

# Munson Brook, Manchester, Vermont

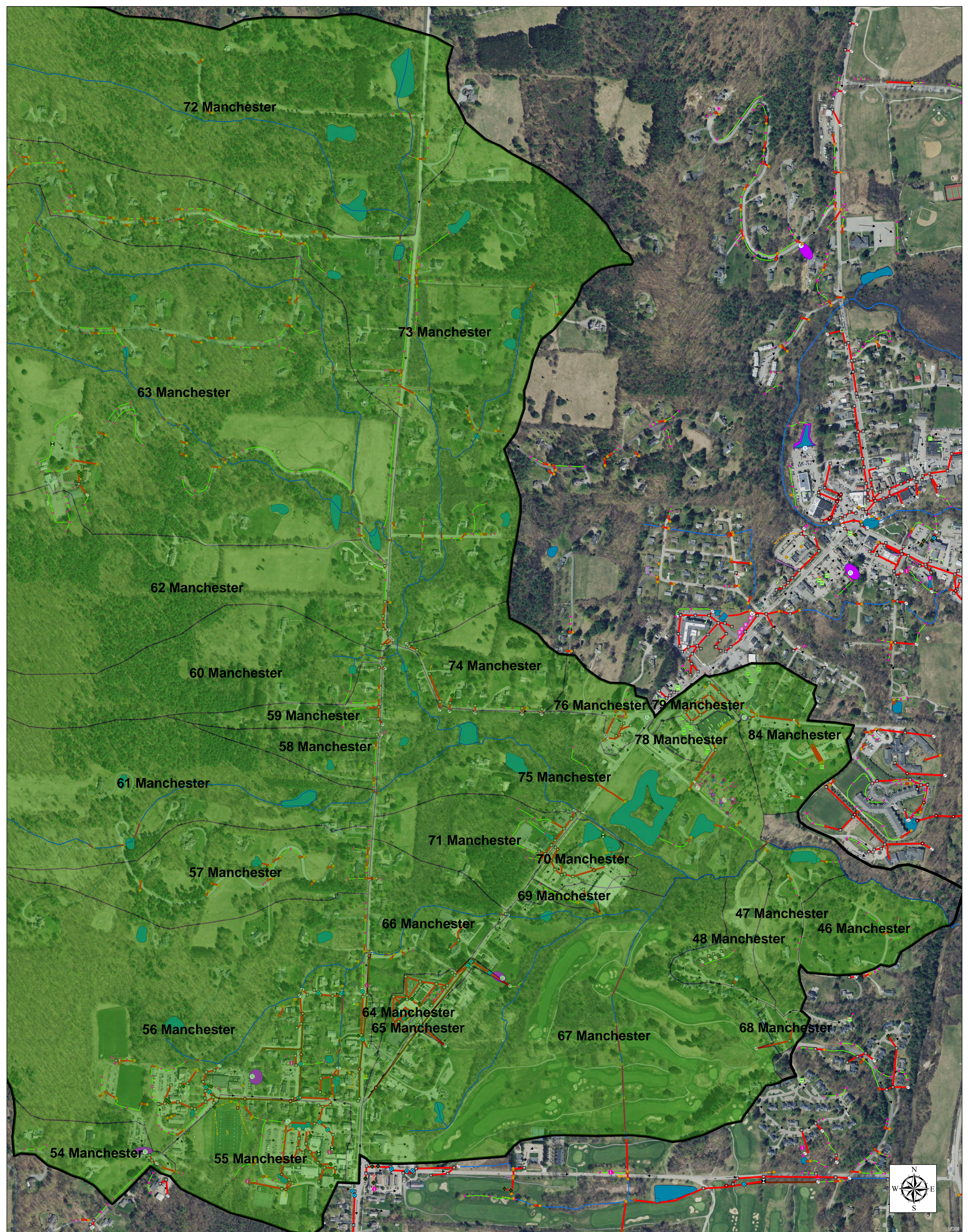
Munson Brook in Manchester and Manchester Center Vermont has been found to be impaired by stormwater water quality as measured by the chemistry and the biological community of the stream. There are at least 26 significant discharges to the stream from the developed lands in the Town of Manchester. The largest discharge to the stream is discharge area #56 which drains a large section of Manchester Village.

The recommended course of action is to install stormwater treatment structures that control both the water quality volume and the hannel protection volume from stormwater discharges. Maps showing the location of 5 of the 26 discharges and possible retrofit locations on public or private land is provided. A possible treatment structure and a cost estimate (excluding land costs) is provided. Implementation of all 5 treatments would reduce sediment to the brook by about 21%.

The Town and the State have very good stormwater treatment requirements for new development and it is less likely that impairment will be the result of future development. Existing developed sites listed as action level 4 are likely to have General Permit 3-9050 stormwater retrofit requirements in 2033. However most of these sites already have some level of existing stormwater treatment in place today.

Addressing the large discharges of stormwater to the brook will reduce contamination and stream channel erosion and will help prevent the stream from becoming more stormwater impaired and lead to the requirement for the Town to create and implement a total maximum daily load (TMDL) to restore the water quality. It will also reduce phosphorus and sediment to the Battenkill River which is on the state's stressed waters list for loss of riparian vegetation, streambank erosion, runoff, and lack of habitat features.





# Manchester, VT

Munson Brook

## DEC Stormwater Infrastructure Mapping Project

This map shows the connectedness of the stormwater infrastructure and was compiled from various sources including Town plans, WWMD plans, Stormwater permit plans, municipal member knowledge, field data, and a mapping grade GPS.

This map is for illustrative purposes only. The accuracy of the data layers shown on this map are limited by the accuracy of the source materials and field data collection. No warranty as to the accuracy or the usefulness of the data is expressed or implied. It is meant to be used as a planning level tool only.

### Legend

#### Line Symbols

- Storm line
- Storm line (old Sanitary line)
- Tunnel (storm)
- Combined sewer
- ⋯ Sanitary line
- Swale
- ⋯ Footing drain
- ⋯ Under drain
- - - Roof drain
- - - Infiltration pipe
- - - French drain
- - - Trench drain
- ⋯ Emergency spillway
- Stream
- Overland flow

0 0.05 0.1 0.2 Miles



#### Point Symbols

- Catchbasin
- Dry Well
- Drop Inlet
- Grate/Curb Inlet
- Yard drain
- CB tied to sanitary sewer
- Junction Box
- Stormwater Manhole
- Outfall
- Pipe Cross (not connected)
- Combined sewer MH
- Sanitary Manhole
- Culvert inlet
- Culvert outlet
- Control Structure
- Treatment feature
- ⊕ Retrofit
- Unknown Point
- Information Point
- Known CSO outfalls

#### Area symbols

- Existing Area
- Proposed Area
- Village Boundaries

#### Proposed Point and Line Symbols

- Proposed Catchbasin
- Proposed Dry well
- Proposed Drop inlet
- Proposed Yard drain
- Proposed Stormwater manhole
- Proposed Control Structure
- Proposed Outfall
- Proposed Culvert inlet
- Proposed Culvert outlet
- Proposed Storm line
- Proposed Swale
- Proposed Footing drain
- Proposed Roof drain
- Proposed Under drain
- Infiltration pipe
- Proposed French drain
- Proposed Emergency spillway
- Tunnel (storm)

Creator: David Ainley, Jim Pease  
 DEC - WMD - Ecosystem Restoration Program  
 Print Date: 7/9/2021  
 Data Sources: VTRANS Roads Data, VT Hydrography  
 Data Set, DEC Stormwater Database  
 Imagery Source: VCGI Best Available





Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Current BMP Sediment Reduction Credit	Sediment Load with Current Reductions (lbs.)	Priority Action Sediment Reduction Credit %	Sediment Load with Priority Action (lbs.)	Current BMP Nitrogen or Phosphorus Reduction Credit	Phosphorus Load with Current Reductions (lbs.)	Priority Action Nitrogen or Phosphorus Reduction Credit	Phosphorus Load with Priority Action (lbs.)
56 Manchester	1, 4	Gravel Wetland or Bioretention for 143 Seminary Rd parking lot, Swirl Separator or Gravel Wetland on Town Land north of 139 Franklin Rd and on 107 Shephard Lane	GW/CB/GS/WP	3487-9015, 3487-9015.2A	125.2	0%	26053	75	6513	0%	217.1	40%	130.27
61 Manchester			GS/WP	3559-9010, 5359-9015	463.7	60%	12312	0	12312	30%	179.5	0%	179.54
63 Manchester			CB/GS/WP		411.4	60%	11425	0	11425	30%	166.6	0%	166.61
72 Manchester			GS/WP	3273-9010	278.6	40%	11324	0	11324	20%	125.8	0%	125.82
67 Manchester			OF		114.9	0%	10964	0	10964	0%	91.4	0%	91.36
73 Manchester			GS/OF/WP		153.4	40%	9234	0	9234	20%	102.6	0%	102.60
62 Manchester			CB/OF/GS		122.5	0%	8522	0	8522	0%	71.0	0%	71.02
84 Manchester			OF/GS/DW		17.7	30%	4393	0	4393	30%	36.6	0%	36.61
64 Manchester	1	Extended Detention pond behind 3962 Main	EDP/PP		5.9	25%	3251	1	1463	25%	27.1	15%	23.03
66 Manchester			OF/GS/CB		21.3	0%	3100	0	3100	0%	25.8	0%	25.83
54 Manchester	1	Extended Detention Pond for school parking lot on W Union St	EDP/CB/GS		11.8	0%	2017	80	403	0%	16.8	40%	10.09
76 Manchester	2	Raingarden in Main St-Ways Ln traffic island	BRA/CB/GS		6.7	0%	1970	20	1576	0%	16.4	20%	13.14

Watershed Number	Action List	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	Proposed or Existing Stormwater Treatment Practice	Priority Action N or P Reduction (lbs.)	Estimated Basin Construction Cost	Estimated Other BMP Construction Cost	Cost of Sediment Removal Per Pound (based on annual sediment load)	Cost of Nitrogen or Phosphorus Removal Per Pound (based on annual nutrient load)	Assistance Program	# LID-Roof Raingardens to Treat Water Quality Volume	Raingarden Cost
56 Manchester	1, 4	1.47		GW/CB/GS/WP	86.8		\$90,000	\$5	\$1,036	CWIP,SRF	737	\$339,027
61 Manchester	0	1.74	0.21	GS/WP	0.0					CWIP,SRF	871	\$400,521
63 Manchester	0	1.62	1.37	CB/GS/WP	0.0					CWIP,SRF	808	\$371,680
72 Manchester	0	1.07	0.59	GS/WP	0.0					CWIP,SRF	534	\$245,598
67 Manchester	0	0.62	1.06	OF	0.0					CWIP,SRF	310	\$142,667
73 Manchester	0	0.87	1.58	GS/OF/WP	0.0					CWIP,SRF	435	\$200,266
62 Manchester	0	0.48	0.27	CB/OF/GS	0.0					CWIP,SRF	241	\$110,899
84 Manchester	0	0.36	FALSE	OF/GS/DW	0.0					CWIP,SRF	178	\$81,664
64 Manchester	1	0.25	0.46	EDP/PP	4.1	\$74,774		\$42	\$18,402	CWIP,SRF	123	\$56,401
66 Manchester	0	0.18	0.38	OF/GS/CB	0.0					CWIP,SRF	88	\$40,339
54 Manchester	1	0.11	0.26	EDP/CB/GS	6.7	\$34,798		\$22	\$5,176	CWIP,SRF	57	\$26,248
76 Manchester	2	0.11	0.24	BRA/CB/GS	3.3		\$10,000	\$25	\$3,045	CWIP,SRF	56	\$25,639

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Current BMP Sediment Reduction Credit	Sediment Load with Current Reductions (lbs.)	Priority Action Sediment Reduction Credit %	Sediment Load with Priority Action (lbs.)	Current BMP Nitrogen or Phosphorus Reduction Credit	Phosphorus Load with Current Reductions (lbs.)	Priority Action Nitrogen or Phosphorus Reduction Credit	Phosphorus Load with Priority Action (lbs.)
46 Manchester			CB/GS/DW		25.9	20%	1970	0	1970	20%	16.4	0%	16.42
74 Manchester			GS/CB		16.9	0%	1800	0	1800	0%	15.0	0%	15.00
47 Manchester			GS/OF		12.5	0%	1248	0	1248	0%	10.4	0%	10.40
60 Manchester			GS/WP		43.1	60%	1174	0	1174	30%	17.1	0%	17.12
59 Manchester			GS/CB/OF		8.4	0%	1164	0	1164	0%	9.7	0%	9.70
75 Manchester	4		GS/WP/OF/CB/CF	5703-9010, 3278-INDS	66.1	80%	1033	0	1033	40%	25.8	0%	25.83
57 Manchester			BRA/GS/WP	3559-9010, 3559-9015	33.0	60%	1004	0	1004	30%	14.6	0%	14.65
79 Manchester	2	Infiltration basin on backside of shopping plaza or in front of 65 The Fields Rd	IB/CB/DW/GS		3.2	0%	2474	1	247	0%	20.6	90%	2.06
55 Manchester	4		EDP(2)/CB/GS	5995-9010	27.6	80%	975	0	975	40%	24.4	0%	24.37
48 Manchester			CB/GS		9.5	0%	1036	0	1036	0%	8.6	0%	8.64
58 Manchester			GS/OF		8.2	0%	683	0	683	0%	5.7	0%	5.69
71 Manchester			CB/IB		18.9	60%	587	0	587	60%	4.9	0%	4.89
70 Manchester	4		CB/WP/GS/SWPPP	3040-9010, 3040-9003	6.5	80%	422	0	422	40%	10.6	0%	10.55
69 Manchester	4		GS/CB/WP/SWPPP	3040-9010, 3040-9003	2.3	80%	123	0	123	40%	3.1	0%	3.07

Watershed Number	Action List	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	Proposed or Existing Stormwater Treatment Practice	Priority Action N or P Reduction (lbs.)	Estimated Basin Construction Cost	Estimated Other BMP Construction Cost	Cost of Sediment Removal Per Pound (based on annual sediment load)	Cost of Nitrogen or Phosphorus Removal Per Pound (based on annual nutrient load)	Assistance Program	# LID-Roof Raingardens to Treat Water Quality Volume	Raingarden Cost
46 Manchester	0	0.14	FALSE	CB/GS/DW	0.0					CWIP,SRF	70	\$32,049
74 Manchester	0	0.10	0.19	GS/CB	0.0					CWIP,SRF	51	\$23,422
47 Manchester	0	0.07	FALSE	GS/OF	0.0					CWIP,SRF	35	\$16,242
60 Manchester	0	0.17	0.10	GS/WP	0.0					CWIP,SRF	83	\$38,192
59 Manchester	0	0.07	0.14	GS/CB/OF	0.0					CWIP,SRF	33	\$15,142
75 Manchester	4	0.29	0.73	GS/WP/OF/CB/CF	0.0					CWIP,SRF	146	\$67,237
57 Manchester	0	0.14	0.33	BRA/GS/WP	0.0					CWIP,SRF	71	\$32,674
79 Manchester	2	0.14	0.26	IB/CB/DW/GS	18.6	\$128,060		\$58	\$6,901	CWIP,SRF	70	\$32,198
55 Manchester	4	0.28	0.92	EDP(2)/CB/GS	0.0					CWIP,SRF	138	\$63,433
48 Manchester	0	0.06	FALSE	CB/GS	0.0					CWIP,SRF	29	\$13,484
58 Manchester	0	0.04	0.05	GS/OF	0.0					CWIP,SRF	19	\$8,882
71 Manchester	0	0.08	0.20	CB/IB	0.0					CWIP,SRF	42	\$19,093
70 Manchester	4	0.12	0.33	CB/WP/GS/SWPPP	0.0					CWIP,SRF	60	\$27,463
69 Manchester	4	0.03	0.10	GS/CB/WP/SWPPP	0.0					CWIP,SRF	17	\$7,998
<b>Total:</b>		<b>11</b>	<b>10</b>		<b>119</b>						<b>5301</b>	

**Subwatershed: 56**  
**Action List: 1, 4**

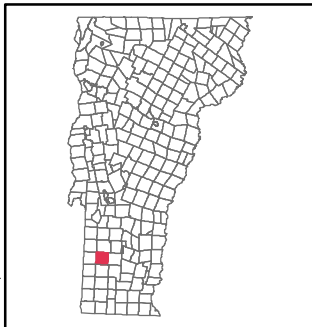


### Manchester, VT

DEC Stormwater Infrastructure Mapping Project

This map shows high priority subwatersheds which are ranked by connectedness, percent of impervious cover, field observations, and potential retrofit measures and locations.

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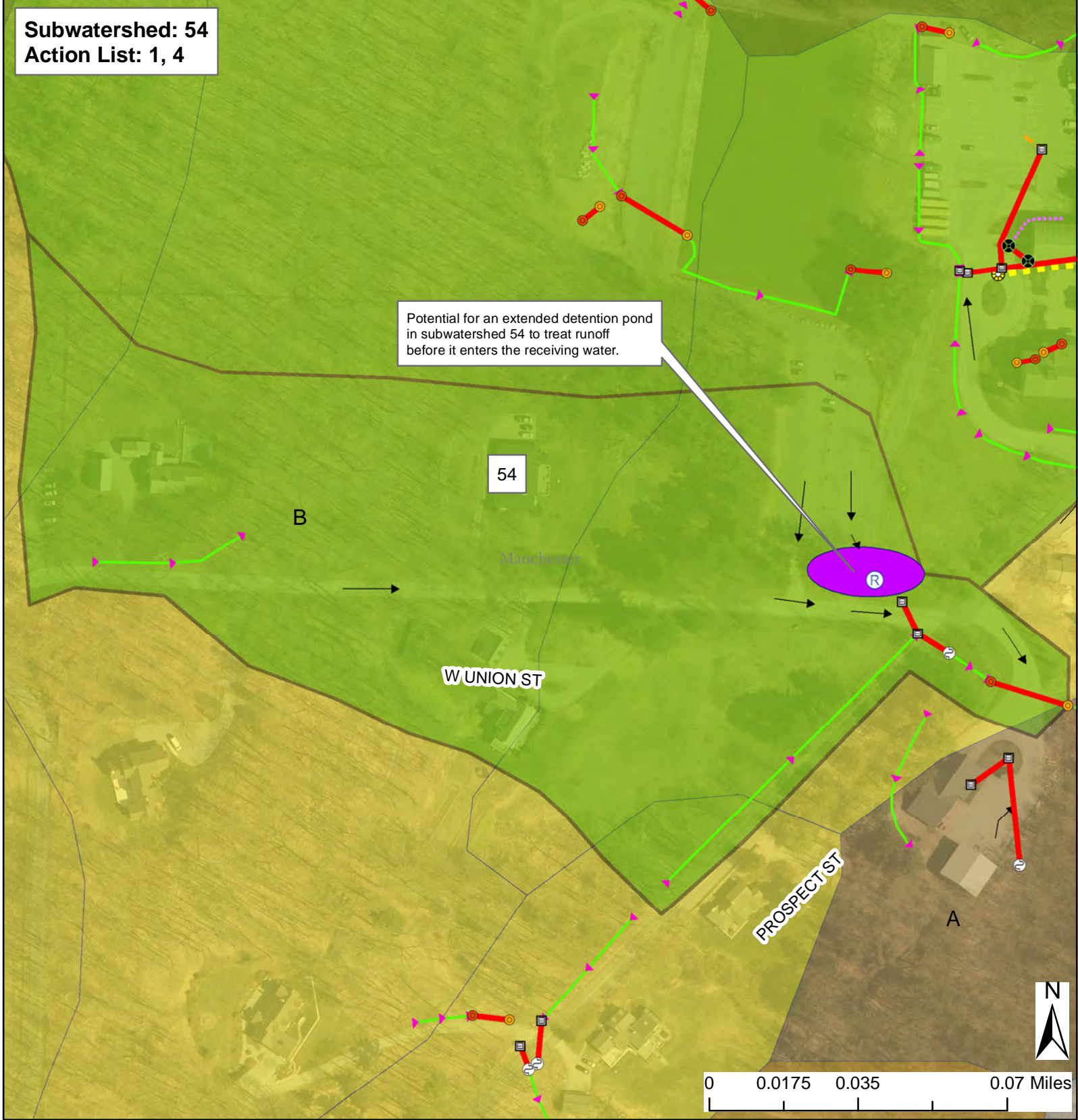


<p><b>Stormwater points</b></p> <ul style="list-style-type: none"> <li> Pipe Cross (not connected)</li> <li> Catchbasin</li> <li> Dry Well</li> <li> Drop Inlet</li> <li> Grate/Curb Inlet</li> <li> Yard drain</li> <li> CB tied to sanitary sewer</li> <li> Junction Box</li> <li> Stormwater Manhole</li> <li> Outfall</li> <li> Culvert inlet</li> <li> Culvert outlet</li> <li> Control Structure</li> <li> Treatment feature (see notes)</li> <li> Retrofit</li> <li> Unknown Point</li> <li> Information Point</li> </ul>	<p><b>Stormwater line</b></p> <ul style="list-style-type: none"> <li> Storm line</li> <li> Storm line (old Sanitary line)</li> <li> Tunnel (storm)</li> <li> Combined sewer</li> <li> Sanitary line</li> <li> Swale</li> <li> Footing drain</li> <li> Under drain</li> <li> Roof drain</li> <li> Infiltration pipe</li> <li> French drain</li> <li> Trench drain</li> <li> Emergency spillway</li> <li> Stream</li> <li> Overland flow</li> </ul>	<p><b>NRCS - Soils</b></p> <ul style="list-style-type: none"> <li> A</li> <li> B</li> <li> C</li> <li> D</li> </ul>	<p><b>SubwatershedID</b></p> <ul style="list-style-type: none"> <li> Priority Subwatershed</li> <li> Stormwater Treatment Area</li> <li> Potential Stormwater Treatment Area</li> </ul>
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Creator: Jim Pease, David Ainley  
 DEC - WID - Clean Water Initiative Program  
 Plotted Date: 7/17/2021  
 Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survey  
 Imagery Source: VCGI Best Available Imagery



**Subwatershed: 54**  
**Action List: 1, 4**

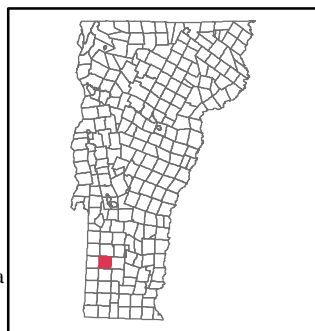


## Manchester, VT

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### Stormwater points

- Pipe Cross (not connected)
- Catchbasin
- Dry Well
- Drop Inlet
- Grate/Curb Inlet
- Yard drain
- CB tied to sanitary sewer
- Junction Box
- Stormwater Manhole
- Outfall
- Culvert inlet
- Culvert outlet
- Control Structure
- Treatment feature (see notes)
- Retrofit
- Unknown Point
- Information Point

### Stormwater line

- Storm line
- Storm line (old Sanitary line)
- Tunnel (storm)
- Combined sewer
- Sanitary line
- Swale
- Footing drain
- Under drain
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### NRCS - Soils

- A
- B
- C
- D

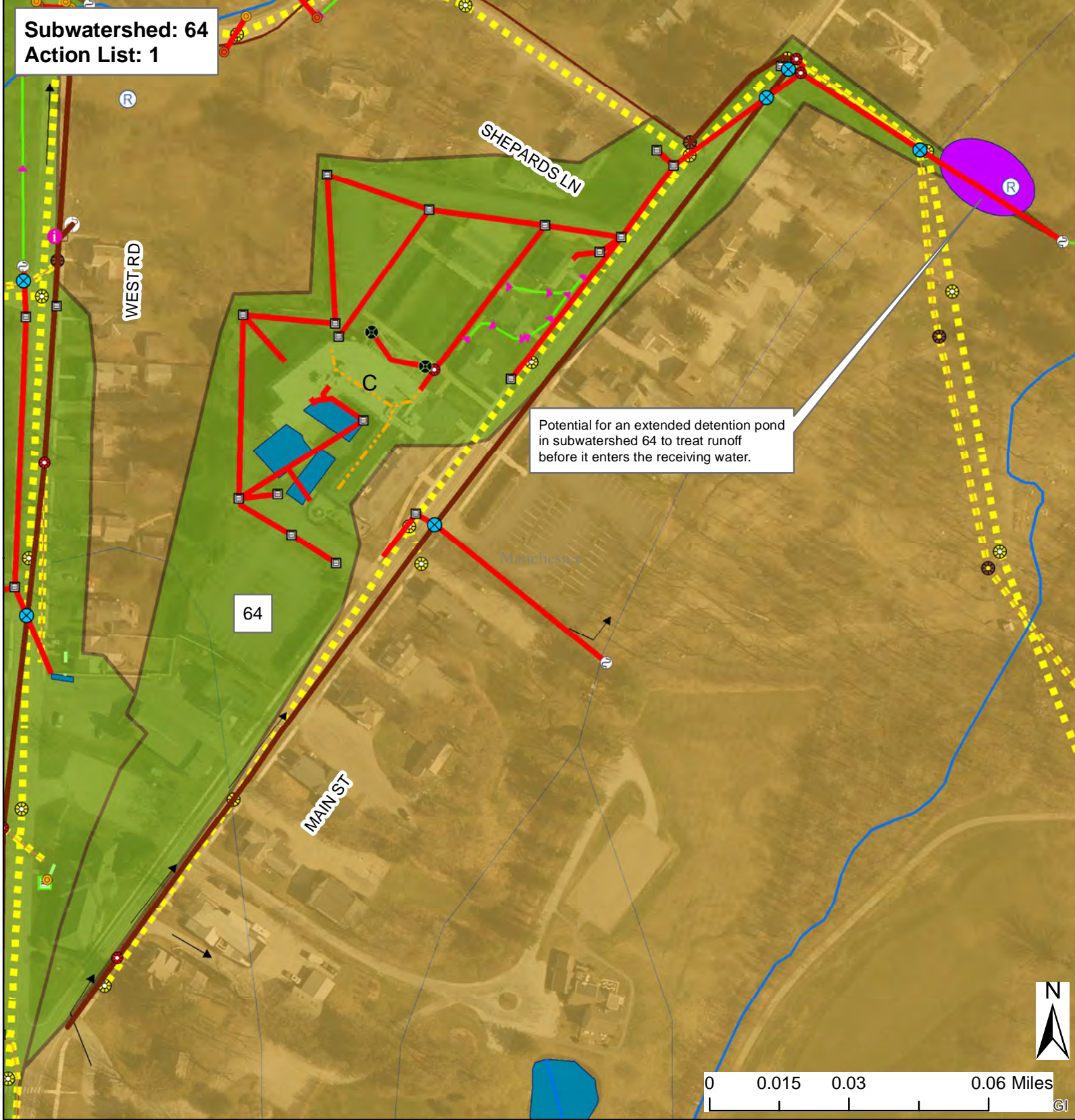
### SubwatershedID

- Priority Subwatershed
- Stormwater Treatment Area
- Potential Stormwater Treatment Area

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**Subwatershed: 64**  
**Action List: 1**



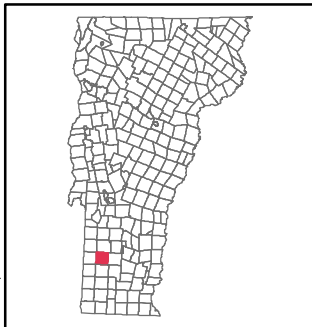
Potential for an extended detention pond in subwatershed 64 to treat runoff before it enters the receiving water.

### Manchester, VT

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| <p><b>Stormwater points</b></p> <ul style="list-style-type: none"> <li> Pipe Cross (not connected)</li> <li> Catchbasin</li> <li> Dry Well</li> <li> Drop Inlet</li> <li> Grate/Curb Inlet</li> <li> Yard drain</li> <li> CB tied to sanitary sewer</li> <li> Junction Box</li> <li> Stormwater Manhole</li> <li> Outfall</li> <li> Culvert inlet</li> <li> Culvert outlet</li> <li> Control Structure</li> <li> Treatment feature (see notes)</li> <li> Retrofit</li> <li> Unknown Point</li> <li> Information Point</li> </ul> | <p><b>Stormwater line</b></p> <ul style="list-style-type: none"> <li> Storm line</li> <li> Storm line (old Sanitary line)</li> <li> Tunnel (storm)</li> <li> Combined sewer</li> <li> Sanitary line</li> <li> Swale</li> <li> Footing drain</li> <li> Under drain</li> <li> Roof drain</li> <li> Infiltration pipe</li> <li> French drain</li> <li> Trench drain</li> <li> Emergency spillway</li> <li> Stream</li> <li> Overland flow</li> </ul> |
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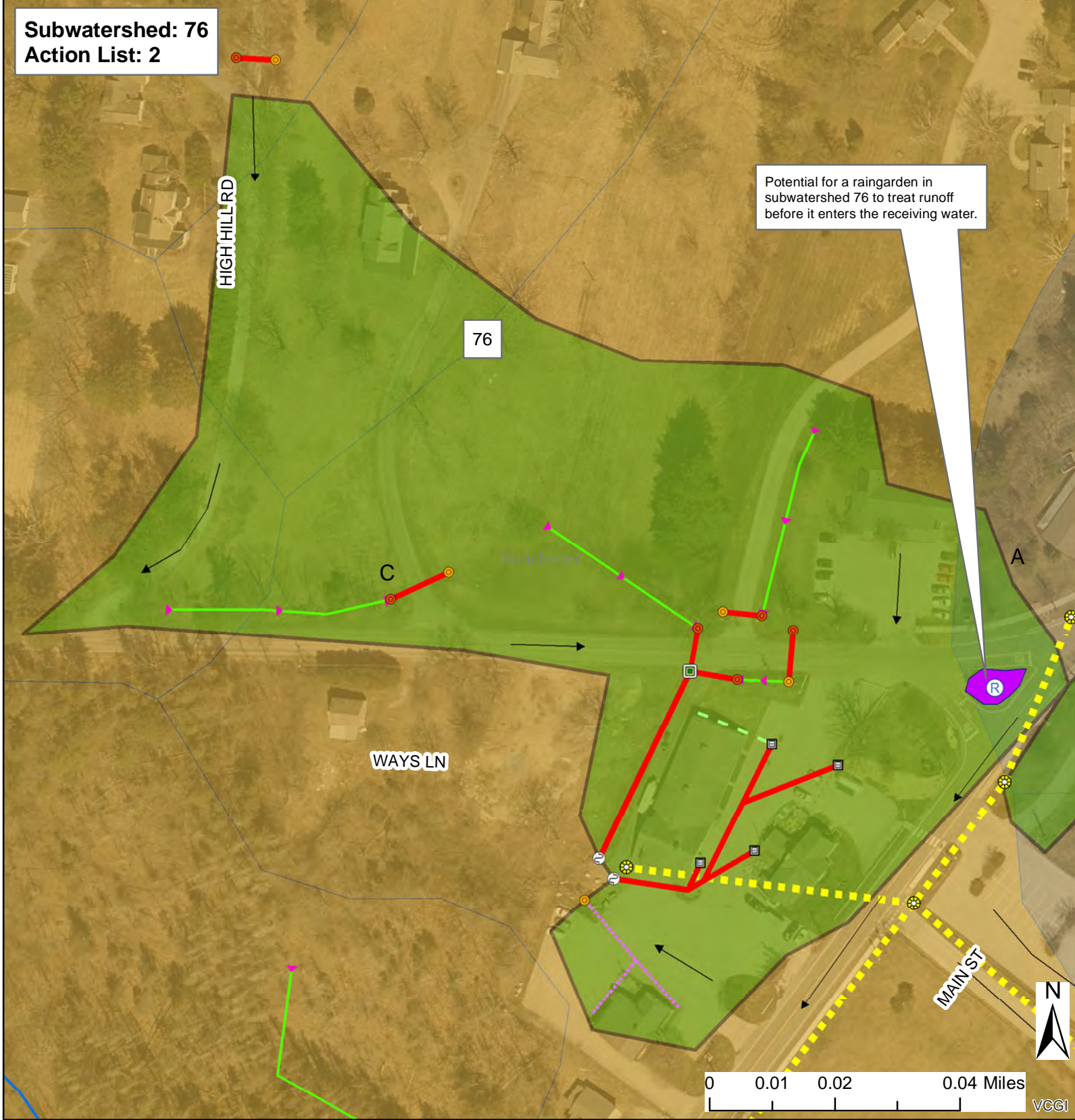
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|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>NRCS - Soils</b></p> <ul style="list-style-type: none"> <li> A</li> <li> B</li> <li> C</li> <li> D</li> </ul> | <p><b>SubwatershedID</b></p> <ul style="list-style-type: none"> <li> Priority Subwatershed</li> <li> Stormwater Treatment Area</li> <li> Potential Stormwater Treatment Area</li> </ul> |
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 DEC - WID - Clean Water Initiative Program  
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 Imagery Source: VCGI Best Available Imagery





**Subwatershed: 76**  
**Action List: 2**



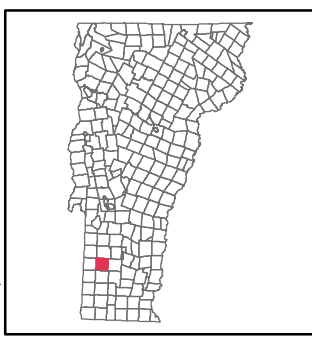
Potential for a raingarden in subwatershed 76 to treat runoff before it enters the receiving water.

### Manchester, VT

DEC Stormwater Infrastructure Mapping Project

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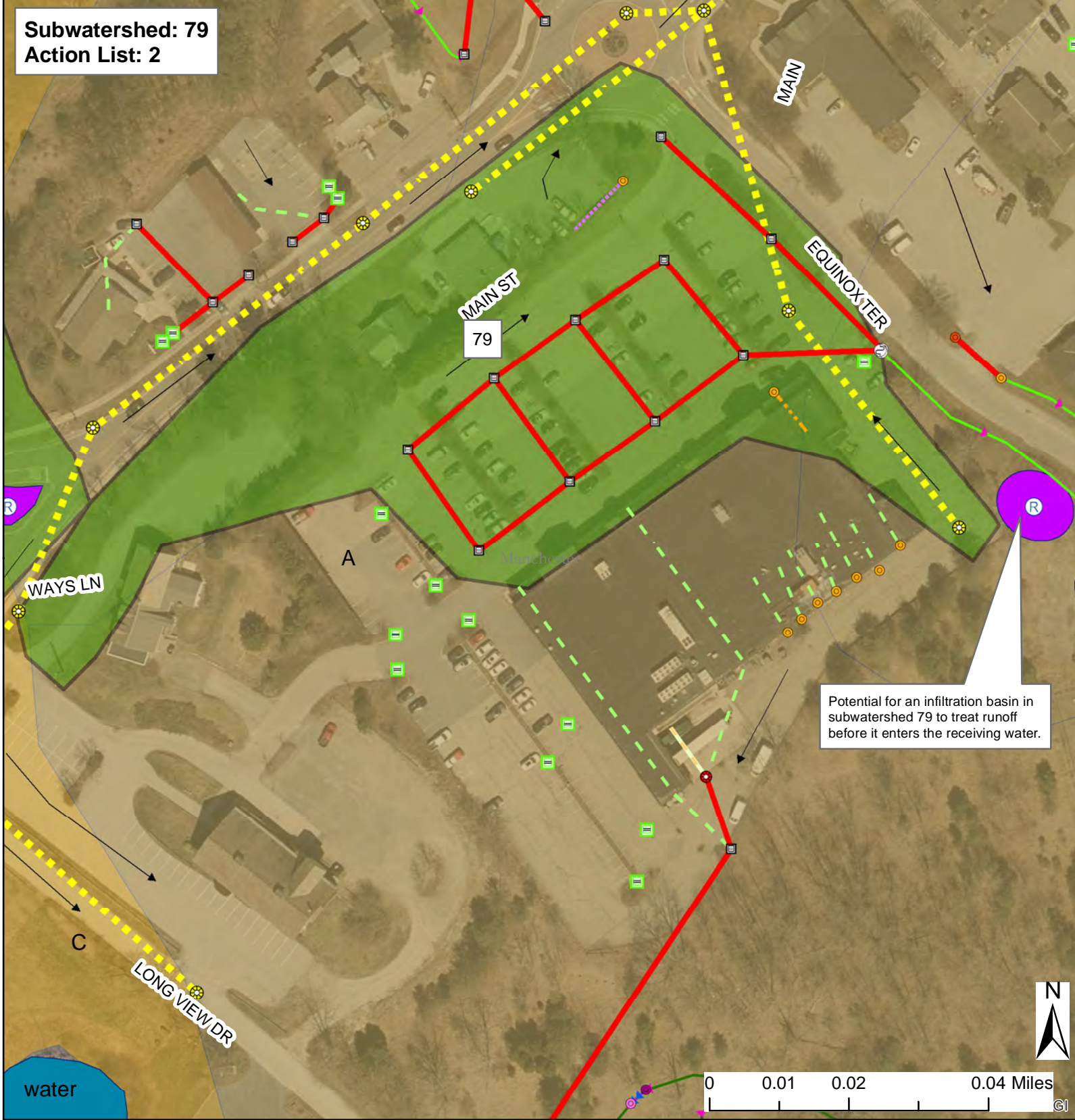


<p><b>Stormwater points</b></p> <ul style="list-style-type: none"> <li> Pipe Cross (not connected)</li> <li> Catchbasin</li> <li> Dry Well</li> <li> Drop Inlet</li> <li> Grate/Curb Inlet</li> <li> Yard drain</li> <li> CB tied to sanitary sewer</li> <li> Junction Box</li> <li> Stormwater Manhole</li> <li> Outfall</li> <li> Culvert inlet</li> <li> Culvert outlet</li> <li> Control Structure</li> <li> Treatment feature (see notes)</li> <li> Retrofit</li> <li> Unknown Point</li> <li> Information Point</li> </ul>	<p><b>Stormwater line</b></p> <ul style="list-style-type: none"> <li> Storm line</li> <li> Storm line (old Sanitary line)</li> <li> Tunnel (storm)</li> <li> Combined sewer</li> <li> Sanitary line</li> <li> Swale</li> <li> Footing drain</li> <li> Under drain</li> <li> Roof drain</li> <li> Infiltration pipe</li> <li> French drain</li> <li> Trench drain</li> <li> Emergency spillway</li> <li> Stream</li> <li> Overland flow</li> </ul>	<p><b>NRCS - Soils</b></p> <ul style="list-style-type: none"> <li> A</li> <li> B</li> <li> C</li> <li> D</li> </ul>	<p><b>SubwatershedID</b></p> <ul style="list-style-type: none"> <li> Priority Subwatershed</li> <li> Stormwater Treatment Area</li> <li> Potential Stormwater Treatment Area</li> </ul>
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**Subwatershed: 79**  
**Action List: 2**



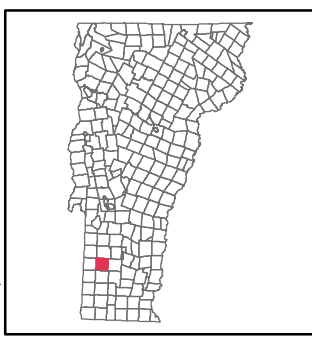
Potential for an infiltration basin in subwatershed 79 to treat runoff before it enters the receiving water.

### Manchester, VT

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**Agency of Natural Resources  
Department of Environmental Conservation**

**Watershed Management Division  
1 National Life Drive, Davis 3**

**MEMORANDUM**

To: 2020 Listing File

From: Biomonitoring and Aquatic Studies Section (VDEC)

Cc: Tim Clear (VDEC), Bethany Sargent (VDEC), Heather Pembrook (VDEC)

Date: February 5, 2020

Subject: Impairment of Munson Brook

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Munson Brook is located in the town of Manchester, VT, and is currently on the Stressed Waters List; waters on this list are described as “in compliance with Vermont Water Quality Standards (VWQS) but stressors are present that impede the water from attaining the highest water quality”. The stressor was described as sediment, with Aquatic Life Support (ALS) stressed due to high embeddedness. The purpose of this memo is to summarize recent biological and chemical data, and to clarify Munson Brook’s current status and potential pollutant sources.

The watershed land use of Munson Brook is shown in Table 1. With nearly 21% of the watershed classified as developed, it’s likely that impervious surfaces are causing significant urban runoff to this brook. The most recent water quality sampling results showed high conductivity (440 & 492  $\mu\text{mho/cm}$ ) and chloride levels (32 & 43 mg/L) (Table 2). These levels are comparable to other biological impairments in urban developed watersheds in Vermont. Road salt applications during the winter months have the potential to significantly degrade surface-water in nearby streams.

The initial listing of Munson Brook on the Stressed Waters List described the stressor as high embeddedness. The estimated embeddedness was at a high of 62% in 2003 and has decreased to 20% in 2019. Although embeddedness has decreased, the amount of silt and fine substrate recorded in 2018 & 2019 continue to be elevated (Table 3). This stressor should continue to be a part of the listing until more data can be collected.

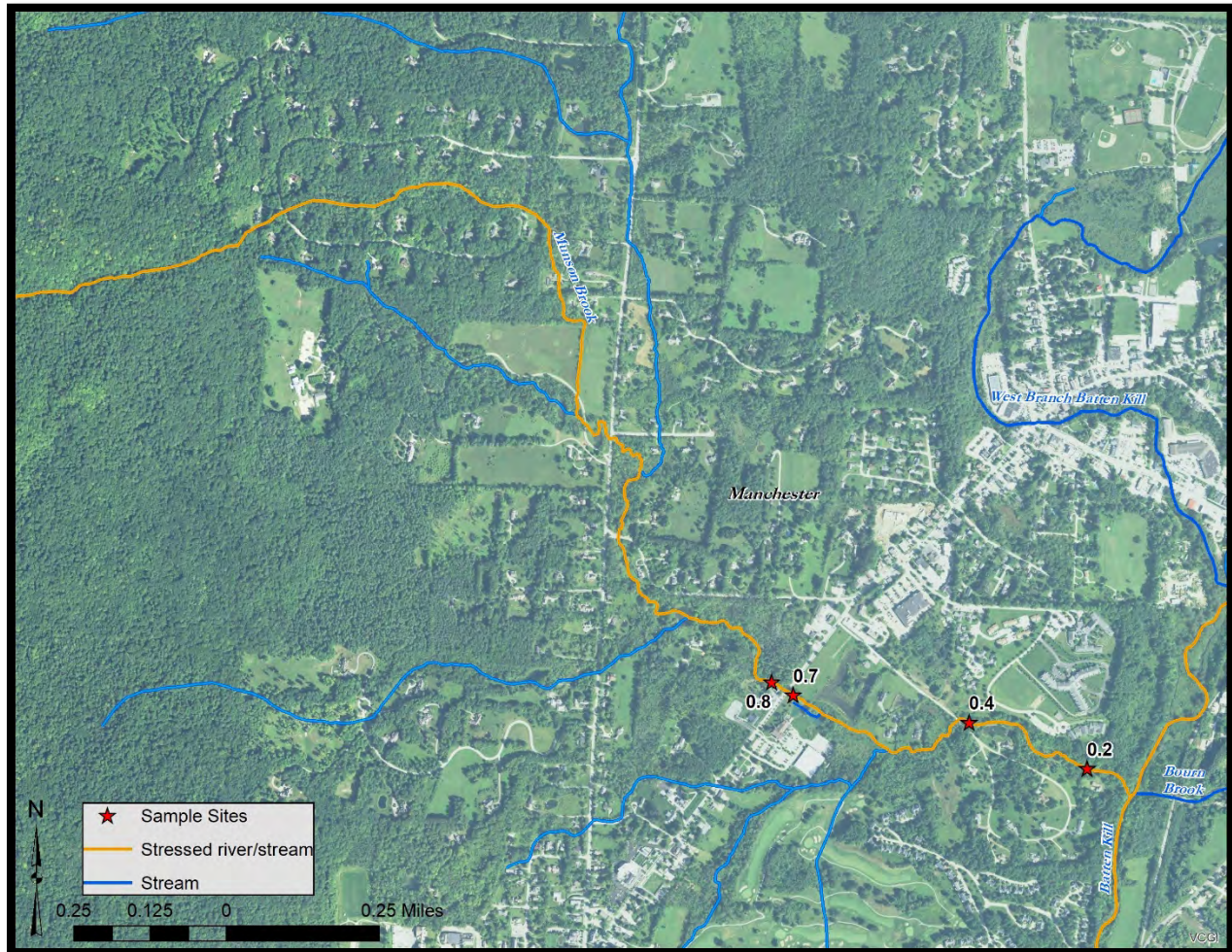
All past water quality sampling results show elevated pH, alkalinity, and calcium; this may be due in part to watershed geology. Calcareous deposits were described as coating the substrate in 2003, 2004, & 2008; this was still an issue in 2018 & 2019 when field comments described instream calcareous cover of 60% and 80% respectively.

The Biomonitoring and Aquatic Studies Section (BASS) originally sampled multiple locations on Munson Brook in 2003, 2004, and 2008 (Table 4). These samples failed to meet VWQS and led to Munson Brook’s addition to the VT Stressed Waters List. To update biological and chemical data for this brook, biologists sampled a site approximately a quarter mile upstream from the confluence with the Batten Kill in 2018 and 2019 (Figure 1). The results from these biological samples failed to meet standards for aquatic biota. Metric scores suggest a community tolerant of water quality degradation (e.g. elevated biotic index), as well as signs of hydrological disturbance and toxic urban runoff (e.g. low richness of the sensitive Ephemeroptera, Plecoptera, and Trichoptera (EPT) orders). There was a complete absence of



Plecoptera in 2018 (and only one species represented by two individuals in 2019). Sampling has shown a high relative abundance of the disturbance tolerant mayfly *Baetis tricaudatus*. The fish community of Munson Brook was sampled for the first time in 2019, with non-native Brown Trout (*Salmo trutta*) present in relatively low densities.

Through six biological sampling events dating back to 2003, Munson Brook has never met macroinvertebrate aquatic biota standards. BASS recommends Munson Brook be added to Part A of the 303(d) List of Impaired Waters. The original pollutant of sediment on the Stressed Waters List was accurate at the time of listing and continues to be an issue, it is recommended the 2020 listing include urban runoff as the pollutant, with the use of ALS impaired due to the surface water quality problem of sediment, embeddedness, and elevated chloride levels.



**Figure 1: Munson Brook, in Manchester, VT. Red stars indicate biological sampling locations and the orange line indicates streams determined to be stressed.**

**Table 1: Site descriptions for Munson Brook sample sites and land use for the monitoring site at river mile 0.2**

River Mile	Location Description	Stream Type	Drainage Area (km <sup>2</sup> )	2016 Land Use			
				Developed %	Forested %	Agriculture %	Wetlands %
0.2	Located just above bedrock falls, above confluence with Batten Kill.	SHG	9.2	20.8	69.9	6.5	2.6
0.4	Below bridge on Longview Drive.	SHG					
0.7	Located below Route 7.	SHG					
0.8	Located immediately above Route 7.	SHG					



**Table 2: Water chemistry sampling results for stations on Munson Brook**

River Mile	Visit Date	Flow Level	Flow Type	Alkalinity (mg/l)	Conductivity (umho/cm)	pH	Temp (c)	Total Chloride (mg/l)	Total Nitrate/Nitrite Nitrogen (mg/l)	Total Nitrogen (mg/l)	Total Phosphorus (ug/l)	Dissolved Phosphorus (ug/l)	Total Calcium (mg/l)	Total Iron (ug/l)	Total Sodium (mg/l)	Total Hardness (mg/l)	Turbidity (NTU)
0.7	10/1/2003	Moderate	Base	292.0	<b>773.0</b>	8.2	10.2	<b>74.0</b>	0.41	0.57	5.0	-	-	-	-	-	1.0
0.4	10/4/2004	Moderate	Base	226.0	<b>479.0</b>	8.1	12.9	<b>17.8</b>	0.85	0.93	23.0	4.0	-	-	-	241.0	1.4
0.2	10/8/2008	Moderate	Base	190.0	<b>478.0</b>	8.3	10.9	<b>31.0</b>	0.48	0.54	5.9	5.0	62.9	77.7	19.1	231.0	2.4
0.2	9/19/2018	Moderate	Base	198.0	<b>492.2</b>	8.0	17.2	<b>42.8</b>	0.33	0.42	8.0	-	55.7	86.2	25.1	202.8	0.6
0.2	9/25/2019	Moderate	Base	177.5	<b>439.9</b>	8.0	14.4	<b>32.6</b>	0.36	0.42	9.0	-	50.4	93.2	17.7	194.1	0.4

**Table 3: Embeddedness and substrate observations at Munson Brook**

Date	River Mile	Embeddedness Estimated %	Silt Rating	Gravel %	Fines %
2003-10-02	0.7	62.5	<b>3</b>	-	-
	0.8	37.5	<b>3</b>	-	-
2004-10-04	0.4	-	<b>4</b>	13	5
2008-10-08	0.2	15	<b>2</b>	-	-
2018-09-19	0.2	30	<b>3</b>	17	5
2019-09-25	0.2	20	<b>4</b>	28	0

**Table 4: Biomonitoring results from all sampling stations on Munson Brook**

Date	River Mile	Lab ID	Density	Richness	EPT Richness	PMA-O	B.I.	Oligo.	EPT/EPT + Chiro	PPCS-F	Community Assessment
<b>10/2/2003</b>	0.7	2003.109	1008	23.0	3.0	52.3	5.33	0.00	0.84	0.35	Poor
	0.8	2003.108	451	30.0	7.0	51.6	4.95	6.81	0.87	0.39	Fair
<b>10/4/2004</b>	0.4	2004.147	2526	46.0	21.5	66.2	3.42	2.39	0.86	0.38	Good/Fair
<b>10/8/2008</b>	0.2	2008.094	2404	36.0	12.0	72.0	3.17	4.83	0.91	0.43	Fair
<b>9/19/2018</b>	0.2	2018.079	1888	29.0	10.0	65.3	3.74	0.64	0.92	0.55	Fair
<b>9/25/2019</b>	0.2	2019.122	3258	35.5	13.0	69.4	3.73	0.60	0.88	0.44	Fair
<b>Full Support</b>			≥ 300	≥ 27	≥ 16	≥ 45	≤ 4.5	≤ 12	≥ 0.45	≥ 0.4	
<b>Indeterminate</b>			≥ 250	≥ 26	≥ 15	≥ 40	≤ 4.65	≤ 14.5	≥ 0.43	≥ 0.35	
<b>Non-Support</b>			< 250	< 26	< 15	< 40	> 4.65	> 14.5	< 0.43	< 0.35	

\*Scoring Guidelines for Stream Type SHG and WQ Class B(2).