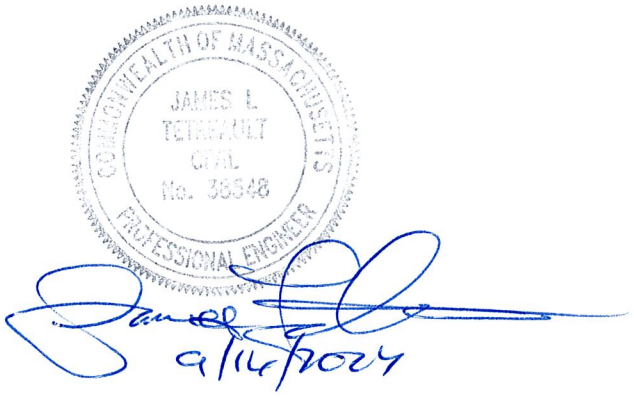
SUPPLEMENTAL DRAINAGE REPORT
AT 120 TURNPIKE ROAD, SOUTHBOROUGH, MA

Job #290-504 Client #504

SEPTEMBER 16, 2024



EXPEDITED ENGINEERING, LLC
118 Turnpike Road, Suite 300, Southborough, MA 01772 (508) 399-9993

INTRODUCTION

The purpose of this brief Supplemental Drainage Report is to provide information to support our response to two comments in the peer review letter from Land Design Collaborative dated 4 September 2024.

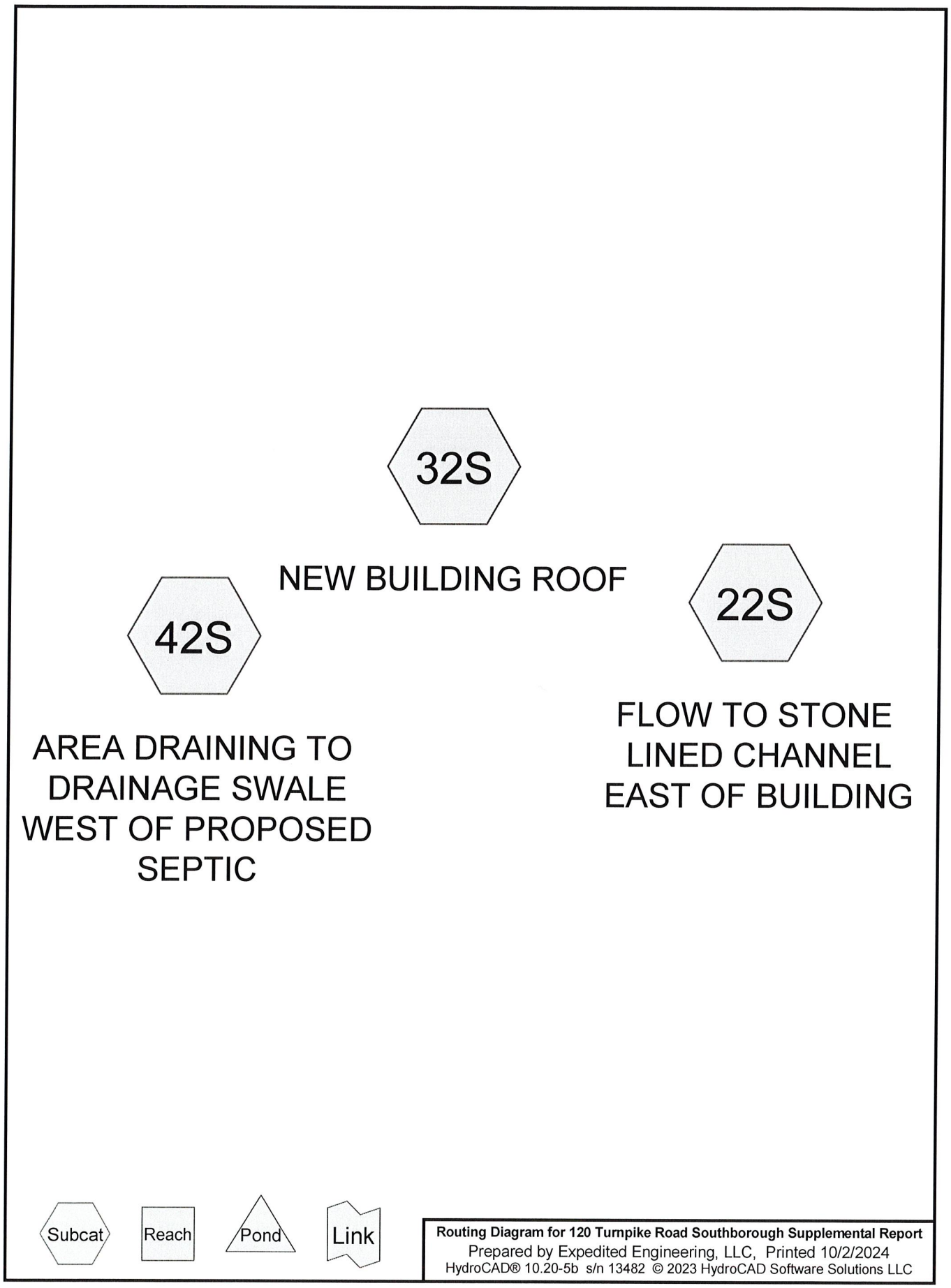
In this report, we calculate the flows from the discharge of the stone lined channel to be east of the proposed building and from the roof runoff discharge from the proposed building. These are subcatchments numbers 22 and 32, respectively.

The 100 year storm flows from these points is necessary to show that the proposed provision of a riprap splash pad and of a pre-formed scour hole will be adequate for the flows discharged and satisfy stormwater management standard #1.

In addition, we calculated total flow to the existing drainage structure on the slope above the parking lot. Runoff collected by this structure is directed to a much lower manhole at the edge of the parking lot and from there, via a 24 inch RC pipe, to a drain structure in front of #118 where the flow joins flow in a 48 inch RC pipe. The question arose as to the adequacy of that 24 inch RC pipe.

That 24 inch RC pipe is 267 feet long and drops 9.4 feet over its length for a slope of s=0.035. The Southborough subdivision regulations prescribes that all drainage pipes such as this must have capacity for at least 50 year storm flows. Using manning's equation, that 24 inch RC pipe has a flowing full capacity of 42.75 cfs. From this report, in the 50 year storm, the flow to the drainage swale and that existing drainage structure west of the proposed septic system will be 38.97 cfs. So adequate capacity seems to have been provided.

Calculations were made using the HydroCAD stormwater modeling program. The 24 hour rainfalls associated with the 50 and 100 year storms were 7.16 and 8.08 inches respectively per NOAA's atlas 14 24 hour rainfalls for this location.



Routing Diagram for 120 Turnpike Road Southborough Supplemental Report
Prepared by Expedited Engineering, LLC, Printed 10/2/2024

50 YEAR STORM

Summary for Subcatchment 22S: FLOW TO STONE LINED CHANNEL EAST OF BUILDING

Runoff = 11.11 cfs @ 12.14 hrs, Volume= 0.849 af, Depth> 3.59"
Routed to nonexistent node 23R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR Rainfall=7.16"

Area (sf)	CN	Description
96,825	70	Woods, Good, HSG C
26,750	74	>75% Grass cover, Good, HSG C
123,575	71	Weighted Average
123,575		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
3.0	367	0.1660	2.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	488	0.0840	7.79	23.36	**Channel Flow,** Area= 3.0 sf Perim= 4.7' r= 0.64' n= 0.041 Riprap, 2-inch
9.9	905	Total			

Summary for Subcatchment 32S: NEW BUILDING ROOF

Runoff = 2.49 cfs @ 12.09 hrs, Volume= 0.193 af, Depth> 6.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR Rainfall=7.16"

Area (sf)	CN	Description
15,804	98	Roofs, HSG C
15,804		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 42S: AREA DRAINING TO DRAINAGE SWALE WEST OF PROPOSED SEPT

Runoff = 38.97 cfs @ 12.21 hrs, Volume= 3.375 af, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR Rainfall=7.16"

Area (sf)	CN	Description
154,591	58	Meadow, non-grazed, HSG B
83,918	55	Woods, Good, HSG B
28,077	71	Meadow, non-grazed, HSG C
306,281	70	Woods, Good, HSG C
20,198	74	>75% Grass cover, Good, HSG C
593,065	65	Weighted Average
593,065		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
2.3	140	0.0430	1.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.0	445	0.1280	2.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.4	375	0.1330	1.82		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	196	0.0510	7.62	99.12	**Channel Flow,** Area= 13.0 sf Perim= 23.1' r= 0.56' n= 0.030 Earth, grassed & winding
14.4	1,206	Total			

100 YEAR STORM

Summary for Subcatchment 22S: FLOW TO STONE LINED CHANNEL EAST OF BUILDING

Runoff = 13.38 cfs @ 12.14 hrs, Volume= 1.025 af, Depth> 4.34"
Routed to nonexistent node 23R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=8.08"

Area (sf)	CN	Description
96,825	70	Woods, Good, HSG C
26,750	74	>75% Grass cover, Good, HSG C
123,575	71	Weighted Average
123,575		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
3.0	367	0.1660	2.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	488	0.0840	7.79	23.36	**Channel Flow,** Area= 3.0 sf Perim= 4.7' r= 0.64' n= 0.041 Riprap, 2-inch
9.9	905	Total			

Summary for Subcatchment 32S: NEW BUILDING ROOF

Runoff = 2.81 cfs @ 12.09 hrs, Volume= 0.218 af, Depth> 7.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=8.08"

Area (sf)	CN	Description
15,804	98	Roofs, HSG C
15,804		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 42S: AREA DRAINING TO DRAINAGE SWALE WEST OF PROPOSED SEPT

Runoff = 48.12 cfs @ 12.21 hrs, Volume= 4.155 af, Depth> 3.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=8.08"

Area (sf)	CN	Description
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593,065		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
2.3	140	0.0430	1.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.0	445	0.1280	2.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.4	375	0.1330	1.82		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	196	0.0510	7.62	99.12	**Channel Flow,** Area= 13.0 sf Perim= 23.1' r= 0.56' n= 0.030 Earth, grassed & winding
14.4	1,206	Total			

Summary for Subcatchment 42S: AREA DRAINING TO DRAINAGE SWALE WEST OF PROPOSED SEPT

Runoff = 38.97 cfs @ 12.21 hrs, Volume= 3.375 af, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR Rainfall=7.16"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
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2.3	140	0.0430	1.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.0	445	0.1280	2.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
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