Interest		5.2	100.0%





Commonwealth of Massachusetts City/Town of Salisbury

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

	Larkin			
	Owner Name 159 Beach Road			
	Street Address		Map/Lot #	
	Salisbury	MA		
	City	State	Zip Code	
В.	Site Information			
1.	(Check one) I New Construction Up	grade 🗌 Repair 🏾 🗖	: pits for drainage pur	poses only
2.	Soil Survey Available? 🏾 🖾 Yes 🔲 No	If yes:	Web Soil Su	1rvey 32A/255B
		,	Source	Soil Map Unit
	Wareham and Windsor loamy sand	Os it Lissits tisses		
	Soli Name	Soli Limitations		
	Soil Parent material	Landform		
3.	Surficial Geological Report Available? Ves No	If ves:		
-		Year Pul	d/Source Map Unit	
	Description of Geologic Map Unit:			
4.	Flood Rate Insurance Map Within a regulator	y floodway? 🗌 Yes	١o	
5.	Within a velocity zone? Yes No	1		
6.	Within a Mapped Wetland Area?	No If yes,	sGIS Wetland Data Layer:	etland Type
7.	Current Water Resource Conditions (USGS):	Month/Day/ Year	Range: Above Normal	Normal Below Normal
8.	Other references reviewed:	-		

Commonwealth of Massachusetts

City/Town of Salisbury

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (minimum of two holes required at every proposed primary and reserve disposal area)

Deep	Observatior	n Hole Numb	er: ^{TP-1}	1/28	/22								
•	Comm	ercial	Hole #	Date		Time		Weather		Latitude		Longitude:	
1. Land	Use (e.g., wo	odland, agricult	ural field, vacant lot, e	etc.)	Vegetation			Surface Stone	s (e.g., cobbles,	stones, boulder	s, etc.)	Slope (%)	
Des	scription of Lo	ocation:											
2 Soil P	Soil Derent Meterial												
2. JUI F		u			La	ndform		Posi	tion on Landscap	e (SU, SH, BS,	FS, TS)		
3. Distar	3. Distances from: Open Water Body feet Drainage Way feet Wetlands feet												
			Property Line	>10 _{fee}	et	Drinking	g Water W	/ell	feet	(Other	feet	
4. Unsuita	ble Materials	s Present:] Yes 🖾 No	If Yes:	Disturbed S	Soil 🗌 I	- Fill Material		Weathered/Fra	ctured Rock	🗌 Bed	lrock	
F 0			52 N.		11	_							
5. Grour	idwater Obse	erved: 📋 Yes	S 🛆 NO		If yes	s:	Depth Wee	ping from Pit	-	Depth St	tanding W	ater in Hole	
		[1	[Soil Log	Caaraa	Tragmanta	1	I			
Depth (in)	Soil Horizon	Soil Texture	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features		itures	% by Volume		Soil Structure	Soil		Other	
Deptil (iii)	/Layer	(USDA		Depth	Color	Percent	Gravel	Cobbles & Stones		(Moist)		Other	
0-8	А	Sandy Loam	10YR3/2						Massive	Friable			
8-18	В	Loamy Sand	10YR5/6						Massive	Friable			
18-90	С	Sand	10YR7/6	78"	High Chroma	>5			Single Grain	Loose			

Commonwealth of Massachusetts

City/Tow

City/Town of Salisbury

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number:		ber: TP-2	TP-2 1/28/22										
			Hole #	Da	ate	Time	Wea	ather	Latitude		Longitude:		
1 Land		ommercia	1										
	(e.g.	, woodland, agr	icultural field, vao	ural field, vacant lot, etc.)			Vegetation Surface Sto		es (e.g., cobbles,	stones, boulders, et	c.) Slope (%)		
Descr	Description of Location:												
2. Soil P	2. Soil Parent Material: Landform Position on Landscape (SI									ape (SU, SH, BS, FS, TS)			
3. Distar	3. Distances from: Open Water Body feet Drainage Way feet Wetlands feet												
		Proper	ty Line <u>>10</u>) _{feet}	0	Drinking W	ater Well	feet	Other feet				
4. Unsuita	ble		-	_									
Materia	Is Present:	X Yes	No If Yes:	Distu	rbed Soil	Ճ Fill Mat	erial	Weathered/	Fractured Rock	Bedrock			
5. Grour	dwater Obse	erved: 🖾 Ye	s 🗌 No			I	f yes: <u>102</u>	Depth Weeping	g from Pit	Depth Sta	anding Water in Hole		
						So	il Log						
Denth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix:	Redoximorphic		atures	Coarse F % by V	Coarse Fragments % by Volume		Soil	Other		
Deptil (iii)			Color-Moist (Munsell)	Depth	Color	Percent	Gravel	Cobbles & Stones	Son Structure	(Moist)	Oulei		
0-78	Fill												
78-102	2 C	Sand	10YR7/6	84"	H.C.	>5			S.G.	Loose			

City/Town of Salisbury

Commonwealth of Massachusetts

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (minimum of two holes required at every proposed primary and reserve disposal area)

Deep Observation Hole Numbe			er: TP-3	1/28	/22							
	Comr	mercial	Hole #	Date		Time	ime Weather			Latitude		tude:
1. Land Use (e.g., woodland		odland, agricultu	ural field, vacant lot, e	etc.) Vegetation				Surface Stone	s, etc.) Slop	pe (%)		
Description of Location:												
2. Soil Parent Material:												
					La	ndform		Pos	tion on Landscap	e (SU, SH, BS,	FS, TS)	
3. Distances from: Open Water Body				feet Dr			rainage Way feet			Wet	lands	feet
Property Line			Property Line	>10 feet Drinking W;				/ell	feet	(Other	feet
4. Unsuita	able Materials	s Present: 🗵	Yes 🗌 No	If Yes: Disturbed Soil I Fill Material					Weathered/Fractured Rock Be			
Б Ото ни					lf voo							
5. Grour	ndwater Obse	ervea: 🛆 Yes		If yes: <u>96</u> Depth Weeping					from Pit Depth Standing Water in Hole			
	1					Soil Log						
Denth (in)	Soil Horizon	Soil Texture (USDA	Soil Matrix: Color-	Redo	oximorphic Fea	tures	Coarse Fragments % by Volume			Soil		Other
Depth (in)	/Layer		Moist (Munsell)	Depth	Color	Percent	Gravel	Cobbles & Stones	Soli Structure	(Moist)	0	Other
0-72	Fill											
72-102	С	Sand	10YR7/6	78"	H.C.	>5			S.G.	Loose		

City/Town of Salisbury

Commonwealth of Massachusetts

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number:		ber: ^{TP-4}	1,	/28/22								
			Hole #	Da	ate	Time	Weather			Longitude:		
4 1.00	C	ommercial									-	
1. Land Use:		.g., woodland, agr	icultural field, va	ral field, vacant lot, etc.)				Surface Stor	nes (e.g., cobbles,	stones, boulders, etc	.) Slope (%)	
Des	Description of Location:											
2. Soil Parent Material: Landform Position on Landscape (SU								pe (SU, SH, BS, FS, TS)				
3. Dist	ances from:	Open Wate	r Body	feet		Drain	age Way	feet	Wetla			
Property Line >10 feet						Drinking W	ater Well	feet	Ot	Other feet		
4. Unsu	table		·			Ũ	-					
Mate	ials Present	🛛 Yes 🗌	No If Yes:	Distu	rbed Soil	🖾 Fill Mat	erial (Weathered	Fractured Rock	Bedrock		
5. Gro	undwater Ob	served: 🖾 Ye	es 🗌 No			I	f yes: <u>84</u> "	_ Depth Weepin	g from Pit	Depth Star	nding Water in Hole	
						So	il Log					
Denth (、 Soil Horiz	on Soil Texture	Soil Matrix:	Redoximorphic		eatures	Coarse Fragments % by Volume		0.11.04	Soil	Other	
Depth (in)	n) /Layer	(USDA)	Color-Moist (Munsell)	Depth	Color	Percent	Gravel	Cobbles & Stones	Soli Structure	(Moist)	Other	
0-60	Fill											
60-96	C	Sand	10YR7/6	66"	H.C.	>5			S.G.	Loose		



Commonwealth of Massachusetts

City/Town of Salisbury

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

n~ lel	1/28/22					
Signature of Soil Evaluator	Date					
William Hall, P.E., S.E. 13592	6/30/24					
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License					
Name of Approving Authority Witness	Approving Authority					

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with <u>Percolation Test Form 12</u>.

Field Diagrams: Use this area for field diagrams:
OPERATIONS AND MAINTENANCE PLAN

August 2, 2022

This Operations and Maintenance (O&M) Plan has been prepared in accordance with the Stormwater Management Policy issued by the Department of Environmental Protection (DEP) for 159 Beach Road in Salisbury, MA.

Upon a period beginning twelve months after the completion of the roadway, the porous pavers shall be inspected annually. Maintenance and inspection shall be performed as indicated below:

Visual Inspection

The surface must be inspected annually for signs of degradation and clogging of the infiltration trenches. Regularly monitor the surface after storm events to make sure that the surface drains properly. Puddling could be an indication of clogging of the drainage system. Trenches shall be weeded and mowed as required to control vegetation.

Snow Storage / Removal

Snow plowed from the proposed driveway will be placed or disposed of in accordance with the policy developed by DEP. Under no circumstances shall snow plowed or removed from the road be stockpiled within the Town right-of-way. If conditions arise where snow storage areas are at capacity the Operator is required to remove and dispose of snow off site in conformance with all local, state and federal regulations.

Property Applicant / Responsible Party: Larkin Real Estate Group, Inc. 383 Main Street Medfield, MA 02052

<u>Construction Period Pollution Prevention Plan:</u> See Sheet C-5 for construction period erosion and sedimentation control measure.

<u>System Map:</u> See Sheet C-3 for the location of all stormwater management facilities.

Estimated Operations and Maintenance Budget

All maintenance will be performed as required. An annual budget of \$1,500 a year should be specified for operations and maintenance of the obligations.