HALEY WARD

ENGINEERING | ENVIRONMENTAL | SURVEYING

Stormwater Report

Kenneth and Elizabeth Burdick

152 South Shore Road

Salisbury, CT

March 21, 2025

JN: 4010218.22157.1

Prepared By:
Haley Ward, Inc.
140 Willow Street, Suite 8 | Winsted, Connecticut 06098

Corporate Office
One Merchants Plaza
Suite 701
Bangor, ME 04401
T: 207.989.4824
F: 207.989.4881

HALEYWARD.COM

Table of Contents

Introduction 1

Site Description 1

Proposed Project 1

Stormwater Management Practices 1

Tables

Table-1: Impervious Surfaces Summary 2

Table-2: Existing and Proposed Peak Discharge Summary 3

Exhibits

A. Watershed Maps

B. Runoff Coefficient and Peak Flow Calculations

C. USDA Soil Classification Map

D. Rain Garden Volume Calculations

E. Permeable Patio Design

Introduction

The owners of the parcel located at 152 South Shore Road intend to demolish and remove the existing house, garage, subsurface sewage disposal system, and the retaining walls located outside the 75-foot upland review area. Stormwater runoff ultimately reaches Lake Washining, which borders the parcel on the northerly side.

Site Description

The project is located on an existing fully developed parcel at the southern shore of Lake Washining. The proposed development will take place within the currently developed areas generally described as follows:

- The property lies in the R-20 Zone and the Lake Protection Overlay District.
- The parcel currently is predominately covered by buildings and lawn (grass) with some mature trees.
- There are Open Water wetlands (Lake Washining) on the northerly side of the site.
- The property generally slopes northerly toward the lake at varying grades of 2% to 15%.
- South Shore Road crosses the southern portion of the Parcel.

Stormwater runoff leaves the site as shallow concentrated flow to the west (Drainage Area-1), to the east (Drainage Area-3, and north (Drainage Area-2). The runoff discharge from these three areas enter to Lake Washining. A small portion on the southern end of the site (Drainage Area-4) flows to an existing catch basin located in South Shore Road which discharges to a swale on the neighboring property and eventually discharges to Lake Washining.

Proposed Project

The project involves the demolition discussed above and the construction of a new, three-bedroom dwelling with an attached garage, decks, and associated utilities. A new subsurface sewage disposal system will be constructed, and the existing driveway will be reconfigured.

Stormwater Management Practices

The project uses the following stormwater management practices:

- Low Impact Development: The project is designed using Low Impact Development techniques, such as keeping site disturbance to the minimum required and reducing the existing impervious surfaces to the extent practical. Table-1 below and the Watershed Maps in Appendix A present additional details for both existing and proposed site conditions.

- Rain Gardens: The site uses two rain gardens to capture and treat the runoff from most of the rooftop and the gravel portion of the driveway.
- Maintaining Site Hydrology: The existing drainage patterns are maintained with runoff being directed to essentially the same locations as under pre-development conditions.
- Crushed Stone Border: A crushed stone border will be installed along the northeast side of the driveway to reduce erosion and promote infiltration.

Table-1: Impervious Surfaces Summary

EXISTING IMPERVIOUS SURFACES		PROPOSED IMPERVIOUS SURFACES	
SURFACE	AREA (SF)	SURFACE	AREA (SF)
Wall at Lake	Per Survey prepared by Lamb Kiefer	Wall at Lake	144.9
Pump House		House	1351.0
House		Shower	31.0
Wall at House		Front Steps	25.5
AC Unit		Garage	253.0
Walls at Garage		South Shore Road	880.2
Garage		Driveway	897.0
South Shore Road		Wall at House	12.0
Driveway			
Existing Total	4053	Proposed Total	3594.6

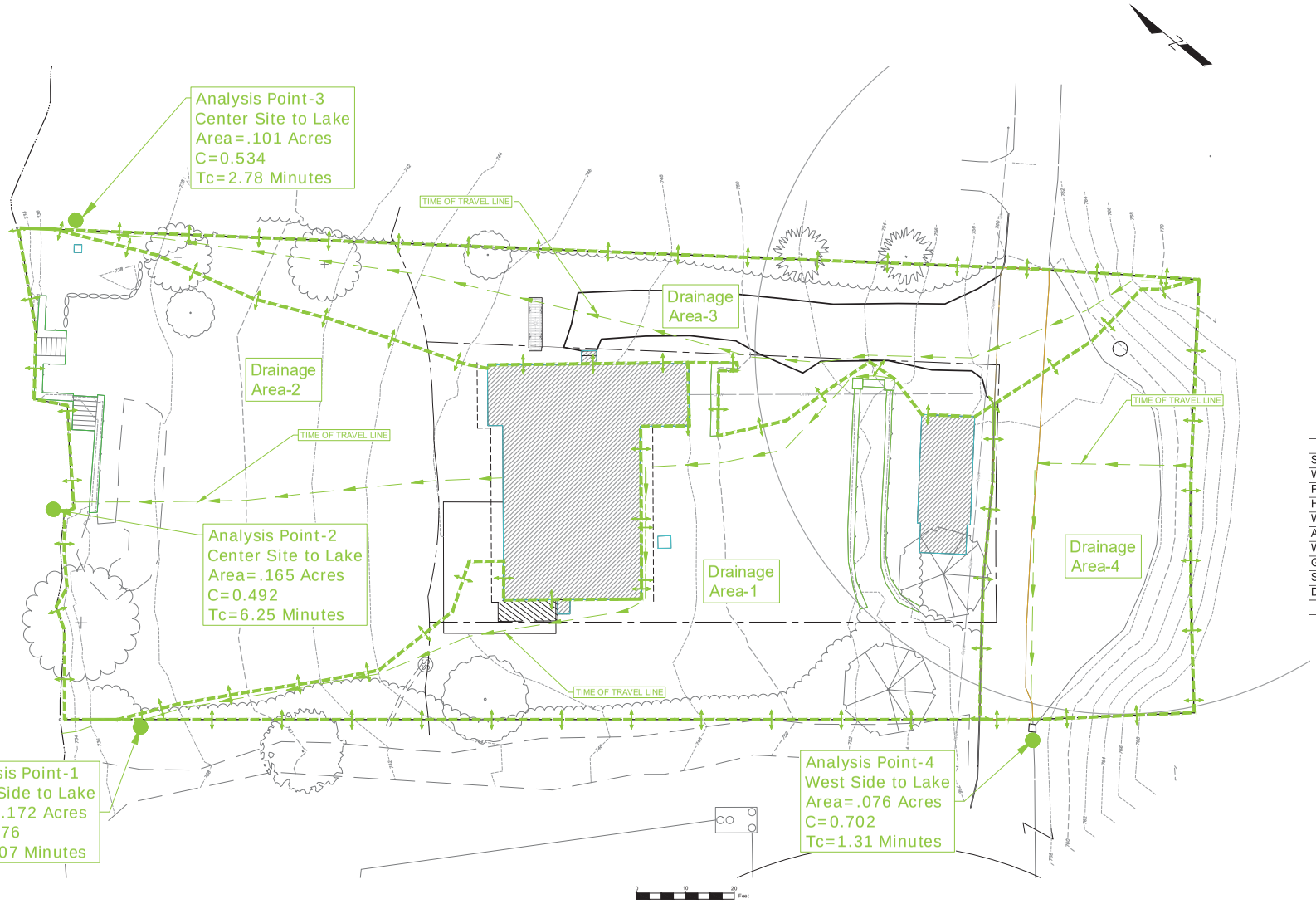
- By reducing the total impervious surfaces by approximately 459 square feet (11.3%), the total site peak discharge rate for the proposed conditions two-year, ten-year, twenty-five-year and one-hundred-year design storms are less than the peak discharge rates for the existing conditions. The peak discharge rates for existing and proposed conditions are shown in Table-2, below. See Appendix B for runoff coefficient and peak flow calculations.

Table-2: Existing and Proposed Peak Discharge Summary

Peak Discharge Storm Summary			
Design Storm	Existing Discharge	Proposed Discharge	Proposed Reduction
(Year)	(CFS)	(CFS)	(CFS)
Analysis Point-1			
2	0.29	0.26	0.03
10	0.42	0.38	0.04
25	0.56	0.49	0.07
100	0.79	0.70	0.09
Analysis Point-2			
2	0.36	0.33	0.03
10	0.52	0.38	0.03
25	0.69	0.64	0.05
100	0.98	0.91	0.07
Analysis Point-3			
2	0.26	0.26	0.00
10	0.38	0.38	0.00
25	0.49	0.50	-0.01
100	0.70	0.71	-0.01
Analysis Point-4			
2	0.25	0.25	0.00
10	0.37	0.37	0.00
25	0.49	0.49	0.00
100	0.69	0.69	0.00
Entire Site			
2	1.16	1.10	0.06
10	1.69	1.62	0.07
25	2.23	2.12	0.11
100	3.16	3.04	0.14

Normally, we would not present the resulting flows to two significant digits as the modeling techniques are not that precise. In this case, because the flows are so small and the differences so minor, the flows are carried to the hundredths of CFS to demonstrate that the post development flow is at or below the predevelopment flow across the range of storm frequencies.

A. Watershed Maps



ALL SITE SOILS:

90C:STOCKBRIDGE LOAM, 8 TO 15 PERCENT SLOPES

HYDROLOGIC SOIL GROUP: B

REDUCED SIZE PRINT
ORIGINAL 24 X 36

300.2 Table of Dimensional Requirements – Residential Zones
See Article III For Standards and Exceptions

Zone	R-20 (LP)	Existing	Proposed
Minimum lot area (sq. ft./acre) – not including area of an access ROW	20,000	22,438 SF	22,438 SF
Minimum buildable area (in square feet)	Not required	N/A	N/A
Minimum street frontage –land owned or an access ROW (in feet)	25	92.5'	92.5'
Minimum Yard Setback (in feet)			
(Note: minimum yard setback shall not include area of a utility easement or access ROW.)			
Front	40		
Side	20	22.2'	20.5'
Rear	30	75.9'	87.7'
Minimum square each side (in feet) – the length of one side shall fit on the front yard setback line	90		
Max building coverage (as percent of total lot area)	15	8.3%	8.7%
Max building height (in feet)	30/35		
Minimum separation between buildings (in feet)	10	47.6'±	
Minimum Setback from Watercourse (in feet)			
Principal building	75	75.9±	87.7'±
Accessory building	50	172.3'±	-
(see also building setback, coverage and other dimensional requirements in overlay districts)			
Storage accessory building permitted in a side or rear yard provided maximum building height 15' and maximum footprint 250 sq. ft. and meets following setback requirements:			
Minimum Setback (in feet) from side property line	5	30.8'±	
Minimum setback of accessory building to access ROW (in feet) (see 50.1)	10		
Minimum Setback from Watercourse (in feet)			
Principal Building	75	75.9±	87.7'±
Assessory Building	50	172.3'±	
Maximum Impervious Surface (as percent of total area within LP)	10		

EXISTING IMPERMOUS SURFACES	
SURFACE	AREA (SF)
Wall at Lake	144.9
Pump House	2.5
House	1550
Wall at House	28.6
AC Unit	6.8
Walls at Garage	132.4
Garage	300.7
South Shore Road	880.2
Driveway	1060.5
Total	4106.6

REV.	DATE	DESCRIPTION	BY	CHK

DRAWING ISSUE STATUS

PERMIT SUBMISSION

HALEY WARD
ENGINEERING | ENVIRONMENTAL | SURVEYING
WWW.HALEYWARD.COM
140 Willow Street
Winsted, Connecticut 06098
860.379.0605

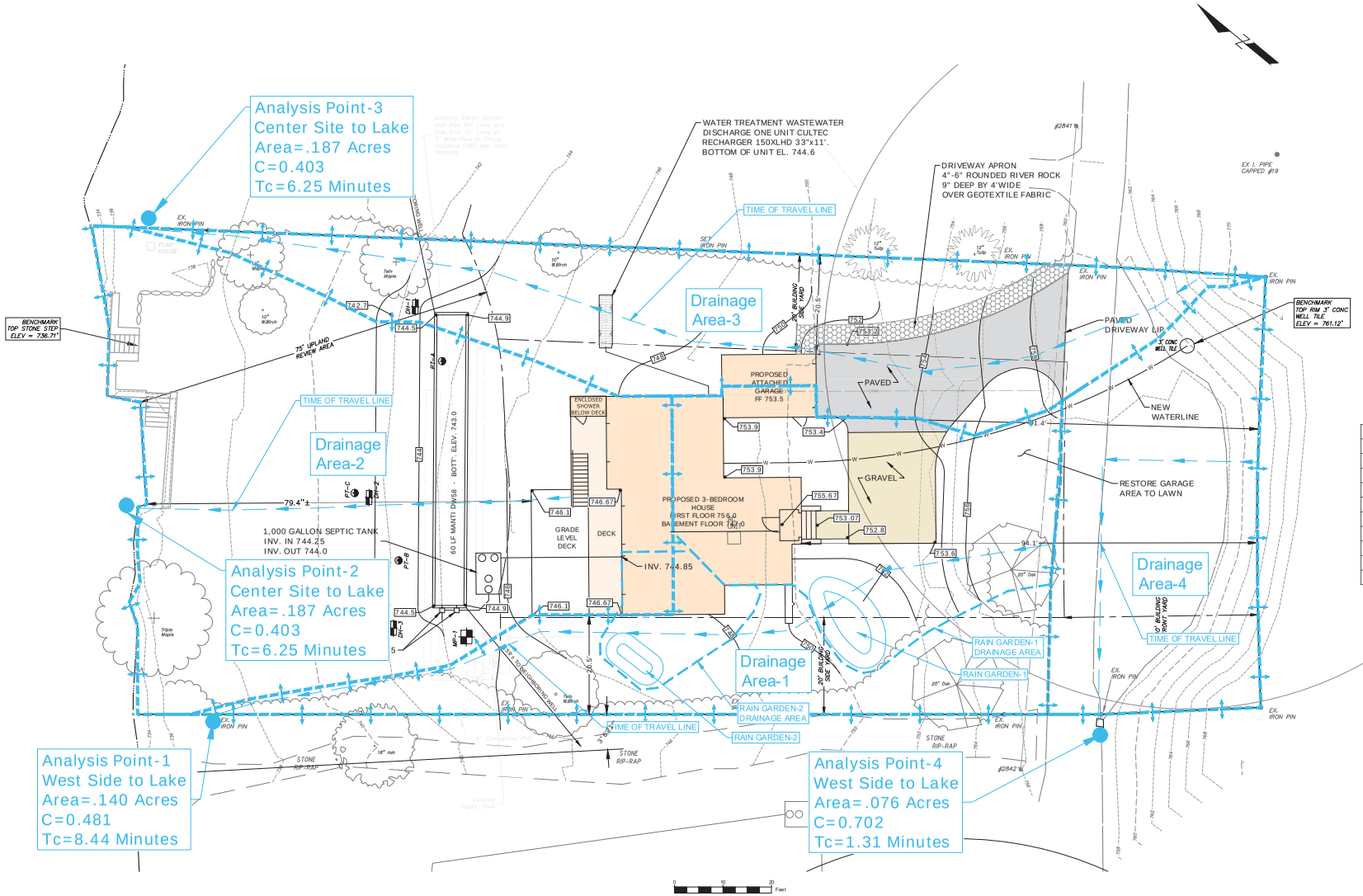
PROJECT

NEW RESIDENCE
KENNETH & ELIZABETH BURDICK
152 SOUTH SHORE ROAD - SALISBURY, CONNECTICUT

TITLE

EXISTING WATERSHED MAP

DATE	SCALE
January 29, 2025	1"= 10'
DRAWN BY: JS	DESIGNED BY: SMA
CHECKED BY: TAP	
PROJECT No.: 40102182157.1	
DRAWING No.: WS-1	REV.



300.2 Table of Dimensional Requirements – Residential Zones
See Article III For Standards and Exceptions

Zone	R-20 (LP)	Existing	Proposed
Minimum lot area (sq. ft./acre) – not including area of an access ROW	20,000	22,438 SF	22,438 SF
Minimum buildable area (in square feet)	Not required	N/A	N/A
Minimum street frontage –land owned or an access ROW (in feet)	25	92.5'	92.5'
Minimum Yard Setback (in feet)			
(Note: minimum yard setback shall not include area of a utility easement or access ROW.)			
Front	40		
Side	20	22.2'	20.5'
Rear	30	75.9'	87.7'
Minimum square each side (in feet) – the length of one side shall fit on the front yard setback line	90		
Max building coverage (as percent of total lot area)	15	8.3%	8.7%
Max building height (in feet)	30/35		
Minimum separation between buildings (in feet)	10	47.6'±	
Minimum Setback from Watercourse (in feet)			
Principal building	75	75.9±	87.7'±
Accessory building	50	172.3'±	-
(see also building setback, coverage and other dimensional requirements in overlay districts)			
Storage accessory building permitted in a side or rear yard provided maximum building height 15' and maximum footprint 250 sq. ft. and meets following setback requirements.			
Minimum Setback (in feet) from side property line	5	30.8'±	
Minimum setback of accessory building to access ROW (in feet) (see 50.1)	10		
Minimum Setback from Watercourse (in feet)			
Principal Building	75	75.9±	87.7'±
Assessory Building	50	172.3'±	
Maximum Impervious Surface (as percent of total area within LP)	10		

PROPOSED IMPERVIOUS SURFACES

SURFACE	AREA (SF)
Wall at Lake	144.9
House	1351.0
Shower	31.0
Front Steps	25.5
Garage	253.0
South Shore Road	880.2
Driveway	897.0
Wall at House	12.0
Total	3594.6

ALL SITE SOILS:

90C:STOCKBRIDGE LOAM, 8 TO 15 PERCENT SLOPES

HYDROLOGIC SOIL GROUP: B

BASIN	BOTTOM ELEVATION (FT)	BOTTOM AREA (SF)	UPPER ELEVATION (FT)	UPPER AREA (SF)	VOLUME (CF)
RAIN GARDEN-1	749.3	67.0	750.3	200.0	134.0
RAIN GARDEN-2	745.5	19.0	746.2	80.0	37.0

REDUCED SIZE PRINT
ORIGINAL 24 X 36

REV.	DATE	DESCRIPTION	BY	CHK

DRAWING ISSUE STATUS
PERMIT SUBMISSION

HALEY WARD
ENGINEERING | ENVIRONMENTAL | SURVEYING
WWW.HALEYWARD.COM
140 Willow Street
Winsted, Connecticut 06098
860.379.0604

PROJECT
NEW RESIDENCE
KENNETH & ELIZABETH BURDICK
152 SOUTH SHORE ROAD - SALISBURY, CONNECTICUT

TITLE
PROPOSED WATERSHED MAP

DATE	SCALE
January 29, 2025	1"= 10'

DRAWN BY	DESIGNED BY	CHECKED BY
JS	SMA	TAP

PROJECT No.
40102.18.22157.1

DRAWING No. **WS-2** REV.

B. Runoff Coefficient and Peak Discharge Calculations

HALEY WARD
ENGINEERING | ENVIRONMENTAL | SURVEYING

PROJECT: Kenneth and Elizabeth Burdick, 152 South Shore Road, Salisbury CT

SUBJECT: Existing Conditions

COMP. BY: SMA CHK. BY: TAP DATE: 01/29/25

Time of Concentration Worksheet

		Drainage Area-1			Drainage Area-2			Drainage Area-3			Drainage Area-4		
Sheet Flow		Segment			Segment			Segment			Segment		
		1	2	3	1	2	3	1	2	3	1	2	3
$Tt = \frac{0.007 (nL)^{0.8}}{(P2)^{0.5} S^{0.4}}$	n=	0.24			0.24			0.4	0.011		0.24	0.011	
	L=	74			88.5			25	75		6	78	
Tt = travel time (hr)	P2=	3.07			3.07			3.07	3.12		3.07	3.12	
n = Manning's roughness coefficient (table 3-1)	S=	0.114			0.130			0.448	0.117		0.571	0.026	
L = flow length (ft)	Tt=	0.095		0.000	0.104	0.000	0.000	0.035	0.008	0.000	0.007	0.015	0.000
P2 = 2-year, 24-hour rainfall (in)			Total Time (hr)	0.095		Total Time (hr)	0.104		Total Time (hr)	0.043		Total Time (hr)	0.022
S=slope of hydraulic grade line (land slope, ft/ft)													
Shallow concentrated Flow Travel		Segment			Segment			Segment			Segment		
		1	2	3	1	2	3	1	2	3	1	2	3
$Tt = \frac{L}{3600V}$	Surface Paved-Unpaved	U						P	U				
	Slope	0.092						0.080	0.109				
	L=	106						35	103				
Tt = Travel Time (hr)	V=	5						5.7	5.5				
L = Flow Length	Tt=	0.006	0.000	0.000	0.000	0.000	0.000	0.002	0.005	0.000	0.000	0.000	0.000
V = Avergae Velocity (ft/s)			Total Time (hr)	0.006		Total Time (hr)	0.000		Total Time (hr)	0.007		Total Time (hr)	0.000
3600 = conversion from seconds to hours													
Take V from From Table													

Open Channel Flow (Manning)		Segment			Segment			Segment			Segment		
		1	2	3	1	2	3	1	2	3	1	2	3
$V = \frac{1.49(r^{(2/3)})s^{1/2}}{n}$	a=												
	Pw=												
n = Manning's roughness coefficient (table 3-1)	r=												
S=slope of hydraulic grade line (land slope, ft/ft)	s=												
r= hydraulic radius = a/Pw	n=												
a=cross sectional flow area (sq ft)	V=												
Pw = Wetted Perimeter (ft)	Flow Length=												
	Tt												
			Total Time (hr)	0		Total Time (hr)	0		Total Time (hr)	0		Total Time (hr)	0
USE 5 MINUTES MINIMUM		Total Travel Time (Tc)(Hrs.)=		0.10	Total Travel Time (Tc)(Hrs.)=		0.10	Total Travel Time (Tc)(Hrs.)=		0.05	Total Travel Time (Tc)(Hrs.)=		0.02
		Total Travel Time (Tc)(Min.)=		6.07	Total Travel Time (Tc)(Min.)=		6.25	Total Travel Time (Tc)(Min.)=		2.98	Total Travel Time (Tc)(Min.)=		1.31
	2 year	4.4			2 year	4.3		2 year	4.76		2 year	4.76	
	10 year	6.4			10 year	6.3		10 year	6.96		10 year	6.96	
	25 year	7.7			25 year	7.5		25 year	8.33		25 year	8.33	
	100 year	9.4			100 year	9.4		100 year	10.4		100 year	10.4	

HALEY WARD
ENGINEERING | ENVIRONMENTAL | SURVEYING

PROJECT: Kenneth and Elizabeth Burdick, 152 South Shore Road, Salisbury CT

SUBJECT: Existing Conditions

COMP. BY: SMA CHK. BY: TAP DATE: 01/29/25

Peak Flow Rate by Rational Method

Rational: Q = CIA

A = Watershed Area (acres)
C = Runoff Coefficient
I = Rain Fall Intensity (In/Hr.)
Q = Peak Discharge (cfs)

Site Soils NRCS Hydrologic Soil Group: B

Drainage Area Label	Composite Runoff Coefficient	Drainage Area (Acres)	Design Storm (Year)	Rain Fall Intensity (In/Hr)	Peak Discharge (CFS)
Drainage Area-1	0.376	0.172	2	4.47	0.29
Drainage Area-2	0.492	0.165	2	4.42	0.36
Drainage Area-3	0.534	0.101	2	4.76	0.26
Drainage Area-4	0.702	0.076	2	4.76	0.25
				Total	1.16
Drainage Area-1	0.376	0.172	10	6.53	0.42
Drainage Area-2	0.492	0.165	10	6.45	0.52
Drainage Area-3	0.534	0.101	10	6.96	0.38
Drainage Area-4	0.702	0.076	10	6.96	0.37
				Total	1.69
Drainage Area-1	0.414	0.172	25	7.81	0.56
Drainage Area-2	0.541	0.165	25	7.72	0.69
Drainage Area-3	0.587	0.101	25	8.33	0.49
Drainage Area-4	0.772	0.076	25	8.33	0.49
				Total	2.23
Drainage Area-1	0.470	0.172	100	9.76	0.79
Drainage Area-2	0.615	0.165	100	9.65	0.98
Drainage Area-3	0.6675	0.101	100	10.40	0.70
Drainage Area-4	0.8775	0.076	100	10.40	0.69
				Total	3.16

Drainage Area	Surface	Area (acres)	Avg. C Value
DA-1	Imp. Area	0.011	0.95
	Trees	0.020	0.25
	Grass	0.141	0.35
	Composite	0.172	0.38
DA-2	Imp. Area	0.039	0.95
	Trees	0.000	0.25
	Grass	0.126	0.35
	Composite	0.165	0.49
DA-3	Imp. Area	0.032	0.95
	Trees	0.010	0.25
	Grass	0.059	0.35
	Composite	0.101	0.53
DA-4	Imp. Area	0.049	0.95
	Trees	0.027	0.25
	Grass	0.000	0.35
	Composite	0.076	0.70
Total Area Modeled		0.514	Acres

Recurrence Interval (years)	Cf
25	1.1
50	1.2
100	1.25

Runoff Coefficients per ConnDOT Drainage Manual - Chapter 6:

Table 6-3 - Recommended Coefficients for Pervious Areas:

	NRCS Hydrologic Soil Group			
Slope	**A**	**B**	**C**	**D**
Flat: (0%-1%)	0.04 - 0.09	0.07 - 0.12	0.11 - 0.16	0.15 - 0.20
Ave.: (2%-6%)	0.09 - 0.14	0.12 - 0.17	0.16 - 0.21	0.20 - 0.25
Steep: (> 6%)	0.13 - 0.18	0.18 - 0.24	0.23 - 0.31	0.28 - 0.38

Table 6-5 - Runoff Coefficients for Impervious Areas

Asphalt Streets	Concrete Streets	Drives & Walks	Roofs
0.70 - 0.95	0.80 - 0.95	0.75 - 0.85	0.75 - 0.95

Table 6-4
Recommended Coefficients for Various Selected Land Uses:

Downtown Areas	Neighbor-hood Areas	Single Family Areas	Multi Units Detached	Multi Units Attached
0.70 - 0.95	0.50 - 0.70	0.30 - 0.50	0.40 - 0.60	0.60 - 0.75
Suburban	Resi-dential (>1.2 Ac.)	Apartment Dwelling Areas	Light Industrial Areas	Heavy Industrial Areas
0.25 - 0.40	0.30 - 0.45	0.50 - 0.70	0.50 - 0.80	0.60 - 0.90
Parks & Cemetery	Play-grounds	Rail Yard Areas	Un-Improved Areas	
0.10 - 0.25	0.20 - 0.40	0.20 - 0.40	0.10 - 0.30	

Notes:
1) Runoff Coefficient estimated by Haley Ward (see separate calculations)
2) Rainfall Intensity calculated by Haley Ward for D = Tc (see separate calculations)
3) Drainage area delineated by Haley Ward and measured using AutoCAD software (see separate watershed delineation)

HALEY WARD
ENGINEERING | ENVIRONMENTAL | SURVEYING

PROJECT: Kenneth and Elizabeth Burdick, 152 South Shore Road, Salisbury CT

SUBJECT: Proposed Conditions

COMP. BY: SMA CHK. BY: DATE: 01/29/25

Time of Concentration Worksheet

		Drainage Area-1			Drainage Area-2			Drainage Area-3			Drainage Area-4		
Sheet Flow		Segment			Segment			Segment			Segment		
		1	2	3	1	2	3	1	2	3	1	2	3
$Tt = \frac{0.007 (nL)^{0.8}}{(P2)^{0.5} S^{0.4}}$	n=	0.24			0.24			0.4	0.011	0.11	0.24	0.011	
	L=	100			88.5			26	25	46	6	78	
Tt = travel time (hr)	P2=	3.07			3.07			3.07	3.12	3.12	3.07	3.12	
n = Manning's roughness coefficient (table 3-1)	S=	0.084			0.130			0.385	0.080	0.120	0.571	0.026	
L = flow length (ft)	Tt=	0.137		0.000	0.104	0.000	0.000	0.038	0.004		0.007	0.015	0.000
P2 = 2-year, 24-hour rainfall (in)			Total Time (hr)	0.137		Total Time (hr)	0.104		Total Time (hr)	0.042		Total Time (hr)	0.022
S=slope of hydraulic grade line (land slope, ft/ft)													
Shallow concentrated Flow Travel		Segment			Segment			Segment			Segment		
		1	2	3	1	2	3	1	2	3	1	2	3
$Tt = \frac{L}{3600V}$	Surface Paved-Unpaved	U						U					
	Slope	0.121						0.109					
	L=	80						142.5					
Tt = Travel Time (hr)	V=	5.6						5.2					
L = Flow Length	Tt=	0.004		0.000	0.000	0.000	0.000	0.008		0.000	0.000	0.000	0.000
V = Avergae Velocity (ft/s)			Total Time (hr)	0.004		Total Time (hr)	0.000		Total Time (hr)	0.008		Total Time (hr)	0.000
3600 = conversion from seconds to hours													
Take V from From Table													
Open Channel Flow (Manning)		Segment			Segment			Segment			Segment		
		1	2	3	1	2	3	1	2	3	1	2	3
$V = \frac{1.49(r^{(2/3)})s^{1/2}}{n}$	a=												
	Pw=												
n = Manning's roughness coefficient (table 3-1)	r=												
S=slope of hydraulic grade line (land slope, ft/ft)	s=												
r= hydraulic radius = a/Pw	n=												
a=cross sectional flow area (sq ft)	V=												
Pw = Wetted Perimeter (ft)	Flow Length=												
	Tt												
			Total Time (hr)	0		Total Time (hr)	0		Total Time (hr)	0		Total Time (hr)	0
		Total Travel Time (Tc)(Hrs.)=		0.14	Total Travel Time (Tc)(Hrs.)=		0.10	Total Travel Time (Tc)(Hrs.)=		0.05	Total Travel Time (Tc)(Hrs.)=		0.02
		Total Travel Time (Tc)(Min.)=		8.44	Total Travel Time (Tc)(Min.)=		6.25	Total Travel Time (Tc)(Min.)=		2.98	Total Travel Time (Tc)(Min.)=		1.31
USE 5 MINUTES MINIMUM		2 year	3.8		2 year	4.429		2 year	4.76		2 year	4.76	
		10 year	5.6		10 year	6.473		10 year	6.96		10 year	6.96	
		25 year	6.6		25 year	7.747		25 year	8.33		25 year	8.33	
		100 year	8.3		100 year	9.678		100 year	10.4		100 year	10.4	

HALEY WARD
ENGINEERING | ENVIRONMENTAL | SURVEYING

PROJECT: Kenneth and Elizabeth Burdick, 152 South Shore Road, Salisbury CT

SUBJECT: Proposed Conditions

COMP. BY: SMA CHK. BY: TAP DATE: 01/29/25

Peak Flow Rate by Rational Method

Rational: Q = CIA

A = Watershed Area (acres)
C = Runoff Coefficient
I = Rain Fall Intensity (In/Hr.)
Q = Peak Discharge (cfs)

Site Soils NRCS Hydrologic Soil Group: B

Drainage Area Label	Composite Runoff Coefficient	Drainage Area (Acres)	Design Storm (Year)	Rain Fall Intensity (In/Hr)	Peak Discharge (CFS)
Drainage Area-1	0.481	0.140	2	3.81	0.26
Drainage Area-2	0.403	0.187	2	4.43	0.33
Drainage Area-3	0.490	0.112	2	4.76	0.26
Drainage Area-4	0.702	0.076	2	4.76	0.25
				Total	1.11
Drainage Area-1	0.481	0.140	10	5.56	0.38
Drainage Area-2	0.403	0.187	10	6.45	0.49
Drainage Area-3	0.490	0.112	10	6.96	0.38
Drainage Area-4	0.702	0.076	10	6.96	0.37
				Total	1.61
Drainage Area-1	0.529	0.140	25	6.66	0.49
Drainage Area-2	0.443	0.187	25	7.72	0.64
Drainage Area-3	0.539	0.112	25	8.33	0.50
Drainage Area-4	0.772	0.076	25	8.33	0.49
				Total	2.13
Drainage Area-1	0.601	0.140	100	8.33	0.70
Drainage Area-2	0.503	0.187	100	9.65	0.91
Drainage Area-3	0.613	0.112	100	10.4	0.71
Drainage Area-4	0.877	0.076	100	10.4	0.69
				Total	3.02

Drainage Area	Surface	Area (acres)	Avg. C Value
DA-1	Imp. Area	0.034	0.95
	Trees	0.020	0.25
	Grass	0.086	0.35
	Composite	0.140	0.48
DA-2	Imp. Area	0.016	0.95
	Trees	0.000	0.25
	Grass	0.170	0.35
	Composite	0.187	0.40
DA-3	Imp. Area	0.028	0.95
	Trees	0.010	0.25
	Grass	0.075	0.35
	Composite	0.112	0.49
DA-4	Imp. Area	0.049	0.95
	Trees	0.027	0.25
	Grass	0.000	0.35
	Composite	0.076	0.70
Total Area Modeled		0.515	Acres

Recurrence Interval (years)	Cf
25	1.1
50	1.2
100	1.25

Runoff Coefficients per ConnDOT Drainage Manual - Chapter 6:

Table 6-3 - Recommended Coefficients for Pervious Areas:

	NRCS Hydrologic Soil Group			
Slope	**A**	**B**	**C**	**D**
Flat: (0%-1%)	0.04 - 0.09	0.07 - 0.12	0.11 - 0.16	0.15 - 0.20
Ave.: (2%-6%)	0.09 - 0.14	0.12 - 0.17	0.16 - 0.21	0.20 - 0.25
Steep: (> 6%)	0.13 - 0.18	0.18 - 0.24	0.23 - 0.31	0.28 - 0.38

Table 6-5 - Runoff Coefficients for Impervious Areas

Asphalt Streets	Concrete Streets	Drives & Walks	Roofs
0.70 - 0.95	0.80 - 0.95	0.75 - 0.85	0.75 - 0.95

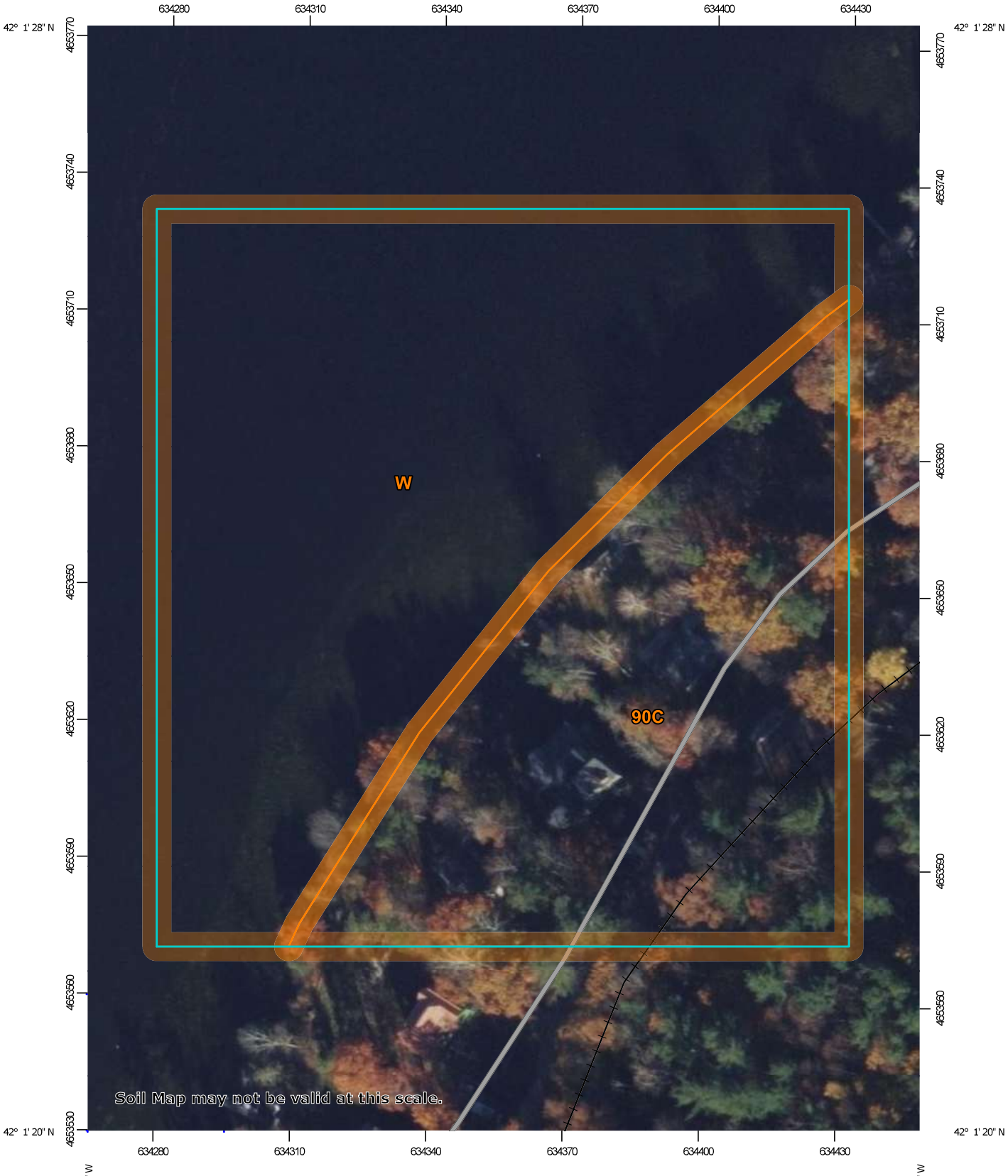
Table 6-4
Recommended Coefficients for Various Selected Land Uses:

Downtown Areas	Neighbor-hood Areas	Single Family Areas	Multi Units Detached	Multi Units Attached
0.70 - 0.95	0.50 - 0.70	0.30 - 0.50	0.40 - 0.60	0.60 - 0.75
Suburban	Resi-dential (>1.2 Ac.)	Apartment Dwelling Areas	Light Industrial Areas	Heavy Industrial Areas
0.25 - 0.40	0.30 - 0.45	0.50 - 0.70	0.50 - 0.80	0.60 - 0.90
Parks & Cemetery	Play-grounds	Rail Yard Areas	Un-Improved Areas	
0.10 - 0.25	0.20 - 0.40	0.20 - 0.40	0.10 - 0.30	

Notes:
1) Runoff Coefficient estimated by Haley Ward (see separate calculations)
2) Rainfall Intensity calculated by Haley Ward for D = Tc (see separate calculations)
3) Drainage area delineated by Haley Ward and measured using AutoCAD software (see separate watershed delineation)

C. USDA Soils Map

Custom Soil Resource Report
Soil Map



Map Scale: 1:1,180 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

State of Connecticut, Western Part

90C—Stockbridge loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9lrs
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Stockbridge and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Stockbridge

Setting

Landform: Hills
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy till derived from limestone and dolomite and/or schist

Typical profile

Ap - 0 to 10 inches: loam
Bw1 - 10 to 20 inches: loam
Bw2 - 20 to 28 inches: loam
C1 - 28 to 42 inches: gravelly loam
C2 - 42 to 48 inches: gravelly loam
C3 - 48 to 65 inches: gravelly loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B
Ecological site: F144AY036NY - Semi-Rich Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Mudgepond
Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Georgia
Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Alden
Percent of map unit: 3 percent
Landform: Depressions, drainageways
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes

Nellis
Percent of map unit: 3 percent
Landform: Hills
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Farmington
Percent of map unit: 2 percent
Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Paxton
Percent of map unit: 2 percent
Landform: Till plains, drumlins, hills
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Data Source Information

Soil Survey Area: State of Connecticut, Western Part
Survey Area Data: Version 2, Aug 30, 2024

D. Rain Garden Volume Calculations

HALEY WARD
ENGINEERING | ENVIRONMENTAL | SURVEYING

PROJECT: Kenneth and Elizabeth Burdick, 152 South Shore Road, Salisbury CT

SUBJECT: Water Quality Volume Calculations RAIN GARDEN 1

COMP. BY: SMA CHK. BY: TAP DATE: 02/05/25

I. Determine Volume of Water Quality Basin

WQV = (1.3"(R)(A))/12 Where:

WQV	=	Water Quality Volume (ac-ft)
R	=	Volumetric Runoff Coefficient
	=	0.05+0.009(I)
I	=	Percent Impervious Cover (whole number)
A	=	Site Area (acres) = Watershed area excluding bottom of basin

Watershed	Watershed Area (acres)	Percent Impervious	Volumetric Runoff Coefficient	Water Quality Volume (ac-ft)	Water Quality Volume (CF)
					-
To Rain Garden-1	0.07	28	0.30	0.0024	105
				Total Required	105

GRV = ((D)(A)(I))/12 Where:

GRV	=	Groundwater Recharge Volume
D	=	Depth of Runoff to be Recharged (Table 7.4 of Stormwater Quality Manual)
A	=	Site Area (acres)
I	=	Percent Impervious Cover (decimal)

Watershed Number	Watershed Area (acres)	Percent Impervious	Groundwater Recharge Depth (D)	Groundwater Recharge Volume (ac.ft)	Groundwater Recharge Volume (CF)
To Rain Garden-1	0.07	0.28	0.25	0.0004	19

Table 7.4

NRCS Hydrologic Soil Group	Average Annual Recharge	Groundwater Recharge Depth (D)
A	18 in/year	0.4 inch
B	12 in/year	0.25 inch
C	6 in/year	0.1 inch
D	3 in/year	0 inch

For Hydrologic Soil Group, see Web Soil Survey
The majority of development occurs over soil with hydrologic group B
For Design Use WQV since it is higher than GRV

Volume of Proposed Rain Garden-1 For New House

Contour Elevation	Elevation Difference (ft)	Area (sq. ft.)	Volume (CF)	Cumulative Volume (CF)	
749.3	-	67			
750.3	1.0	200	134		
			-	134	Greater Than 105 CF, OKAY

HALEY WARD
ENGINEERING | ENVIRONMENTAL | SURVEYING

PROJECT: Kenneth and Elizabeth Burdick, 152 South Shore Road, Salisbury CT

SUBJECT: Water Quality Volume Calculations RAIN GARDEN 2

COMP. BY: SMA CHK. BY: TAP DATE: 02/05/25

I. Determine Volume of Water Quality Basin

WQV = (1.3"(R)(A))/12 Where:

WQV	=	Water Quality Volume (ac-ft)
R	=	Volumetric Runoff Coefficient
	=	0.05+0.009(I)
I	=	Percent Impervious Cover (whole number)
A	=	Site Area (acres) = Watershed area excluding bottom of basin

Watershed	Watershed Area (acres)	Percent Impervious	Volumetric Runoff Coefficient	Water Quality Volume (ac-ft)	Water Quality Volume (CF)
					-
To Rain Garden-2	0.01	42	0.43	0.0006	28
				Total Required	28

GRV = ((D)(A)(I))/12 Where:

GRV	=	Groundwater Recharge Volume
D	=	Depth of Runoff to be Recharged (Table 7.4 of Stormwater Quality Manual)
A	=	Site Area (acres)
I	=	Percent Impervious Cover (decimal)

Watershed Number	Watershed Area (acres)	Percent Impervious	Groundwater Recharge Depth (D)	Groundwater Recharge Volume (ac.ft)	Groundwater Recharge Volume (CF)
To Rain Garden-2	0.01	0.42	0.25	0.0001	5

Table 7.4

NRCS Hydrologic Soil Group	Average Annual Recharge	Groundwater Recharge Depth (D)
A	18 in/year	0.4 inch
B	12 in/year	0.25 inch
C	6 in/year	0.1 inch
D	3 in/year	0 inch

For Hydrologic Soil Group, see Web Soil Survey
The majority of development occurs over soil with hydrologic group B
For Design Use WQV since it is higher than GRV

Volume of Proposed Rain Garden-2 For New House

Contour Elevation	Elevation Difference (ft)	Area (sq. ft.)	Volume (CF)	Cumulative Volume (CF)	
745.45	-	19			
746.20	0.75	80	37		
			-	37	Greater Than 28 CF, OKAY

E. Permeable Patio Design

HALEY WARD
ENGINEERING | ENVIRONMENTAL | SURVEYING

PROJECT: Kenneth and Elizabeth Burdick, 152 South Shore Road, Salisbury CT

SUBJECT: Permeable Patio Design

COMP. BY: TAP CHK. BY: DATE: 03/21/25

I. Determine Water Quality Volume Required

WQV = (1.3"(R)(A))/12 Where:

WQV	=	Water Quality Volume (ac-ft)
R	=	Volumetric Runoff Coefficient
	=	0.05+0.009(I)
I	=	Percent Impervious Cover (whole number)
A	=	Site Area (acres) = Area of Patio 580 SF

Watershed	Watershed Area (acres)	Percent Impervious	Volumetric Runoff Coefficient	Water Quality Volume (ac-ft)	Water Quality Volume (CF)
					-
Patio Area	0.0133	100	0.95	0.0014	60
				Total Required	60

II. Soil Conditions

The underlying soil is Stockbridge Loam, Class B
Test pits reveal bedrock is deeper than 70" and seasonal high groundwater (SHGW) is an average of 41"

The finished grade at the patio is the same as the existing grade.
The depth of the patio system will be 16"
At 16", the bottom will be more than 3 feet above bedrock
At 16", the bottom will be 25" above SHGW, 24" is recommended for residential applications

III. Volume of Reservoir

The reservoir is 6 inches of crushed stone with an estimated void ratio of 35%

Area (SF)	Void ratio (%	Depth (ft)	Volume (CF)
580	35%	0.5	101.5 > 60, okay