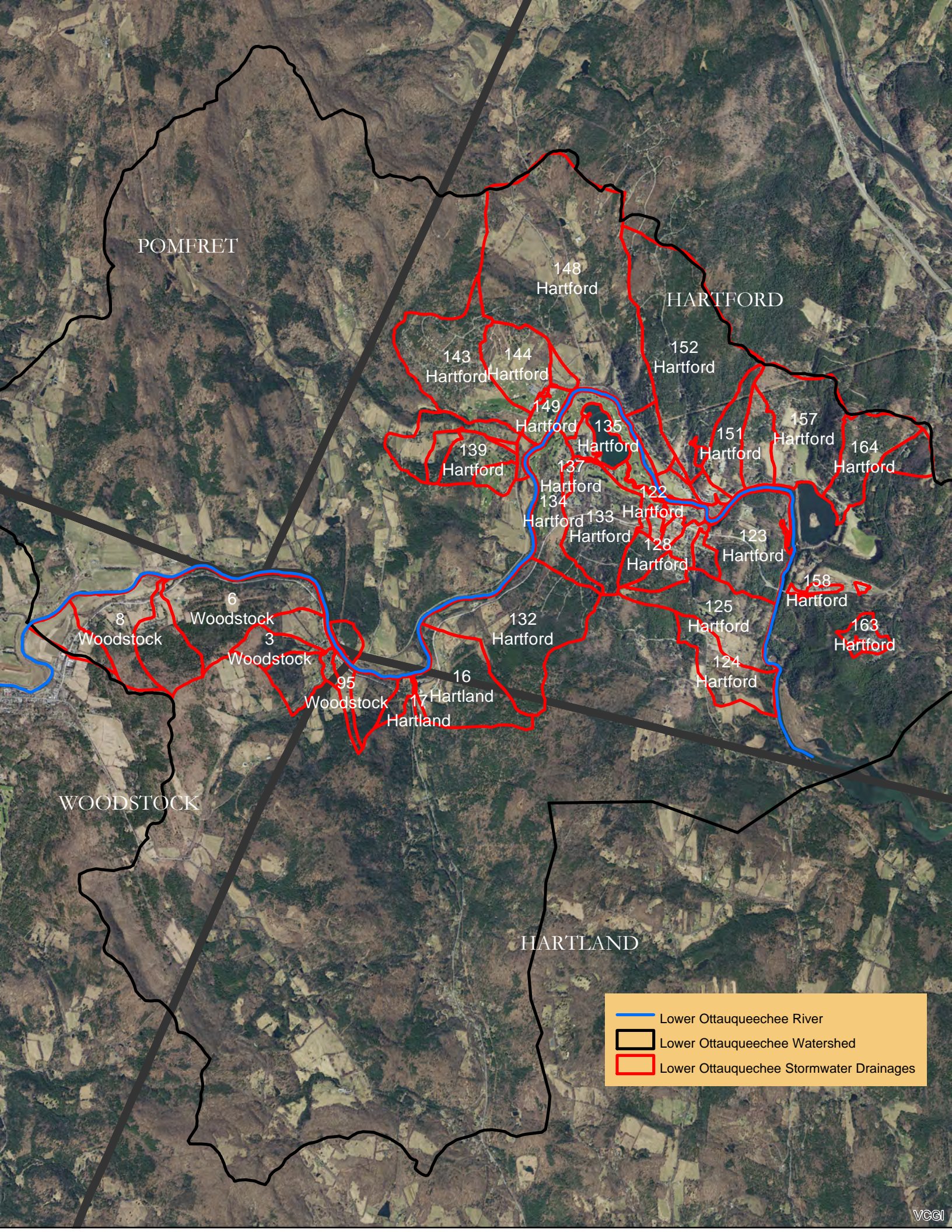


# Lower Ottauquechee River, Woodstock, Hartland, Hartford, VT

The Lower Ottauquechee River in eastern Vermont has been found to be stressed by stormwater runoff as measured by the biology and chemistry of the river. There are at least 58 significant discharges to the river from the developed lands of Woodstock, Hartland and Hartford. The largest urbanized discharge to the stream is drainage area 148 Hartford which drains a large area of Quechee. The recommended course of action for stormwater impacted rivers is to install a treatment structure that controls the water quality volume from these discharges. A map showing the location of the discharges and a possible retrofit location is provided. A cost estimate (excluding land costs) is provided for structural stormwater practices. Kedron Brook in Woodstock discharges to the Lower Ottauquechee River and is also stressed by stormwater runoff. There is an additional report for Kedron Brook.

Addressing the large discharges of stormwater to the river will reduce contamination and flooding and will help prevent the stream from becoming declared impaired on the state of Vermont's 303d list of impaired waters. It will also reduce nitrogen currently being discharged to the Ottauquechee River, the Connecticut River and Long Island Sound.



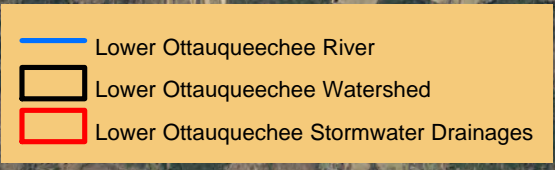


POMFRET

HARTFORD

WOODSTOCK

HARTLAND







Macroinvertebrate Site Summary - River/Stream

# Ottauquechee River

Above Woodstock WWTF Discharge.  
 Woodstock, VT (43.62911, -72.50758)  
 Stream Type: Medium High Gradient

## Macroinvertebrate Community Metrics

Macroinvertebrate Community Assessments are based primarily on eight metrics of the Macroinvertebrate community. These include metrics of abundance, species richness, and indexes of Sensitive to tolerant species ratios. (For More Details)

Date	Density	Richness	EPT Richness	PMA-O	B.I.	Oligo.	EPT/EPT + Chiro	PPCS-F	Community Assessment
9/15/2010	3576	58.0	35.0	76.4	4.04	0.45	0.96	0.43	Very Good
9/28/2015	3160	48.0	31.0	76.4	4.12	0.00	0.98	0.38	Good - Fair
9/17/2019	3968	42.0	24.0	79.2	4.32	0.10	0.93	0.45	Good
Scoring Guideline for a MHG Stream of Water Quality Class B(2)									
	≥ 300	≥ 30	≥ 18	≥ 45	≤ 5	≤ 12	≥ 0.45	≥ 0.4	Full Support
	≥ 250	≥ 28	≥ 16	≥ 40	≤ 5.15	≤ 14.5	≥ 0.43	≥ 0.35	Indeterminate
	< 250	< 28	< 16	< 40	> 5.15	> 14.5	< 0.43	< 0.35	Non-Support



## Macroinvertebrate Site Summary - River/Stream

# Ottauquechee River

Located below WWTF 300m. Below a tractor path crossing of river.

Woodstock, VT (43.63086, -72.51085)

Stream Type: Medium High Gradient

### Macroinvertebrate Community Metrics

Macroinvertebrate Community Assessments are based primarily on eight metrics of the Macroinvertebrate community. These include metrics of abundance, species richness, and indexes of Sensitive to tolerant species ratios. (For More Details)

Date	Density	Richness	EPT Richness	PMA-O	B.I.	Oligo.	EPT/EPT + Chiro	PPCS-F	Community Assessment
9/9/2002	2520	42.0	20.0	76.2	5.10	0.32	0.82	0.37	Good - Fair
10/2/2003	3588	52.0	23.0	85.9	4.26	1.23	0.80	0.59	Very Good - Good
9/24/2007	2856	49.0	26.0	71.9	4.50	0.00	0.86	0.43	Very Good - Good
9/15/2010	5080	62.0	37.0	74.3	4.58	0.00	0.77	0.52	Good
9/20/2012	2752	49.0	26.0	70.0	4.97	0.00	0.71	0.53	Good - Fair
9/10/2014	2820	48.0	29.0	82.1	4.36	0.43	0.77	0.37	Good - Fair
9/28/2015	3864	60.0	33.0	63.4	3.69	0.10	0.91	0.41	Good
9/17/2019	4676	62.0	32.0	71.8	4.12	0.09	0.81	0.37	Good - Fair
Scoring Guideline for a MHG Stream of Water Quality Class B(2)									
	≥ 300	≥ 30	≥ 18	≥ 45	≤ 5	≤ 12	≥ 0.45	≥ 0.4	Full Support
	≥ 250	≥ 28	≥ 16	≥ 40	≤ 5.15	≤ 14.5	≥ 0.43	≥ 0.35	Indeterminate
	< 250	< 28	< 16	< 40	> 5.15	> 14.5	< 0.43	< 0.35	Non-Support

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Effective Impervious Area	Sediment Load with Current Reductions (lbs.)	Sediment Load with Priority Action (lbs.)	Nitrogen Load with Current Reductions (lbs.)	Nitrogen Load with Priority Action (lbs.)	Water Quality Volume (ft <sup>3</sup> )	Estimated Basin Construction Cost	Estimated Other BMP Construction Cost	Cost of Sediment Removal Per Pound (based on annual sediment load)	Cost of Nitrogen Removal Per Pound (based on annual nitrogen load)	Assistance Program	# LID-Roof Raingardens to Treat Water Quality Volume	Raingarden Cost	
148	Hartford		GS/OF/WP	5736-9015	829.4	1.5	69810	69810	581.8	581.8	172051.0					CWIP,SRF,LISF	1975	\$908,429	
132	Hartford		OF/CB/GS/SWPPP		365.3	1.3	30062	30062	250.5	250.5	74089.8					CWIP,SRF,LISF	850	\$391,194	
143	Hartford		GS/OF		273.4	3.4	29298	29298	244.2	244.2	72207.1					CWIP,SRF,LISF	829	\$381,254	
152	Hartford		GS/WP		526.7	1.4	26127	26127	290.3	290.3	107319.8					CWIP,SRF,LISF	1232	\$566,649	
133	Hartford		GS/CB/WP	4282-9010	208.6	5.4	21889	21889	205.2	205.2	67432.8					CWIP,SRF,LISF	774	\$356,045	
157	Hartford		OF/GS		238.7	1.8	21030	21030	175.3	175.3	51830.4					CWIP,SRF,LISF	595	\$273,664	
6	Woodstock		CB/OF		259.20	0.6	18899	18899	157.5	157.5	46577.7					CWIP,SRF,LISF	535	\$245,930	
16	Hartland		GS/OF/CB/WP	3690-9010	215.82	1.2	17462	10477	116.4	116.4	43035.3					CWIP,SRF,LISF	494	\$227,227	
125	Hartford		GS/OF/WP		194.0	1.2	15590	15590	129.9	129.9	38423.4					CWIP,SRF,LISF	441	\$202,875	
164	Hartford		OF/GS	4530-9003	135.7	2.9	13630	13630	113.6	113.6	33591.9					CWIP,SRF,LISF	386	\$177,365	
134	Hartford		GS/CB/OF		137.2	2.1	12531	12531	104.4	104.4	30884.2					CWIP,SRF,LISF	355	\$163,068	
8	Woodstock		CB/GS/OF		150.69	1.1	11933	11933	99.4	99.4	29408.7					CWIP,SRF,LISF	338	\$155,278	
144	Hartford		GS/OF/CB		134.6	1.8	11743	11743	97.9	97.9	28941.6					CWIP,SRF,LISF	332	\$152,812	
123	Hartford		GS/CB/EDP/CB	4455-9010	204.8	0.9	11120	11120	112.5	112.5	39149.5					CWIP,SRF,LISF	449	\$206,710	
124	Hartford		GS/OF		124.4	1.8	10921	10921	91.0	91.0	26914.9					CWIP,SRF,LISF	309	\$142,111	
156	Hartford		GS/OF		78.0	3.7	8649	8649	72.1	72.1	21315.5					CWIP,SRF,LISF	245	\$112,546	
142	Hartford		GS		95.6	2.0	8560	8560	71.3	71.3	21096.3					CWIP,SRF,LISF	242	\$111,388	
128	Hartford		CB/GS	3256-9010	68.8	4.7	8455	8455	70.5	70.5	20838.0					CWIP,SRF,LISF	239	\$110,025	
7	Woodstock		OF/GS	4052-9010	118.11	0.4	8403	8403	70.0	70.0	20709.6					CWIP,SRF,LISF	238	\$109,347	
153	Hartford	1	Swirl separator at outfall on Main St Quechee Village	VS/CB/OF	26.9	19.2	7946	1589	66.2	53.0	19583.3		\$50,000	\$8	\$3,776	CWIP,SRF,LISF	225	\$103,400	
139	Hartford		OF		71.7	2.5	6911	6911	57.6	57.6	17032.8					CWIP,SRF,LISF	196	\$89,933	
10	Woodstock		CB/GS/OF		67.32	2.7	6619	6619	55.2	55.2	16311.8					CWIP,SRF,LISF	187	\$86,126	
122	Hartford		GS/CB		48.1	4.6	5851	5851	48.8	48.8	14420.5					CWIP,SRF,LISF	166	\$76,140	
154	Hartford		CB/OF		49.5	3.4	5288	5288	44.1	44.1	13032.0					CWIP,SRF,LISF	150	\$68,809	
135	Hartford		OF		71.6	0.2	4911	4911	40.9	40.9	12102.6					CWIP,SRF,LISF	139	\$63,902	
163	Hartford		OF		28.1	9.0	4867	4867	40.6	40.6	11993.9					CWIP,SRF,LISF	138	\$63,328	
4	Woodstock		OF/GS/DW		69.33	0.7	4627	4627	38.6	38.6	12670.8					CWIP,SRF,LISF	145	\$66,902	
151	Hartford		CB/DW/GS	3227-9010	96.4	0.9	4482	4482	49.8	49.8	18410.5					CWIP,SRF,LISF	211	\$97,208	
14	Hartland		CB/OF		60.65	0.6	4460	4460	37.2	37.2	10990.9					CWIP,SRF,LISF	126	\$58,032	
165	Hartford		GS/CB		47.5	2.3	4455	4455	37.1	37.1	10980.2					CWIP,SRF,LISF	126	\$57,976	
2	Woodstock		CB/GS		49.86	1.7	4304	4304	35.9	35.9	10606.5					CWIP,SRF,LISF	122	\$56,002	
95	Woodstock		GS/WP/CB		30.01	5.3	3889	3889	32.4	32.4	9584.6					CWIP,SRF,LISF	110	\$50,607	
127	Hartford		CB/GS		23.4	7.9	3778	3778	31.5	31.5	9310.3					CWIP,SRF,LISF	107	\$49,158	
3	Woodstock	3	Wet pond in headwaters to reduce residential flooding	GS/WP	54.51	0.1	3678	2207	30.6	24.5	9063.6		\$40,000	\$27	\$6,526	CWIP,SRF,LISF	104	\$47,856	
137	Hartford		GS/CB		11.6	17.8	3233	3233	26.9	26.9	7968.5					CWIP,SRF,LISF	91	\$42,074	
141	Hartford		OF/GS/CB		28.0	3.7	3081	3081	25.7	25.7	7592.6					CWIP,SRF,LISF	87	\$40,089	
129	Hartford		CB/GS		14.7	11.6	3017	3017	25.1	25.1	7434.8					CWIP,SRF,LISF	85	\$39,256	
158	Hartford	1	Infiltration basin at outfall near Deweys Mills Rd.	IB/CB/DW/OF	5741-9015	10.0	33.5	2783	2505	30.9	27.8	11431.7	\$120,033		\$431	\$11,091	CWIP,SRF,LISF	131	\$60,360
160	Hartford		CB	3706-9010	2.9	73.4	2703	2703	22.5	22.5	6662.2					CWIP,SRF,LISF	76	\$35,176	

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Effective Impervious Area	Sediment Load with Current Reductions (lbs.)	Sediment Load with Priority Action (lbs.)	Nitrogen Load with Current Reductions (lbs.)	Nitrogen Load with Priority Action (lbs.)	Water Quality Volume (ft <sup>3</sup> )	Estimated Basin Construction Cost	Estimated Other BMP Construction Cost	Cost of Sediment Removal Per Pound (based on annual sediment load)	Cost of Nitrogen Removal Per Pound (based on annual nitrogen load)	Assistance Program	# LID-Roof Raingardens to Treat Water Quality Volume	Raingarden Cost
1 Woodstock			CB/GS		12.75	11.5	2591	2591	21.6	21.6	6386.3					CWIP,SRF,LISF	73	\$33,720
138 Hartford			GS/OF		28.8	1.8	2523	2523	21.0	21.0	6218.3					CWIP,SRF,LISF	71	\$32,833
5 Woodstock			GS/CB/OF		24.89	2.7	2441	2441	20.3	20.3	6015.4					CWIP,SRF,LISF	69	\$31,761
15 Hartland			GS/OF		24.23	1.2	1959	1959	16.3	16.3	4828.2					CWIP,SRF,LISF	55	\$25,493
145 Hartford			GS		19.2	3.0	1958	1958	16.3	16.3	4825.9					CWIP,SRF,LISF	55	\$25,481
149 Hartford			OF/WP		40.7	1.0	1910	1910	21.2	21.2	7846.1					CWIP,SRF,LISF	90	\$41,427
126 Hartford			GS/CB/OF/WP	3256-9010	37.0	3.9	1665	1665	24.3	24.3	10258.5					CWIP,SRF,LISF	118	\$54,165
17 Hartland	2		GS/OF/IB		7.01	13.0	1554	311	13.0	5.2	3831.1	\$80,454		\$65	\$10,351	CWIP,SRF,LISF	44	\$20,228
131 Hartford			CB/GS	3025-9010	11.4	9.5	1224	1224	13.6	13.6	5029.0					CWIP,SRF,LISF	58	\$26,553
146 Hartford			CB/GS		1.4	62.2	1094	1094	9.1	9.1	2696.9					CWIP,SRF,LISF	31	\$14,239
150 Hartford			OF		13.3	1.0	1031	1031	8.6	8.6	2539.9					CWIP,SRF,LISF	29	\$13,411
161 Hartford			CB		5.1	9.9	946	946	7.9	7.9	2331.4					CWIP,SRF,LISF	27	\$12,310
140 Hartford			GS		4.4	9.9	820	820	6.8	6.8	2021.2					CWIP,SRF,LISF	23	\$10,672
136 Hartford			GS/EDP/CB	5523-9015	22.7	9.5	816	816	20.4	20.4	10053.2					CWIP,SRF,LISF	115	\$53,081
147 Hartford			CB/GS		1.3	42.6	765	765	6.4	6.4	1885.2					CWIP,SRF,LISF	22	\$9,954
159 Hartford			CB/SB		1.4	51.3	575	575	6.4	5.8	2362.7					CWIP,SRF,LISF	27	\$12,475
162 Hartford			DW		4.0	8.6	402	402	4.5	4.5	1652.6					CWIP,SRF,LISF	19	\$8,726
155 Hartford			CB/GS/EDP	3600-9015	6.3	10.8	247	247	6.2	6.2	3042.6					CWIP,SRF,LISF	35	\$16,065
134 Hartford			CB/EDP/GS		4.5	0.9	70	70	1.7	1.7	857.0					CWIP,SRF,LISF	10	\$4,525

# *Target Maps*

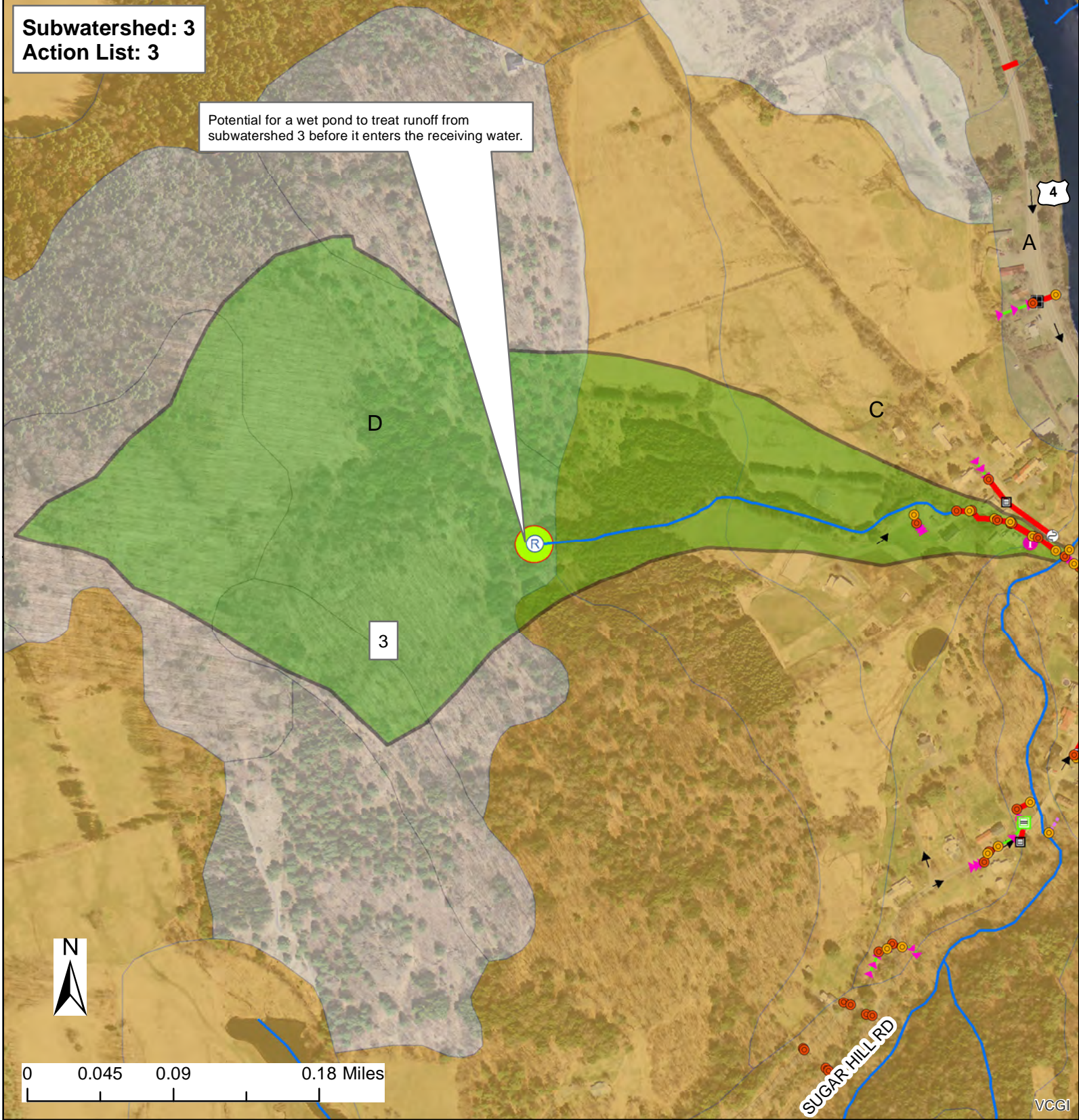
*Showing Priority Action List  
Drainage Areas*

*And Potential Retrofit Locations*



**Subwatershed: 3**  
**Action List: 3**

Potential for a wet pond to treat runoff from subwatershed 3 before it enters the receiving water.

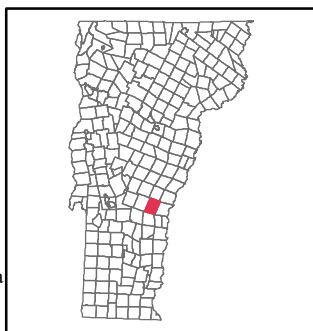


## Woodstock, VT

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.

The data shown on this map is only as accurate as the available sources and field observations allowed and should be used as a basic planning level tool only.



### 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
- Pond outlet 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
- Roof drain
- Infiltration pipe
- French drain
- Trench drain
- Emergency spillway
- Stream
- Overland flow

### NRCS - Soils

- A
- B
- C
- D

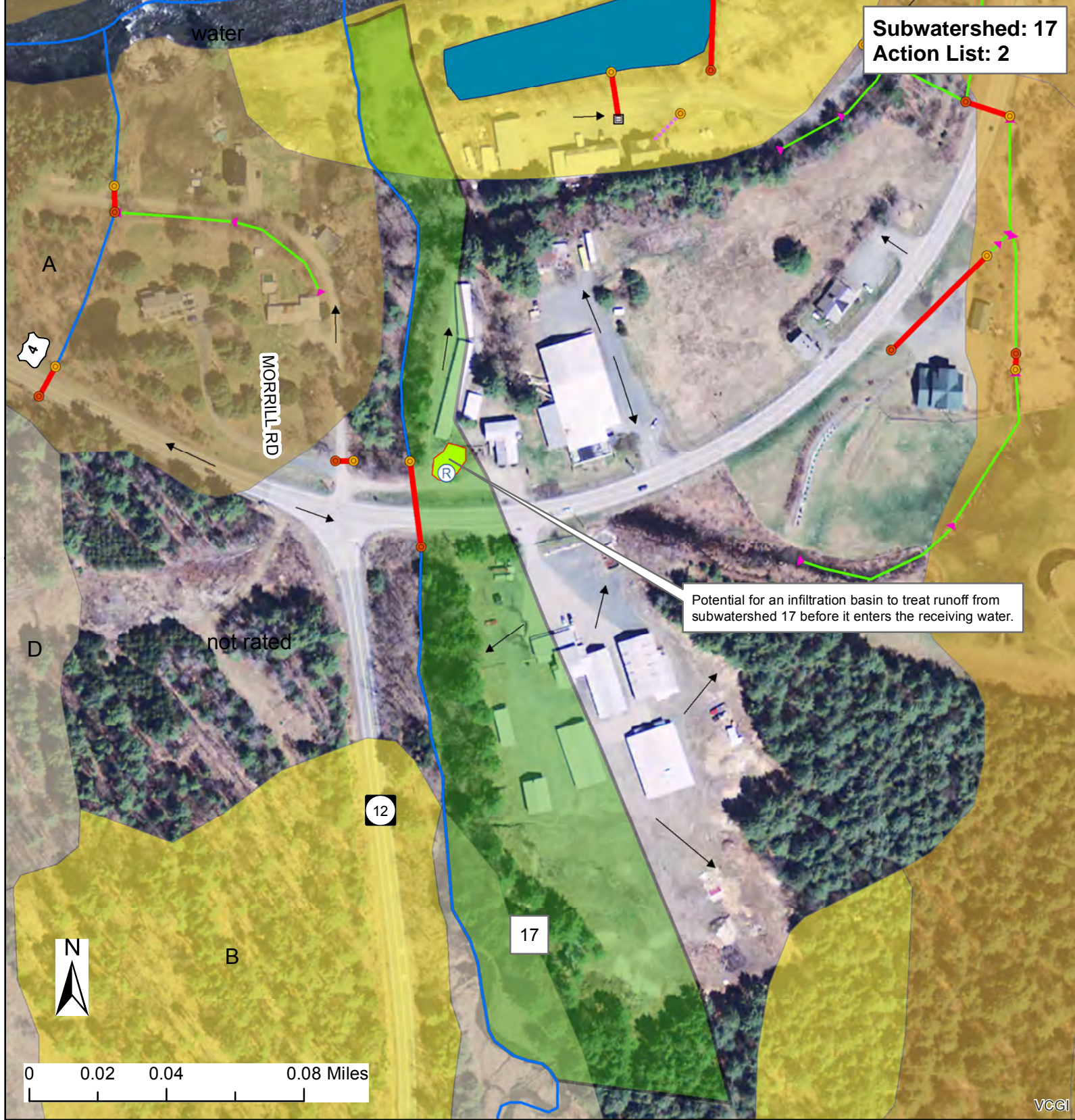
### SubwatershedID

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

Creator: Jim Pease, David Ainley  
DEC - WSMD - Ecosystem Restoration Program  
Plotted Date: 3/9/2016  
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survey  
Imagery Source: VCGI 2012, .5m



**Subwatershed: 17**  
**Action List: 2**

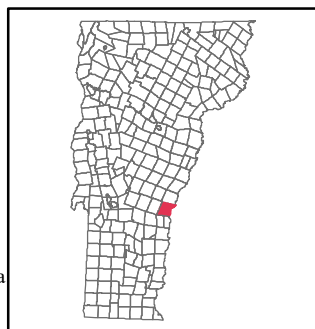


## Hartland, VT

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.

The data shown on this map is only as accurate as the available sources and field observations allowed and should be used as a basic planning level tool only.



### 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
- Pond outlet structure
- Treatment feature (see notes)
- Retrofit
- Unknown Point
- Information Point

### Stormwater line

- Storm line
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- Trench drain
- Emergency spillway
- Stream
- Overland flow

### NRCS - Soils

- A
- B
- C
- D

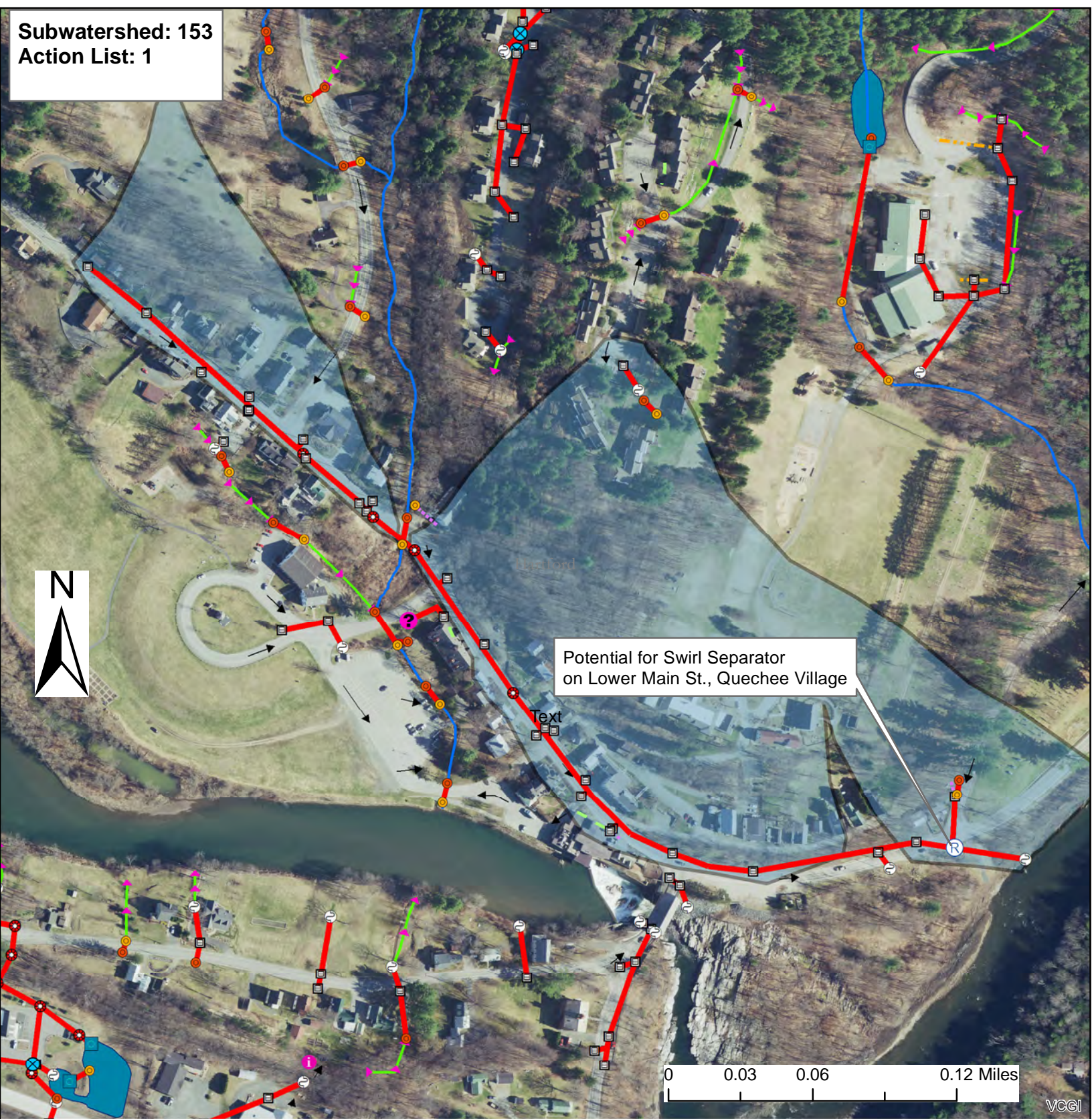
### SubwatershedID

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

Creator: Jim Pease, David Ainley  
DEC - WSMD - Ecosystem Restoration Program  
Plotted Date: 3/9/2016  
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survey  
Imagery Source: VCGI 2012, .5m



Subwatershed: 153  
Action List: 1



Potential for Swirl Separator  
on Lower Main St., Quechee Village

Text

## Lower Ottawaquechee River Hartford, 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.

The data shown on this map is only as accurate as the available sources and field observations allowed and should be used as a basic planning level tool only.

### 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
- Roof drain
- Infiltration pipe
- French drain
- Trench drain
- Emergency spillway
- Stream
- Overland flow

### SubwatershedID

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

### NRCS Soils

Creator: Jim Pease, David Ainley  
DEC - WID - Clean Water Initiative Program  
Plotted Date: 2/18/2022  
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survey  
Imagery Source: VCGI Best Available Imagery

VCGI





## Lower Ottauquechee River Hartford, 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.

The data shown on this map is only as accurate as the available sources and field observations allowed and should be used as a basic planning level tool only.

### 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
- Roof drain
- Infiltration pipe
- French drain
- Trench drain
- Emergency spillway
- Stream
- Overland flow

### SubwatershedID

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

### NRCS Soils

Creator: Jim Pease, David Ainley  
DEC - WID - Clean Water Initiative Program  
Plotted Date: 2/18/2022  
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survey  
Imagery Source: VCGI Best Available Imagery