Town of

Stowe

Stormwater Infrastructure Mapping Project

October 2009
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VTDEC – CLEAN WATER INITIATIVE PROGRAM, WATERSHED MANAGEMENT DIVISION

https://dec.vermont.gov/water-investment/cwi/solutions/developed-lands/idde

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Overview

This stormwater infrastructure mapping project was completed for the municipality by the Agency of Natural Resources Ecosystems Restoration program to supplement the existing drainage data collected by the town and with the intention of providing a tool for planning, maintenance, and inspection of the stormwater infrastructure.

The GIS maps and geodatabase are meant to provide an overall picture and understanding of the connectivity or connectedness of the storm system on both public and private properties in order to raise the awareness of the need for regular maintenance. The generation and transport of nonpoint source pollution increases with increasing connectivity of a drainage system. Having an understanding of the connectedness of the system is also a valuable tool for hazardous material spill planning and prevention. Knowledge of the extent of the system is also essential for the detection and elimination of illicit discharges. Outfall locations and system connectedness data are used as a base for locating illicit or illegal discharges of non-stormwater to the municipal storm system and tracing them up to the source. Knowledge of which areas of the sewer service area have combined stormwater and sewer systems can better assist the municipality in planning and implementing combined sewer separation projects. Knowledge of the layout and extent of the stormwater system can inform options for cleaning up existing polluted stormwater discharges. This project provides information and guidance for potential retrofit treatment locations and opportunities. Finally, by providing a more thorough understanding of the system it is the hope that this project could be the basis for a local stormwater ordinance or be used to help enhance an existing stormwater management program.

Project Summary

The principal goal of this project was to develop up to date municipal drainage maps. These drainage maps were created showing the paths that stormwater runoff travels from where it falls on impervious surfaces such as parking lots, roads, and rooftops, to the outfall points in various receiving waters. These maps show the stormwater infrastructure including features like pipes, manholes, catchbasins, and swales within a municipality. Data sources included data collected from field work, a mapping grade Trimble GPS unit, available state permit plans, record drawings, town plans, WWMD plans, existing GIS data from contractors, and the input and guidance of knowledgeable members from the municipalities.

A second goal of this project was to establish potential locations for Best Management Practice (BMP) stormwater retrofit sites. These are sites where stormwater treatment structures could be added and where they would be most cost effective and efficient for sediment and phosphorus or nitrogen removal. In order to develop a retrofit site list, drainage area subwatersheds were delineated around the drainage networks. Determining how the stormwater infrastructure was connected was necessary in determining the subwatershed drainage areas within the town.

Delineating the drainage areas was done using the stormwater infrastructure maps, along with satellite imagery, a Digital Elevation Model (DEM), and USGS topographic maps. These data sources were used to approximate where the land area within each municipality was draining to; as well as where the high points were that divided the sub-drainage areas. The completed maps show the drainage coverage for essentially the entire municipality, but with a focus on areas with greater concentrations of impervious cover.

Impervious cover layers were created by either hand digitization or by using a method of raster pixel calculation (with ArcGIS spatial analyst extension) to create a vegetation index from the National Agricultural Imagery Program (NAIP) 08 orthophotos. The area which contrasted with the vegetation represents impervious surfaces and was then modified with buffered water and roads layers to make it more accurate. A more detailed explanation of this process is available in a separate document. The impervious layer was used to calculate the percent of each delineated drainage area that would generate stormwater runoff. The percentage of impervious surface number for each subwatershed was then adjusted with a connectivity rating. A rating was assigned to each drainage area polygon describing how directly connected the impervious surfaces within that subwatershed are to the receiving water. By adjusting the percent impervious area numbers with this connectivity rating the effective impervious area (EIA) was established for each subwatershed (*Sutherland, 1995*). This effective impervious number is a more accurate description of the amount of runoff produced by each of the subwatersheds because it helps to take factors such as infiltration into account.

After the effective impervious numbers were calculated for the subwatersheds the Simple Method was used to estimate the annual sediment (TSS) and phosphorus (TP) or Nitrogen (TN) loads generated by each subwatershed. The Simple method uses information which includes the adjusted impervious value, average annual rainfall for the location, total subwatershed area, and a given pollutant concentration value to calculate an annual load for various pollutants (*Schueler,1987*). Pollutant loads estimated by the Simple Method in this project are planning level estimates and are meant to give a general idea of the amounts of sediment or nutrient wash-off produced by each subwatershed for prioritization purposes. Subwatersheds were then prioritized, using the loading calculations as well as other criteria, and given Action List numbers ranging from 1 to 4 (one being the highest priority). The Action List number depends both upon loading values and feasibility of potential retrofit treatment options. Potential retrofit options listed in the TARGET maps are based on field observations and not on actual availability of land or willingness of landowner. For Action List #4 General Permit 3-9050 will require these parcels to implement or improve their existing stormwater discharges by 2028.

Water Quality Volume (WQv – the amount of storage needed to treat stormwater from a 0.9 inch storm) and Channel Protection Volume (CPv – the volume of storage that is needed to hold and slowly release stormwater for a 2.1inch rain event) were also calculated for delineated subwatershed areas. CPv calculations are only applicable if the receiving water is not a large body of water and is therefore susceptible to channel erosion. These numbers were used in the retrofit recommendation process because the volume of water to be treated was a key factor in determining the type of retrofit.

Project References

Schueler, T. 1987. Technical Documentation of a Simple Method for Estimating Urban Storm Pollutant Export. Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs. Appendix A.

Schueler, T. et.al., 2007. Urban Stormwater Retrofit Practices, Version 1.0. Manual 3, Center for Watershed Protection, August 2007.

Sutherland, R. 1995. Methodology for Estimating the Effective Impervious Area of Urban Watersheds. Technical Note 58 – Pervious Area Management. Watershed Protection Techniques. Vol. 2, No. 1

***All data was created in an ArcGIS 10 Geodatabase format and is available from VTDEC.**

Act 64 Municipal Roads General Permit (MRGP)

The 2015 Vermont Legislature adopted Act 64 which will require all municipalities to address stormwater runoff from all hydrologically connected existing municipal roads. In January 2018 the final general permit was issued; municipalities must file a notice of intent to comply with the permit by July 31, 2018. As part of this permit all municipalities will be required, as explained below, to evaluate connected road segments with catch basin served infrastructure to determine compliance with MRGP Standards by December 31, 2020 as part of their road erosion inventory. The permit will require:

- Municipalities to develop road stormwater management plans. These plans will include a comprehensive (1) Road Erosion Inventory (REI) of hydrologically-connected road segments and (2) an Implementation Table.
- The inventory will include an evaluation of municipal hydrologically-connected road segments to determine if they meet the MRGP standards.
- Those road segments that do not currently meet MRGP standards and that can impact waterways will be prioritized for remediation within the Implementation Table. DEC has developed an Implementation Table-Portal for this purpose.

Municipalities will submit annual reports to DEC due on April 1st starting in 2019. The Annual Reports will document progress in upgrading roads to meet MRGP standards. Municipalities will be able to use the spread sheet, mentioned above, for annual compliance reporting requirements. This report and the mapping information contained in it can be used by municipalities to develop the plan for the paved road segments with catchbasins that are hydrologically directly connected. The map(s) and data provided with this report indicate where these road segments outfalls are located using the best available mapping information DEC has to date. The MRGP standard for paved roads with catch basins is that any outfalls that are eroded will have to be stabilized with practices such as stone aprons, culvert headwalls, and stone-lined ditches. As with other classes of roads covered by this permit the municipality should first check the maps provided. DEC suggests municipalities take the following steps to check the maps and/or data provided to determine what outfalls will require municipal attention for erosion repair:

1. Using the provided maps and/or data as a guide confirm that the road draining to this outfall is paved, and the discharge pipe from the catchbasin(s) is directly discharging to waters of the state. Include any outfall from these road segments that discharges within 500 linear feet of surface waters.

2. Using the maps locate the outfall and note any level of erosion present in the outfall and/or in the 500 foot or less long swale between the pipe outlet and waters of the state.

3. Prepare a list of all outfalls with notes pertaining to the erosion using the Guidance and Field Sheet or the i-phone application.

   Inventory Guidance:
   http://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/Permitinformation/MunicipalRoads/sw_MRGP_PavedRoadsWithCathBasins_REI-Supplement.pdf
   Field Sheet (use form C only):
   http://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/Permitinformation/MunicipalRoads/sw_MRGP_RoadErosionInventory.pdf

   I-phone Application:

   http://vtanr.maps.arcgis.com/home/item.html?id=fe11c5ffd0d04eeca968115d84dacf90
   Please contact Jim Ryan at Jim.Ryan@vermont.gov for user ID and password

Main Lake and Winooski River Nonpoint Phosphorus Overview

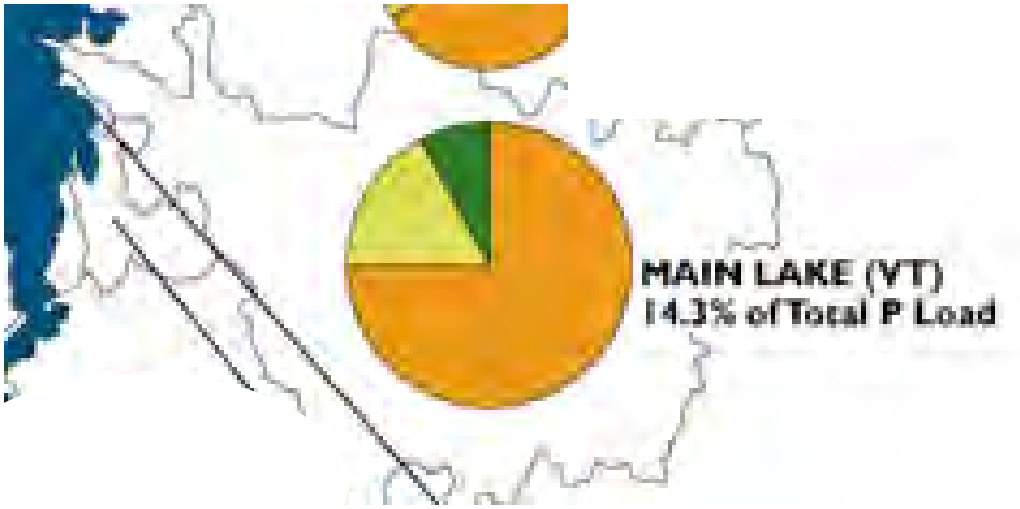
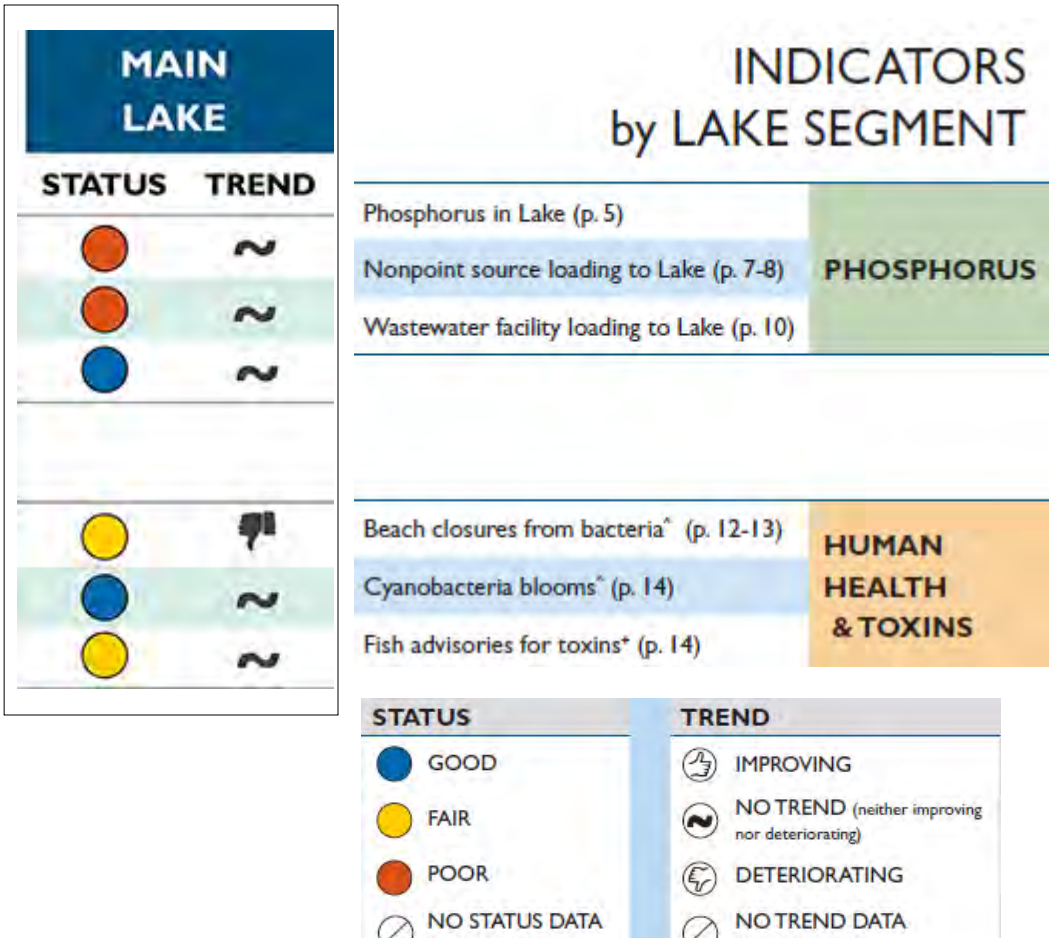


Figure shows the breakdown of contributions from developed, agricultural and forested land sources in the Main Lake-Winooski River Watershed to Total Phosphorus loading of the Main Lake, VT side.



* Figures taken from Lake Champlain Basin Program – *State of the Lake and Ecosystem Indicators Report (2018).* http://sol.lcbp.org/

Subwatershed Data

Tables showing calculations and Priority drainage area retrofit possibilities

This is a key showing the abbreviations of the different stormwater treatment structures or practices listed in the calculation sheets.

Abbreviation Key	
Code	**Structure Type**
BB	Baffle Box
BFCB	Baffled Catchbasin
BR	Bioretention Area (aka Bioretention Filter)
BS	Buffer Strip (25' Min.)
CB	Catch Basin
CBI	Catch Basin Insert
CD	Check Dam
DG	Detention Gallery
DI	Drop Inlet
DP	Dry Pond
DS	Dry Swale
DW	Drywell
EDPMP	Extended Detention Pond with Micropool (aka Micropool Extended Detention Basin)
GS	Grass Swale (aka Open Channel)
IB	Infiltration Basin
IG	Infiltration Gallery
IP	Infiltration Pipe
OF	Overland Flow
OGF	Organic Filter
POP	Pocket Pond
PP	Perforated Pipe
RDD	Roof Drain Disconnect
RR	Rock Riprap
RS	Riprap Swale
SB	Sediment Basin
SF	Sand Filter (aka Surface Sand Filter)
SS-SF	Swirl Separator – Sand Filter
ST	Septic Tank
SWPPP	Stormwater Pollution Prevention Plan
TT	Treatment Tank
WL	Wetland (Constructed)
WP	Wet Pond (Retention)
WS	Wet Swale

		Action List	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Effective Impervious Area	Sediment Load with Current Reductions (lbs)	Priority Action Sediment Reduction Credit	Sediment Load with Priority Action (lbs)	Phosphorus Load with Current Reductions (lbs)	Priority Action Phosphorus Reduction Credit	Phosphorus Load with Priority Action (lbs)	Water Quality Volume (ft3)	Channel Protection Volume (ft3)	Estimated Basin Construction Cost	Estimated Other BMP Construction Cost	Cost of Sediment Removal Per Pound (based on annual sediment load)	Cost of Phosphorus Removal Per Pound (based on annual phosphorus load)	Assistance Program
1	Stowe	4	CB		3.84	53.7	2704		2704	7.51		7.51	6701	12173					CWIP, SRF, LCBP
2	Stowe		OF	3036-9010	2.38	20.2	654		654	1.92		1.92	1801	4433					CWIP, SRF, LCBP
3	Stowe		OF	3036-9010	2.52	21.6	731		731	2.14	5%	2.04	2013	4890					CWIP, SRF, LCBP
4	Stowe	4	CB	3365-9010	0.84	19.6	227		227	0.66		0.66	624	1544					CWIP, SRF, LCBP
5	Stowe	4	GS		0.53	72.3	487		487	1.35		1.35	1206	2033					CWIP, SRF, LCBP
6	Stowe	4	GS		0.84	14.3	197		197	0.55		0.55	488	1096					CWIP, SRF, LCBP
7	Stowe	4	EDMP	3365-9010	2.36	51.1	317		317	2.20		2.20	3931	6437					CWIP, SRF, LCBP
8	Stowe		CB		0.28	72.0	257		257	0.71		0.71	638	1015					CWIP, SRF, LCBP
9	Stowe	1 Swirl Separator inline in Inn parking lot	VS/CB		13.17	61.3	10455	80%	6273	29.04	5%	27.59	25910	38717		$50,000	$12	$34,434	CWIP, SRF, LCBP
10	Stowe		GS/CB		0.15	28.7	60		60	0.17		0.17	149	309					CWIP, SRF, LCBP
11	Stowe	2 Infiltration or Bioretention at Maple St Park	IB/CB		10.56	32.9	4813	90%	481	13.37	90%	1.34	11927	19935					CWIP, SRF, LCBP
12	Stowe		CB		1.41	64.0	1165		1165	3.24		3.24	2887	4645					CWIP, SRF, LCBP
13	Stowe		CB		3.25	19.9	984		984	2.73		2.73	2440	5322					CWIP, SRF, LCBP
14	Stowe		OF		0.32	85.6	350		350	0.97		0.97	867	1327					CWIP, SRF, LCBP
15	Stowe		CB		0.42	30.8	181		181	0.50		0.50	448	749					CWIP, SRF, LCBP
16	Stowe		CB		0.13	74.0	125		125	0.35		0.35	309	491					CWIP, SRF, LCBP
17	Stowe		CB		1.03	63.5	843		843	2.34		2.34	2089	3364					CWIP, SRF, LCBP
18	Stowe		CB		0.59	56.8	434		434	1.20		1.20	1075	1747					CWIP, SRF, LCBP
19	Stowe		CB		1.92	56.9	1424		1424	3.96		3.96	3530	5735					CWIP, SRF, LCBP
20	Stowe	Swirl separator and dry wells for roofs, 1,4 (Combine with 21,108)	VS/CB		0.51	83.5	538	80%	323	1.49	25%	1.12	1332	2090		$75,000	$1,524	$200,869	CWIP, SRF, LCBP
21	Stowe	1 (Combine with 20,108)	VS/DW/CB		0.14	85.7	151	80%	91	0.42	25%	0.31	374	585					CWIP, SRF, LCBP

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22	Stowe		CB		0.47	79.6	477		477	1.32		1.32	1182	1863					CWIP, SRF, LCBP
23	Stowe		CB		0.60	70.0	538		538	1.49		1.49	1333	2127					CWIP, SRF, LCBP
24	Stowe		CB		7.50	21.6	2418		2418	6.72		6.72	5992	9989					CWIP, SRF, LCBP
25	Stowe		CB		0.92	77.6	908		908	2.52		2.52	2249	3554					CWIP, SRF, LCBP
26	Stowe		CB		1.53	53.7	1073		1073	2.98		2.98	2660	4832					CWIP, SRF, LCBP
27	Stowe		CB		4.08	61.6	3247		3247	9.02		9.02	8046	12988					CWIP, SRF, LCBP
28	Stowe		GS		0.27	34.6	131		131	0.36		0.36	324	647					CWIP, SRF, LCBP
29	Stowe		OF		3.19	29.6	1332		1332	3.70		3.70	3300	6795					CWIP, SRF, LCBP
30	Stowe		CB		1.05	39.6	560	10%	504	1.56		1.56	1389	2704					CWIP, SRF, LCBP
31	Stowe		CB		0.28	64.2	235		235	0.65		0.65	582	1012					CWIP, SRF, LCBP
32	Stowe	1 Gravel Wetland (Combine with 119)	GW/CB/RS/POP	3714-9010	7.87	53.0	3283	80%	657	12.16	20%	9.73	13559	25901	$102,369		$911	$42,100	CWIP, SRF, LCBP
33	Stowe	2 Combine with 43	IB or BRA		3.08	9.3	543	80%	109	1.51	40%	0.90	1346	3030					CWIP, SRF, LCBP
34	Stowe		CB		1.82	40.9	1001		1001	2.78		2.78	2481	4796					CWIP, SRF, LCBP
35	Stowe		CB		0.64	40.1	346		346	0.96		0.96	857	1664					CWIP, SRF, LCBP
36	Stowe		CB		2.72	45.7	1658		1658	4.60		4.60	4108	6775					CWIP, SRF, LCBP
37	Stowe		CB		0.07	79.1	67		67	0.19		0.19	165	260					CWIP, SRF, LCBP
38	Stowe		CB		0.01	94.8	16		16	0.04		0.04	40	61					CWIP, SRF, LCBP
39	Stowe		CB		1.66	60.8	1304		1304	3.62		3.62	3231	5220					CWIP, SRF, LCBP
40	Stowe		CB		0.16	78.0	159		159	0.44		0.44	394	623					CWIP, SRF, LCBP
41	Stowe		OF		0.52	97.3	630		630	1.75		1.75	1562	2409					CWIP, SRF, LCBP
42	Stowe		OF		0.67	64.5	555		555	1.54		1.54	1377	2391					CWIP, SRF, LCBP

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43	Stowe	2 Combine with 33	IB or BRA		1.88	36.0	926	80%	185	2.57	40%	1.54	2295	4554					CWIP, SRF, LCBP
44	Stowe	2 Combine with 77,78,79	IB	3247-9010	3.77	10.9	441	40%	264	1.63	20%	1.31	1820	4113					CWIP, SRF, LCBP
45	Stowe	4	SF	3445-9010	2.72	13.8	94		94	1.04		1.04	1552	4850					CWIP, SRF, LCBP
46	Stowe	4	CB	3445-9010	1.54	51.7	1046		1046	2.90		2.90	2591	4239					CWIP, SRF, LCBP
47	Stowe		CB		2.12	35.7	1036		1036	2.88		2.88	2566	5102					CWIP, SRF, LCBP
48	Stowe		CB		1.92	73.9	1807		1807	5.02		5.02	4478	7508					CWIP, SRF, LCBP
49	Stowe	4	SF	3445-9010	1.81	37.7	140		140	1.03		1.03	2306	5333					CWIP, SRF, LCBP
50	Stowe	4	OF		0.94	60.3	732		732	2.03		2.03	1813	3202					CWIP, SRF, LCBP
51	Stowe	4	OF		2.27	39.3	1205		1205	3.35		3.35	2987	5823					CWIP, SRF, LCBP
52	Stowe		OF		2.91	27.7	1146		1146	3.18		3.18	2839	5913					CWIP, SRF, LCBP
53	Stowe		DW		0.42	20.3	130		130	0.36		0.36	322	791					CWIP, SRF, LCBP
54	Stowe		GS		1.47	61.1	1162		1162	3.23		3.23	2879	5068					CWIP, SRF, LCBP
55	Stowe	4	DW		0.44	31.6	196		196	0.54		0.54	485	1077					CWIP, SRF, LCBP
56	Stowe	4	DW		0.52	47.3	325		325	0.90		0.90	805	1594					CWIP, SRF, LCBP
57	Stowe	4	OF		1.05	64.7	879		879	2.44		2.44	2179	3781					CWIP, SRF, LCBP
58	Stowe	4	WP	4225-9015	3.91	1.7	67		67	0.46		0.46	828	2407					CWIP, SRF, LCBP
59	Stowe	4	DW		0.45	67.9	394		394	1.10		1.10	978	1723					CWIP, SRF, LCBP
60	Stowe	4	OF		1.86	53.7	1305		1305	3.62		3.62	3234	5875					CWIP, SRF, LCBP
61	Stowe	4	GS		0.84	49.5	549		549	1.52		1.52	1360	2518					CWIP, SRF, LCBP
62	Stowe		GS		1.17	51.8	799		799	2.22		2.22	1979	3628					CWIP, SRF, LCBP
63	Stowe		DW		1.03	24.0	360		360	1.00		1.00	893	1902					CWIP, SRF, LCBP

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64	Stowe		DW		1.00	34.7	476		476	1.32		1.32	1180	2556					CWIP, SRF, LCBP
65	Stowe		DW		0.29	22.8	97		97	0.27		0.27	241	578					CWIP, SRF, LCBP
66	Stowe		DW		0.20	54.8	142		142	0.39		0.39	352	665					CWIP, SRF, LCBP
67	Stowe		DW		0.38	41.5	210		210	0.58		0.58	519	1070					CWIP, SRF, LCBP
68	Stowe		DW		0.44	20.8	138		138	0.38		0.38	343	839					CWIP, SRF, LCBP
69	Stowe		DW		0.76	26.3	286		286	0.80		0.80	710	1650					CWIP, SRF, LCBP
70	Stowe		DW		0.34	20.3	104		104	0.29		0.29	258	636					CWIP, SRF, LCBP
71	Stowe		DW		0.45	9.9	82		82	0.23		0.23	204	550					CWIP, SRF, LCBP
72	Stowe		OF		3.72	37.8	1914		1914	5.32		5.32	4743	9321					CWIP, SRF, LCBP
73	Stowe		OF		7.39	0.0	487		487	1.35		1.35	1208	2					CWIP, SRF, LCBP
74	Stowe		OF		2.11	51.8	1437		1437	3.99		3.99	3562	6527					CWIP, SRF, LCBP
75	Stowe		DW		1.29	10.0	238		238	0.66		0.66	591	1592					CWIP, SRF, LCBP
76	Stowe		OF		4.86	31.6	2140		2140	5.94		5.94	5304	10794					CWIP, SRF, LCBP
77	Stowe	2 (Combine with 44,78,79)	IB/OF		0.74	65.0	624	80%	125	1.73	40%	1.04	1546	2679					CWIP, SRF, LCBP
78	Stowe	2 (Combine with 44,77,79	IB/CB		1.50	45.5	911	80%	182	2.53	40%	1.52	2257	3723					CWIP, SRF, LCBP
79	Stowe	2 (Combine with 44,77,78)	IB/CB		2.93	45.7	1780	80%	356	4.94	40%	2.97	4411	7275					CWIP, SRF, LCBP
80	Stowe		GS		1.49	32.5	672		672	1.87		1.87	1666	3373					CWIP, SRF, LCBP
81	Stowe		OF/CB		2.18	31.2	953		953	2.65		2.65	2362	4817					CWIP, SRF, LCBP
82	Stowe	1 Bioretention at Swimming Hole	IB/DW/POP/CB/GS		15.11	21.1	4775	80%	955	13.26	40%	7.96	11834	25645	$248,520		$65	$46,840	CWIP, SRF, LCBP
83	Stowe		WP		1.36	16.9	363		363	1.01		1.01	899	2288					CWIP, SRF, LCBP
84	Stowe		CB		4.48	26.0	1679		1679	4.66		4.66	4160	8751					CWIP, SRF, LCBP

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85	Stowe		WP		1.31	62.6	1058		1058	2.94		2.94	2621	4744					CWIP, SRF, LCBP
86	Stowe		CB		0.15	2.4	14		14	0.04		0.04	36	61					CWIP, SRF, LCBP
87	Stowe		CB		0.82	63.2	668		668	1.86		1.86	1656	2668					CWIP, SRF, LCBP
88	Stowe		CB		0.26	55.9	189		189	0.52		0.52	468	842					CWIP, SRF, LCBP
89	Stowe		GS		0.41	99.4	517		517	1.44		1.44	1280	1980					CWIP, SRF, LCBP
90	Stowe		OF		1.78	52.6	1231		1231	3.42		3.42	3052	5572					CWIP, SRF, LCBP
91	Stowe	4	CB	3365-9010	0.16	51.7	97		97	0.28		0.28	267	490					CWIP, SRF, LCBP
92	Stowe	4	CB	3365-9010	0.16	70.8	129		129	0.38		0.38	354	601					CWIP, SRF, LCBP
93	Stowe		OF/GS		0.66	46.4	404		404	1.12		1.12	1002	1885					CWIP, SRF, LCBP
94	Stowe		OF		3.24	45.7	1970		1970	5.47		5.47	4883	9213					CWIP, SRF, LCBP
95	Stowe		CF	5456-9015	4.83	24.4	344		344	2.86		2.86	4257	10072					CWIP, SRF, LCBP
96	Stowe		CB		2.08	20.7	648		648	1.80		1.80	1607	3490					CWIP, SRF, LCBP
97	Stowe		CB		0.76	74.0	721		721	2.00		2.00	1786	2836					CWIP, SRF, LCBP
98	Stowe		CB		0.67	64.9	560		560	1.56		1.56	1389	2408					CWIP, SRF, LCBP
99	Stowe		OF		2.41	29.0	987		987	2.74		2.74	2446	5053					CWIP, SRF, LCBP
100	Stowe		OF		0.34	31.9	149		149	0.41		0.41	369	750		10000			CWIP, SRF, LCBP
101	Stowe		OF		0.18	80.0	184		184	0.51		0.51	457	720		10000			CWIP, SRF, LCBP
102	Stowe		GS		0.16	50.3	109		109	0.30		0.30	270	499					CWIP, SRF, LCBP
103	Stowe		OF		0.87	15.3	215		215	0.60		0.60	534	1193		10000			CWIP, SRF, LCBP
104	Stowe		GS		1.22	17.2	330		330	0.92		0.92	817	1809		10000			CWIP, SRF, LCBP
105	Stowe		OF		1.87	42.8	1071		1071	2.98		2.98	2654	5080					CWIP, SRF, LCBP

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106	Stowe	4	EDMP	3365-9015	3.63	9.1	126		126	0.87		0.87	1560	5235					CWIP, SRF, LCBP
107	Stowe	1,4	DW/GSI/GS	5682-INDS	5.38	34.9	1547	50%	774	5.73	70%	1.72	6391	12764					CWIP, SRF, LCBP
108	Stowe	1,4 (Combine with 20,21)	SB/ST		1.34	71.7	1224	80%	735	3.40	25%	2.55	3034	4832					CWIP, SRF, LCBP
109	Stowe		OF		1.34	33.6	622		622	1.73		1.73	1541	3099					CWIP, SRF, LCBP
110	Stowe		CB		0.98	89.9	1105		1105	3.07		3.07	2738	4202	$32,852				CWIP, SRF, LCBP
111	Stowe		CB		0.19	85.2	207		207	0.57		0.57	512	783					CWIP, SRF, LCBP
112	Stowe		GS		0.69	38.1	359		359	1.00		1.00	891	1748					CWIP, SRF, LCBP
113	Stowe		GS		0.57	11.7	115		115	0.32		0.32	286	450					CWIP, SRF, LCBP
114	Stowe		DW		0.12	28.3	49		49	0.14		0.14	122	278					CWIP, SRF, LCBP
115	Stowe		OF		2.53	22.9	851		851	2.36		2.36	2109	4522					CWIP, SRF, LCBP
116	Stowe		OF		2.61	23.4	897		897	2.49		2.49	2223	4749					CWIP, SRF, LCBP
117	Stowe		OF		2.84	12.5	609		609	1.69		1.69	1510	3407					CWIP, SRF, LCBP
118	Stowe		OF		10.37	13.6	2352		2352	6.53		6.53	5829	13115					CWIP, SRF, LCBP
119	Stowe	1 (Combine with 32)	EDMP-IB/CB		2.98	25.3	1090	80%	218	3.03	40%	1.82	2701	5709					CWIP, SRF, LCBP
120	Stowe		OF		1.47	14.1	343		343	0.95		0.95	850	1909	$8,911				CWIP, SRF, LCBP
121	Stowe	4	EDMP	3365-9015	3.92	2.9	79		79	0.55		0.55	977	3209					CWIP, SRF, LCBP
122	Stowe	4	CB/EDP/GS/OF/SF	3929-9015.A1, WQRP	900.28	0.0	35873		35873	132.86		132.86	147352	5645					CWIP, SRF, LCBP
123	Stowe	4	CB/EDP/GS	3929-9010.R, WQRP	2.03	33.7	190		190	1.58		1.58	2343	18545					CWIP, SRF, LCBP
124	Stowe	4	OF	WQRP	379.42	0.1	25614		25614	71.15		71.15	63127	22973					CWIP, SRF, LCBP
125	Stowe	4	OF		514.16	0.1	34631		34631	96.20		96.20	85349	38179					CWIP, SRF, LCBP
126	Stowe	4	OF/GS/CB/EDP	3929-9010.R, WQRP	204.84	0.2	8368		8368	30.99		30.99	34373	17061					CWIP, SRF, LCBP

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127	Stowe	4	OF/GS/CB/EDP	3929-9010.R, WQRP	66.25	0.3	2772		2772	10.26		10.26	11384	2747					CWIP, SRF, LCBP
128	Stowe	4	CB/SF/CR/WP	3929-9015.A1	3.76	2.3	71		71	0.59		0.59	871	2284					CWIP, SRF, LCBP
129	Stowe	4	CB/SF/CR/WP	3929-9015.A1	1.97	5.9	54		54	0.45		0.45	661	318					CWIP, SRF, LCBP
130	Stowe	4	CB/GS	3929-9015.A1	0.22	8.7	38		38	0.11		0.11	94	119352					CWIP, SRF, LCBP
131	Stowe	4	CB/GS/BRA/VS/WP	3929-9015.2	81.75	9.3	2895		2895	24.12		24.12	35669	6609					CWIP, SRF, LCBP
131A	Stowe	4 Extended Detention Micropool at Little Spruce ski slope culvert inlet to control downstream erosion	EDPMP/OF		28.89	0.2	1993	80%	399	5.54	40%	3.32	4912	31809		$34,384	$22	$15,527	SRF
132	Stowe	4	CB/WP	3929-9010.R	15.91	17.4	872		872	7.27		7.27	10743	10012					CWIP, SRF, LCBP
133	Stowe	4	CB/WP	WQRP	9.84	7.2	1499		1499	4.16		4.16	3694	1144					CWIP, SRF, LCBP
134	Stowe	4	OF		2.78	2.5	268		268	0.74		0.74	660	1290					CWIP, SRF, LCBP
135	Stowe	4	OF		1.14	11.4	232		232	0.64		0.64	571	0					CWIP, SRF, LCBP
136	Stowe		OF		3.11	12.5	669		669	1.86		1.86	1649	11699					CWIP, SRF, LCBP
137	Stowe		2WP/OF		34.85	1.9	3081		3081	8.56		8.56	7593	1708					CWIP, SRF, LCBP
138	Stowe		GS/CR	6512-9015	1.62	7.7	51		51	0.43		0.43	630	0					CWIP, SRF, LCBP
139	Stowe		CB/GS		1.21	0.0	80		80	0.22		0.22	198	0					CWIP, SRF, LCBP
140	Stowe		EDP/OF/CB		1.05	49.1	138		138	1.15		1.15	1696	0					CWIP, SRF, LCBP
141	Stowe		CB/OF		16.50	2.2	1531		1531	4.25		4.25	3774	0					CWIP, SRF, LCBP
142	Stowe		CB/OF		7.22	1.3	592		592	1.64		1.64	1458	0					CWIP, SRF, LCBP
143	Stowe		OF		3.56	41.2	1984		1984	5.51		5.51	4890	0					CWIP, SRF, LCBP
144	Stowe		GS/OF		46.97	0.8	3555		3555	9.87		9.87	8761	13025					CWIP, SRF, LCBP
145	Stowe		GS/OF		59.45	1.0	4634		4634	12.87		12.87	11421	25885					CWIP, SRF, LCBP

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146	Stowe		GS/OF		57.56	2.9	5789		5789	16.08		16.08	14268	5585					CWIP, SRF, LCBP
147	Stowe	1 Bioretention with underdrain in field	BRA/CB/GS	3500-9010.RA1	6.79	5.0	857	80%	171	2.38	40%	1.43	2112	2090	$11,151		$16	$11,712	CWIP, SRF, LCBP
148	Stowe		CB/GS	3500-9010.RA1	0.70	44.7	295		295	0.99		0.99	1038	1180					CWIP, SRF, LCBP
149	Stowe		CB/GS	3500-9010.RA1	0.89	11.4	125		125	0.42		0.42	441	611					CWIP, SRF, LCBP
150	Stowe		GS	3500-9010.RA1	0.13	96.2	111		111	0.37		0.37	391	3677					CWIP, SRF, LCBP
151	Stowe		GS	3500-9010.RA1	1.02	62.4	576		576	1.94		1.94	2029	7069					CWIP, SRF, LCBP
152	Stowe	1 Bioretention with underdrain in field	BRA/CB/GS/BRA	3500-9010.RA1, 3894-9010	8.69	4.9	544	30%	380	2.42	20%	1.93	2679	4198	$14,147		$87	$13,013	CWIP, SRF, LCBP
153	Stowe		CB/WP		2.62	11.2	366		366	1.23		1.23	1289	8025					CWIP, SRF, LCBP
154	Stowe		CB/GS		5.61	16.3	1464		1464	4.07		4.07	3607	1687					CWIP, SRF, LCBP
155	Stowe		GS		9.05	0.8	683		683	1.90		1.90	1682	7518					CWIP, SRF, LCBP
156	Stowe		CB/GS		5.75	14.2	1359		1359	3.77		3.77	3349	2888					CWIP, SRF, LCBP
157	Stowe		CB/GS		4.21	5.4	551		551	1.53		1.53	1358	2258					CWIP, SRF, LCBP
158	Stowe		CB/GS		3.53	4.9	439		439	1.22		1.22	1083	1270					CWIP, SRF, LCBP
159	Stowe		CB		0.33	81.0	338		338	0.94		0.94	833	32808					CWIP, SRF, LCBP
160	Stowe	4	CB/GS/EDMP	5349-9010.A	54.74	1.6	930		930	7.75		7.75	11461	8119					CWIP, SRF, LCBP
161	Stowe	4	CB/GS/EDMP	5349-9010.A	22.41	0.6	328		328	2.73		2.73	4038	10803					CWIP, SRF, LCBP
162	Stowe		GS/CB/IG/WP	6312-9015.1	6.04	13.9	281		281	2.34		2.34	3460	2892					CWIP, SRF, LCBP
163	Stowe		GS/CB/IG/WP	6312-9015.1	2.01	9.0	70		70	0.58		0.58	861	2376					CWIP, SRF, LCBP
164	Stowe		GS/CB/IG/WP	6312-9015.1	0.78	40.5	86		86	0.71		0.71	1056	4759					CWIP, SRF, LCBP
165	Stowe	1 Bioretention with underdrain in field	BRA/CB/GS		4.43	16.7	1177	80%	235	3.27	40%	1.96	2900	12056	$15,310		$16	$11,712	CWIP, SRF, LCBP
166	Stowe	1 Modify outlet of pond to meet requirements	MOD/CB/WP		3.53	71.2	2265	50%	1133	7.64	25%	5.73	7975	5504	$42,108		$37	$12,923	CWIP, SRF, LCBP

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167	Stowe	4	GS/OF		2.34	34.4	1115		1115	3.10		3.10	2749	1235					CWIP, SRF, LCBP
168	Stowe	4	CB/GS		0.67	31.7	300		300	0.83		0.83	738	2708					CWIP, SRF, LCBP
169	Stowe		CB/GS		1.70	19.1	501		501	1.39		1.39	1235	2685					CWIP, SRF, LCBP
170	Stowe	1 Bioretention with underdrain in field	BRA/CB/GS		5.75	3.0	590	40%	354	1.64	20%	1.31	1454	789	$3,839		$16	$11,712	CWIP, SRF, LCBP
171	Stowe		CB/GS		1.35	4.2	158		158	0.44		0.44	390	9124					CWIP, SRF, LCBP
172	Stowe	4	CB/GS/WP		34.74	0.7	1821		1821	6.14		6.14	6412	411					CWIP, SRF, LCBP
173	Stowe	4	GS		0.97	2.6	95		95	0.26		0.26	234	5551					CWIP, SRF, LCBP
174	Stowe	4	CB/GS/WP		6.15	8.2	705		705	2.38		2.38	2483	568					CWIP, SRF, LCBP
175	Stowe	4	CB/GS/WP		1.33	1.7	80		80	0.27		0.27	281	1162					CWIP, SRF, LCBP
176	Stowe	4	CB/GS/WP		1.03	8.6	122		122	0.41		0.41	429	1426					CWIP, SRF, LCBP
177	Stowe	4	GS/WP		1.07	11.4	152		152	0.51		0.51	534	2735					CWIP, SRF, LCBP
178	Stowe	4	OF/WP		3.13	7.8	349		349	1.18		1.18	1228	4291					CWIP, SRF, LCBP
179	Stowe	4	OF		4.67	8.4	777		777	2.16		2.16	1916	5100					CWIP, SRF, LCBP
180	Stowe		OF		55.59	0.3	3860		3860	10.72		10.72	9513	0					CWIP, SRF, LCBP
181	Stowe		OF		0.82	14.8	199		199	0.55		0.55	490	0					CWIP, SRF, LCBP
182	Stowe		OF		8.29	2.6	808		808	2.24		2.24	1992	146931					CWIP, SRF, LCBP
183	Stowe	4	GS/OF		878.02	0.7	65032		65032	180.64		180.64	160275	7306					CWIP, SRF, LCBP
184	Stowe		GS/OF		22.60	0.0	1498		1498	4.16		4.16	3692	8629					CWIP, SRF, LCBP
185	Stowe		CB/OF		10.51	7.1	1586		1586	4.41		4.41	3909	20142					CWIP, SRF, LCBP
186	Stowe	4	GS/OF/CB/CR	7759-9015	111.54	0.4	1580		1580	13.17		13.17	19472	0					CWIP, SRF, LCBP
187	Stowe	4	OF		14.47	0.6	1067		1067	2.96		2.96	2630	15208					CWIP, SRF, LCBP

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188	Stowe	4	GS/WP	3463-9015.T	16.97	3.5	367		367	3.06		3.06	4518	1442					CWIP, SRF, LCBP
189	Stowe	4	GS/WP	3463-9015.T	2.28	1.7	40		40	0.33		0.33	489	1256					CWIP, SRF, LCBP
190	Stowe	4	GS	3463-9015.T	3.43	0.6	50		50	0.42		0.42	619	17206					CWIP, SRF, LCBP
191	Stowe	4	GS/WP	3463-9015.T	14.61	6.0	404		404	3.37		3.37	4982	4445					CWIP, SRF, LCBP
192	Stowe	4	GS	3463-9015.T	7.48	1.5	127		127	1.05		1.05	1560	17951					CWIP, SRF, LCBP
193	Stowe	4	GS	3463-9015.T	67.01	0.3	938		938	7.82		7.82	11562	4580					CWIP, SRF, LCBP
194	Stowe	4	GS/WP	3463-9015.T	17.75	0.3	248		248	2.06		2.06	3051	4399					CWIP, SRF, LCBP
195	Stowe	4	GS/CR	3463-9050	18.39	0.2	255		255	2.12		2.12	3138	14209					CWIP, SRF, LCBP
196	Stowe		OF		25.75	3.9	2907		2907	8.08		8.08	7165	0					CWIP, SRF, LCBP
197	Stowe		CB		2.40	52.1	1654		1654	4.59		4.59	4076	0					CWIP, SRF, LCBP
198	Stowe		2WP/IB/CB/GS		16.81	2.3	316		316	4.38	40%	2.63	3889	0					CWIP, SRF, LCBP
199	Stowe	4	BRA/GS/SWPPP	7242-9015	17.57	9.2	618		618	5.15		5.15	7618	0					CWIP, SRF, LCBP
200	Stowe		OF		25.48	8.8	4367		4367	12.13		12.13	10762	0					CWIP, SRF, LCBP
201	Stowe		CB/GS/OF		4.83	17.0	1300		1300	3.61		3.61	3204	0					CWIP, SRF, LCBP
202	Stowe		CB/GS/OF		16.95	12.8	3705		3705	10.29		10.29	9131	0					CWIP, SRF, LCBP
203	Stowe		GS		1.45	17.9	407		407	1.13		1.13	1002	0					CWIP, SRF, LCBP
204	Stowe		OF		0.62	84.3	666		666	1.85		1.85	1640	14347					CWIP, SRF, LCBP
205	Stowe		GS		46.32	1.6	3978		3978	11.05		11.05	9804	6880					CWIP, SRF, LCBP
206	Stowe		WP/GS/CB	4155-9015	3.22	19.9	196		196	1.63		1.63	2410	41773					CWIP, SRF, LCBP
207	Stowe	4	GS/OF		409.98	0.3	28690		28690	79.69		79.69	70708	36768					CWIP, SRF, LCBP
208	Stowe		GS/WP/OF		81.01	1.8	4995		4995	16.85		16.85	17587	0					CWIP, SRF, LCBP

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209	Stowe		OF		0.85	56.3	626		626	1.74		1.74	1543	2351					CWIP, SRF, LCBP
210	Stowe		IB/CB	Act 250	1.90	6.6	55		55	0.46		0.46	683	1859					CWIP, SRF, LCBP
211	Stowe		CB/IB(2)	Act 250	2.69	2.1	49		49	0.41		0.41	604	0					CWIP, SRF, LCBP
212	Stowe		GS/CB		3.77	20.1	1153		1153	3.20		3.20	2842	0					CWIP, SRF, LCBP
213	Stowe		CB		2.16	11.3	436		436	1.21		1.21	1074	0					CWIP, SRF, LCBP
214	Stowe		CB/GS		3.49	14.0	816		816	2.27		2.27	2010	0					CWIP, SRF, LCBP
215	Stowe		PP/GS/OF	7524-INDS	63.94	0.0	850		850	11.80	40%	7.08	10474	0					CWIP, SRF, LCBP
216	Stowe		PP/GS/OF	7524-INDS	13.51	0.4	192		192	2.67	40%	1.60	2371	0					CWIP, SRF, LCBP
217	Stowe	4	EDP/OF/CB	4311-9010	5.35	8.6	181		181	2.52	40%	1.51	2232	0					CWIP, SRF, LCBP
218	Stowe	4	CB/WP/GS	4311-9010	29.58	11.7	1220		1220	16.95	40%	10.17	15039	0					CWIP, SRF, LCBP
219	Stowe		GS/WP	3490-9050	5.52	4.6	134		134	1.11		1.11	1647	0					CWIP, SRF, LCBP
220	Stowe		GS	3490-9050	7.13	7.1	216		216	1.80		1.80	2656	0					CWIP, SRF, LCBP
221	Stowe		GS/SB	3490-9050	2.63	3.6	57		57	0.48		0.48	708	0					CWIP, SRF, LCBP
222	Stowe		EDMP/CB/ GS	3490-9015.1	14.31	1.2	232		232	1.93		1.93	2856	0					CWIP, SRF, LCBP
223	Stowe		GS	3490-9050	40.10	0.0	535		535	4.46		4.46	6598	2438					CWIP, SRF, LCBP
224	Stowe		OF/GS		2.41	9.7	439		439	1.22		1.22	1081	0					CWIP, SRF, LCBP
225	Stowe		GS		4.91	6.4	700		700	1.94		1.94	1724	0					CWIP, SRF, LCBP
226	Stowe		GS		1.89	6.0	261		261	0.73		0.73	644	5434					CWIP, SRF, LCBP
227	Stowe		GS/WP	6836-9015	5.47	4.3	129		129	1.07		1.07	1585	4134					CWIP, SRF, LCBP
228	Stowe		GS	6836-9015	78.10	0.0	1038		1038	8.65		8.65	12785	537					CWIP, SRF, LCBP
229	Stowe		GS	6836-9015	2.76	0.2	38		38	0.31		0.31	464	0					CWIP, SRF, LCBP

		Action List	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Effective Impervious Area	Sediment Load with Current Reductions (lbs)	Priority Action Sediment Reduction Credit	Sediment Load with Priority Action (lbs)	Phosphorus Load with Current Reductions (lbs)	Priority Action Phosphorus Reduction Credit	Phosphorus Load with Priority Action (lbs)	Water Quality Volume (ft3)	Channel Protection Volume (ft3)	Estimated Basin Construction Cost	Estimated Other BMP Construction Cost	Cost of Sediment Removal Per Pound (based on annual sediment load)	Cost of Phosphorus Removal Per Pound (based on annual phosphorus load)	Assistance Program
230	Stowe		GS/CB	5021-9010	58.52	1.3	3339		3339	11.26		11.26	11756	24212					CWIP, SRF, LCBP
231	Stowe	4	GS/CB/ EDP	3929-INDS.T, WQRP	8.16	0.0	108		108	0.90		0.90	1334	1468					CWIP, SRF, LCBP
232	Stowe	4	CB		0.34	89.4	382		382	1.06		1.06	943	0					CWIP, SRF, LCBP
233	Stowe	4	CB		0.68	26.9	263		263	0.73		0.73	649	2685					CWIP, SRF, LCBP
235	Stowe		CB/GS		2.02	14.6	486		486	1.35		1.35	1198	39730					CWIP, SRF, LCBP
236	Stowe		GS/OF		78.47	3.4	8416		8416	23.38		23.38	20743	5614					CWIP, SRF, LCBP
237	Stowe		GS/OF		17.15	1.8	1502		1502	4.17		4.17	3701	3247					CWIP, SRF, LCBP
238	Stowe		GS/SB		1.10	48.5	425		425	1.57		1.57	1745	9086					CWIP, SRF, LCBP
239	Stowe		GS/WP		36.18	1.2	2041		2041	6.88		6.88	7186	4363					CWIP, SRF, LCBP
240	Stowe		GS/OF		19.28	1.0	1514		1514	4.20		4.20	3731	3168					CWIP, SRF, LCBP
241	Stowe		GS/WP		5.40	4.3	444		444	1.50		1.50	1563	4200					CWIP, SRF, LCBP
242	Stowe		GS		10.09	2.6	977		977	2.71		2.71	2408	1393					CWIP, SRF, LCBP
243	Stowe		OF		69.80	0.0	4649		4649	12.91		12.91	11457	1801					CWIP, SRF, LCBP
244	Stowe		GS		5.90	1.6	504		504	1.40		1.40	1242	9418					CWIP, SRF, LCBP
245	Stowe		GS/OF		31.13	1.6	2653		2653	7.37		7.37	6538	12082					CWIP, SRF, LCBP
246	Stowe		GS/OF		20.92	4.2	2431		2431	6.75		6.75	5991	44746					CWIP, SRF, LCBP
247	Stowe		GS/WP/O F		242.11	0.8	12764		12764	43.05		43.05	44941	82209					CWIP, SRF, LCBP
248	Stowe		GS/WP/O F		371.28	1.0	20306		20306	68.49		68.49	71493	13489					CWIP, SRF, LCBP
249	Stowe		GS/OF		24.01	4.0	2741		2741	7.61		7.61	6756	0					CWIP, SRF, LCBP
250	Stowe		CB/DW		1.10	52.6	458		458	1.70		1.70	1880	0					CWIP, SRF, LCBP
251	Stowe		CB		1.08	72.4	1008		1008	2.80		2.80	2484	0					CWIP, SRF, LCBP

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252	Stowe		GS		51.04	3.2	5316		5316	14.77		14.77	13102	3606					CWIP, SRF, LCBP
253	Stowe		GS/OF		17.93	0.9	1372		1372	3.81		3.81	3382	4536					CWIP, SRF, LCBP
254	Stowe		GS/OF		6.10	6.1	849		849	2.36		2.36	2093	9192					CWIP, SRF, LCBP
255	Stowe		GS/OF		9.69	8.8	1661		1661	4.61		4.61	4093	3255					CWIP, SRF, LCBP
256	Stowe		CB		0.86	76.0	834		834	2.32		2.32	2056	32686					CWIP, SRF, LCBP
257	Stowe		OF/GS/WP		189.14	0.7	9857		9857	33.25		33.25	34706	58641					CWIP, SRF, LCBP
258	Stowe		DW/GS/WP	3246-9010, 9130-9050,	270.57	1.0	4208		4208	35.06		35.06	51851	23094					CWIP, SRF, LCBP
259	Stowe		GS/OF		68.32	1.9	6056		6056	16.82		16.82	14924	6788					CWIP, SRF, LCBP
260	Stowe		GS		21.27	1.7	1846		1846	5.13		5.13	4549	1483					CWIP, SRF, LCBP
261	Stowe		OF		4.34	1.9	386		386	1.07		1.07	953	2642					CWIP, SRF, LCBP
262	Stowe		OF		11.51	1.0	907		907	2.52		2.52	2236	1830					CWIP, SRF, LCBP
263	Stowe		OF		8.80	0.9	678		678	1.88		1.88	1671	5046					CWIP, SRF, LCBP
264	Stowe		WP/OF		10.34	3.3	760		760	2.56		2.56	2677	7963					CWIP, SRF, LCBP
265	Stowe		OF		9.68	7.1	1463		1463	4.06		4.06	3606	4239					CWIP, SRF, LCBP
266	Stowe		CB/OF		2.56	20.3	790		790	2.19		2.19	1947	239					CWIP, SRF, LCBP
267	Stowe	1 Combine with 268 & 270 in infiltration basin with limestone liner.	LS-IB/GS		0.24	9.3	43	90%	4	0.12	90%	0.01	106	869	$76,203		$7	$7,163	CWIP, SRF, LCBP
268	Stowe	1 Combine with 270 in infiltration basin on 267	LS-IB/GS/CB		0.22	76.2	212	90%	21	0.59	90%	0.06	522	3304					CWIP, SRF, LCBP
269	Stowe		CB		0.97	59.5	757		757	2.10		2.10	1865	42087					CWIP, SRF, LCBP
270	Stowe	1 Combine with 268 in infiltration basin on 267	LS-IB/GS/CB		349.47	0.4	24824	10%	22341	68.96	20%	55.16	61180	5331					CWIP, SRF, LCBP
271	Stowe	4	CB/WP	WQRP, 3929-9010.R	8.78	1.6	150		150	1.25		1.25	1849	5467					CWIP, SRF, LCBP
272	Stowe	4			4.10	0.0	54		54	0.45		0.45	670	1872					CWIP, SRF, LCBP
273	Stowe	4			1.80	0.0	24		24	0.20		0.20	294	1872					CWIP, SRF, LCBP

Target Maps

Showing Priority Action List Drainage Areas

And Potential Retrofit Locations

Stowe, VT

DEC Stormwater Infrastructure Mapping Project

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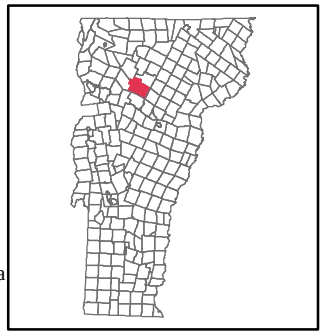

Stormwater points

- Pipe Cross (not connected)
- Catchbasin
- Dry Well
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- Yard drain
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Stormwater line

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- 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 - WID - Clean Water Initiative Program
Plotted Date: 1/31/2022
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survery
Imagery Source: VCGI Best Available Imagery

Subwatershed: 20, 21, &108
Action List: 1,4

C

D

108

Add swirl separator and dry wells around buildings of subwatersheds 20, 21, and 108 to limit runoff entering the receiving water.

20

B/D

B

21

N

0 0.0075 0.015 0.03 Miles

VCGI

Stowe, VT

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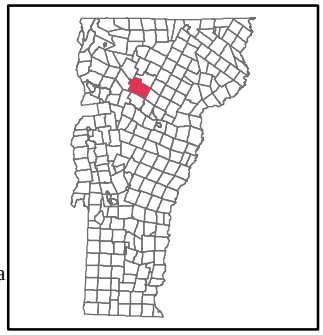

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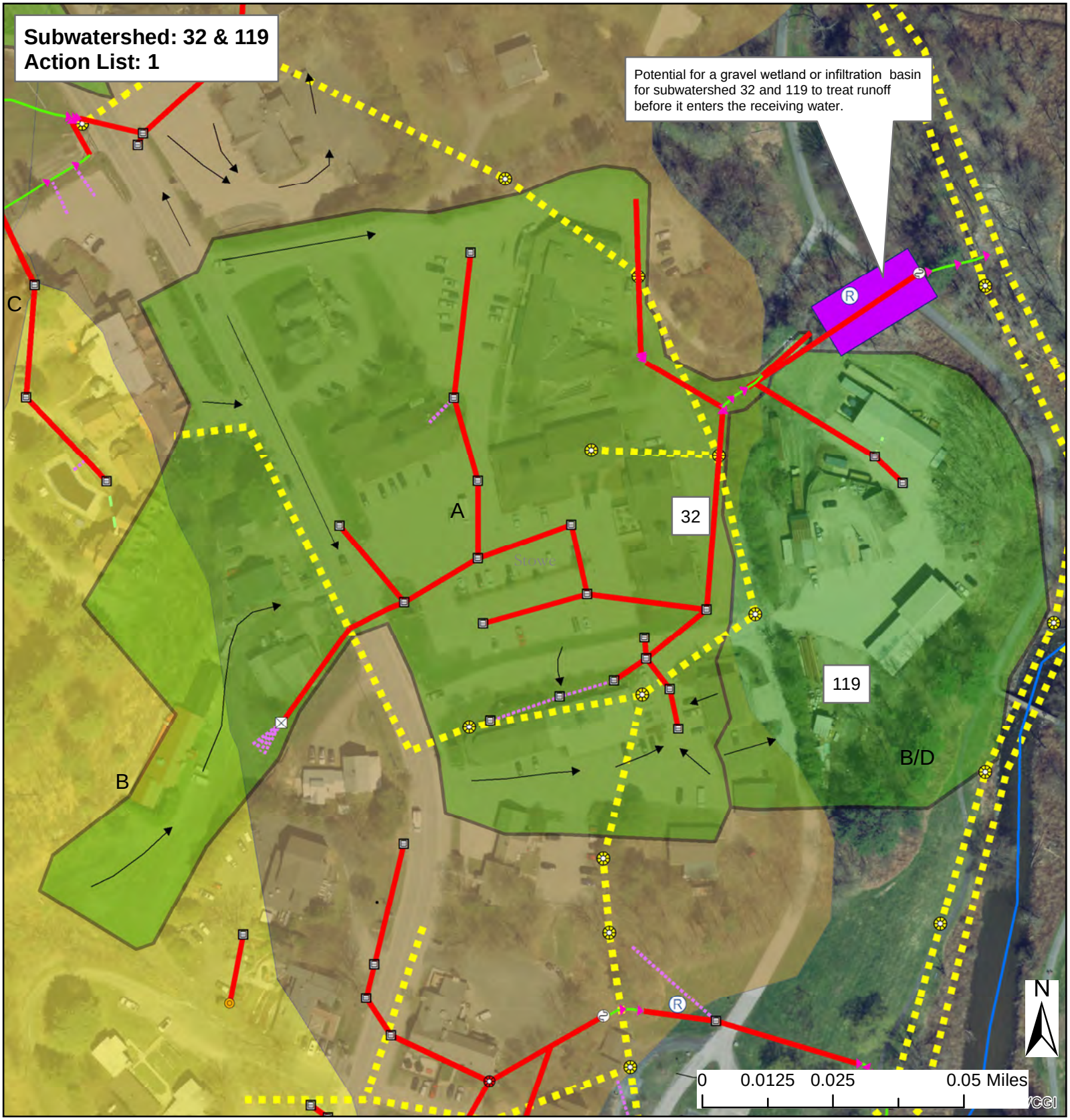

Stowe, VT

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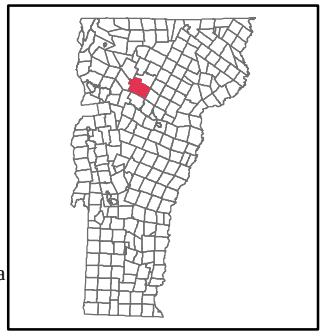

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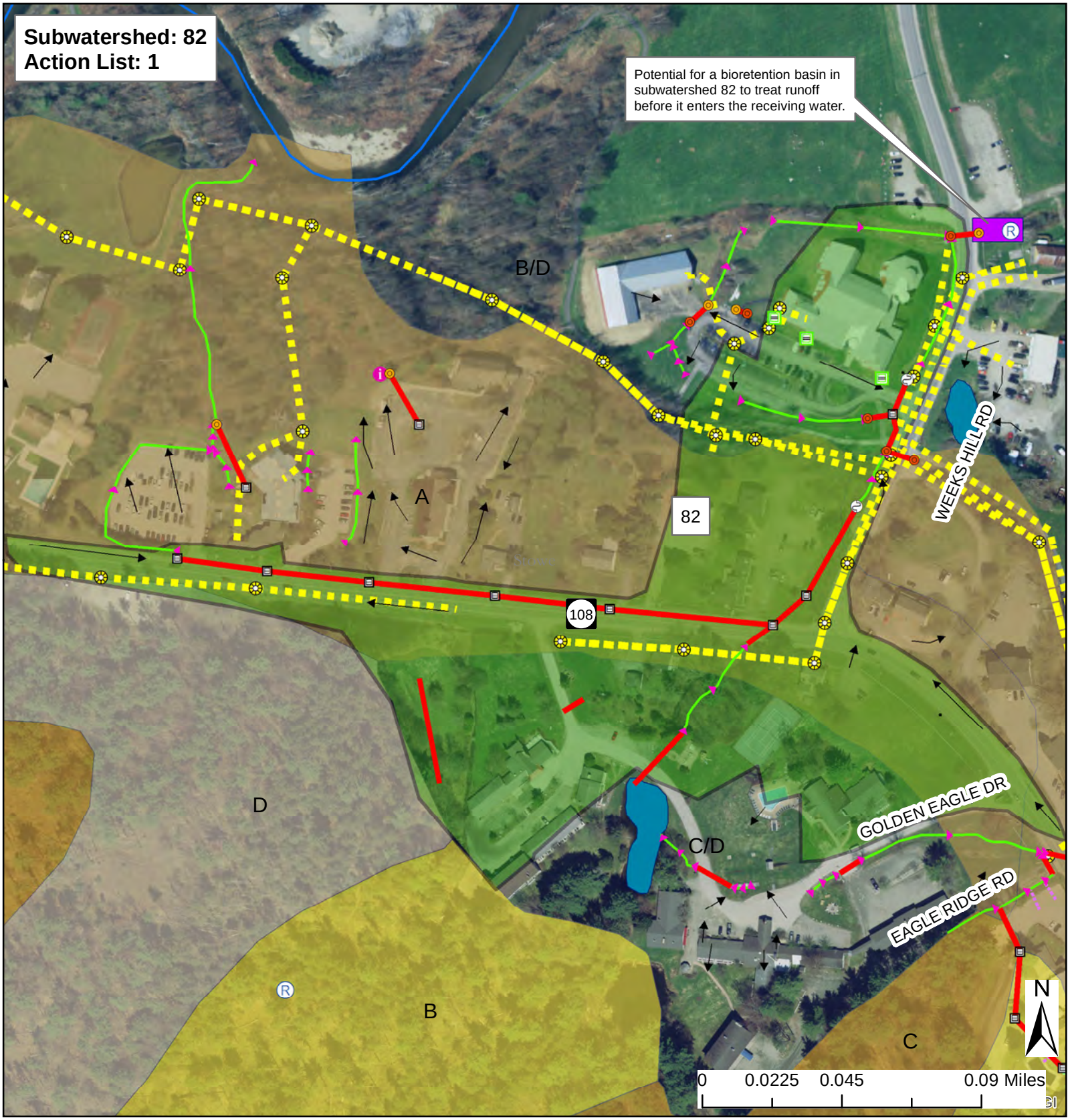

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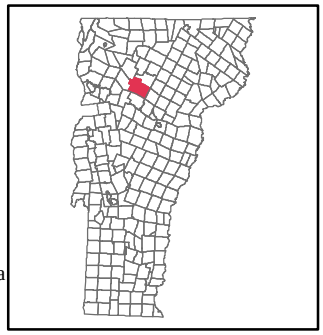

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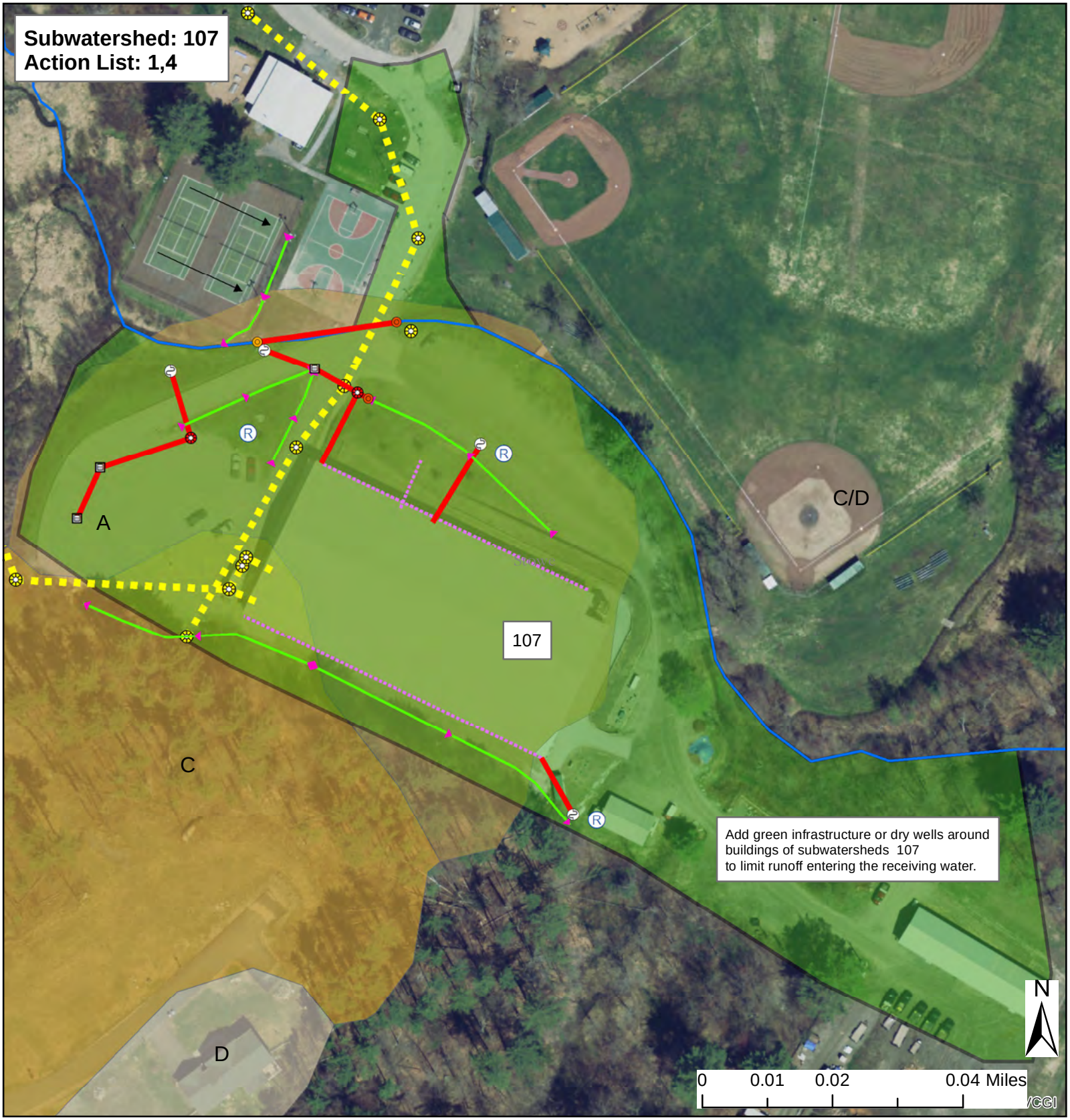

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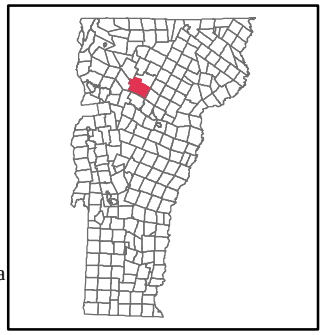

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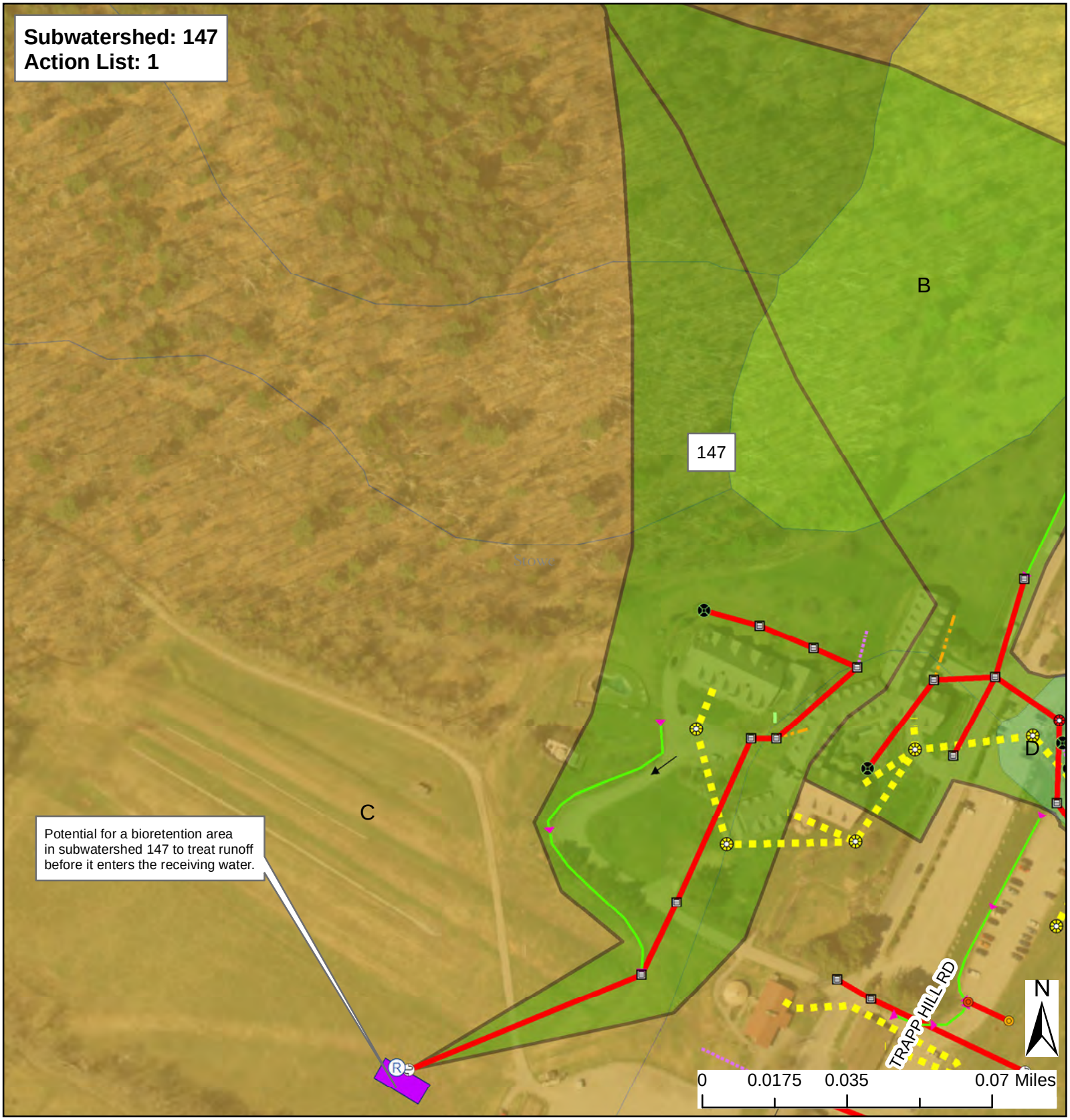
Subwatershed: 147
Action List: 1



Stowe, VT

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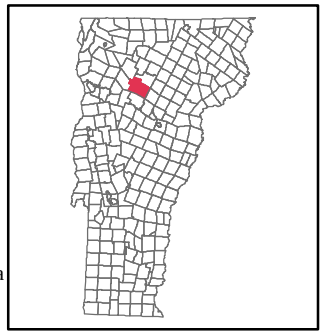

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Creator: Jim Pease, David Ainley
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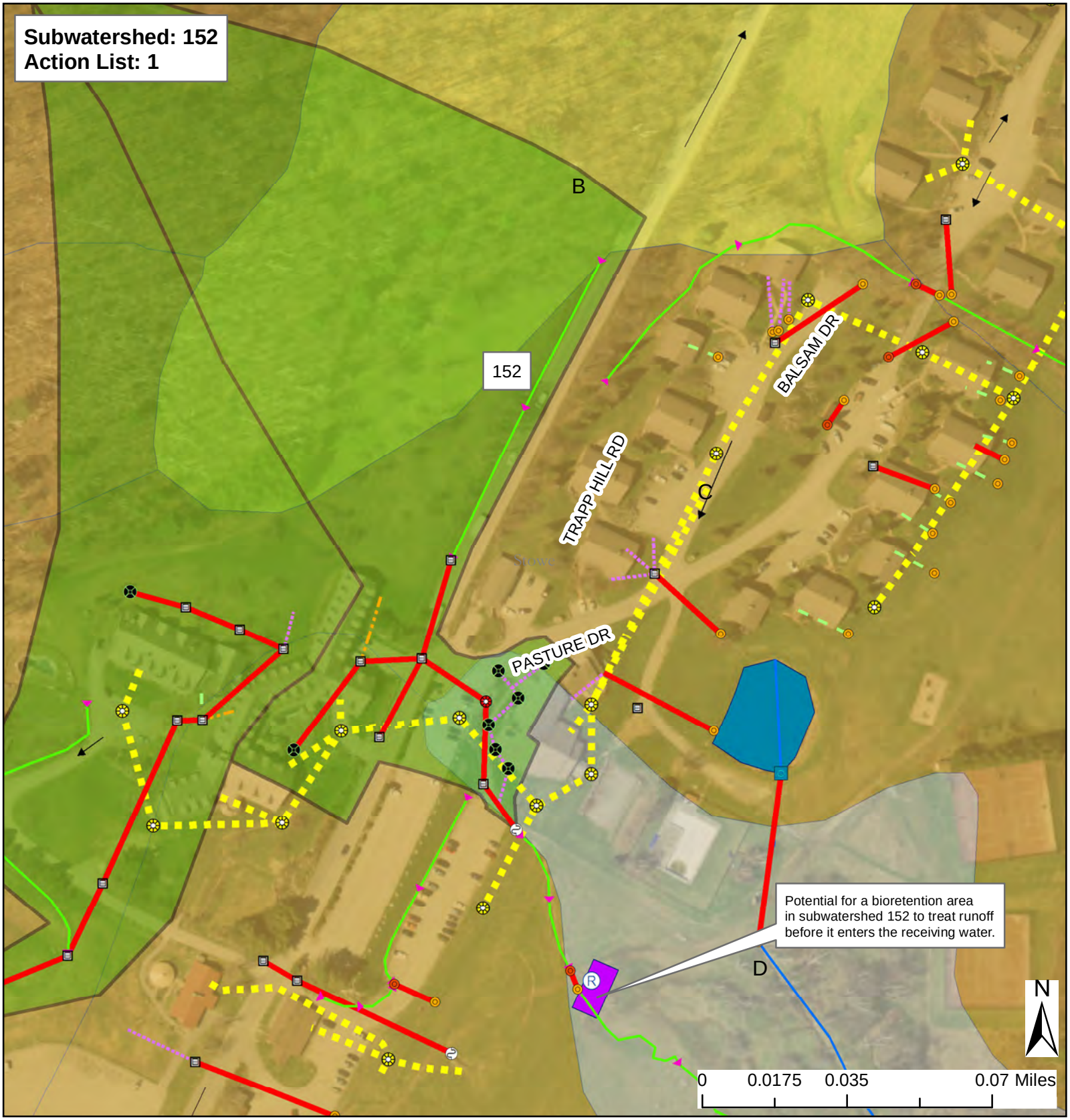

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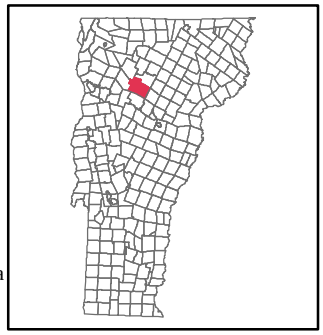

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- Tunnel (storm)
- Combined sewer
- Sanitary line
- Swale
- Footing drain
- Under drain
- Roof drain
- Infiltration pipe
- French drain
- Trench drain
- Emergency spillway
- Stream
- Overland flow

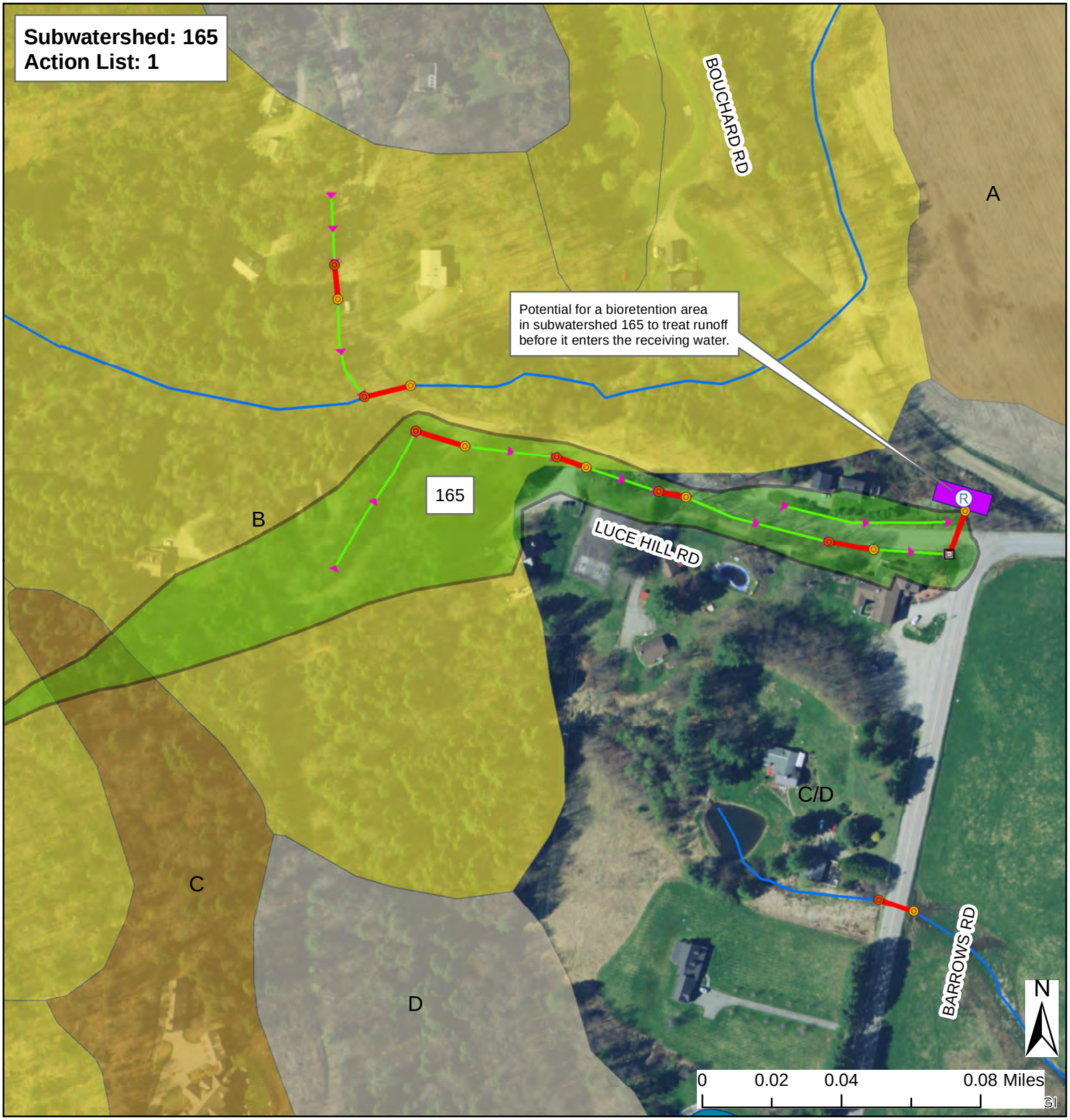
NRCS - Soils

- A
- B
- C
- D

SubwatershedID

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

Creator: Jim Pease, David Ainley
DEC - WID - Clean Water Initiative Program
Plotted Date: 9/20/2021
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survery
Imagery Source: VCGI Best Available Imagery

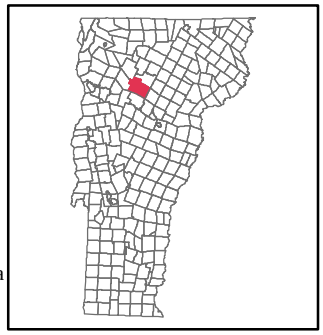


Stowe, VT

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

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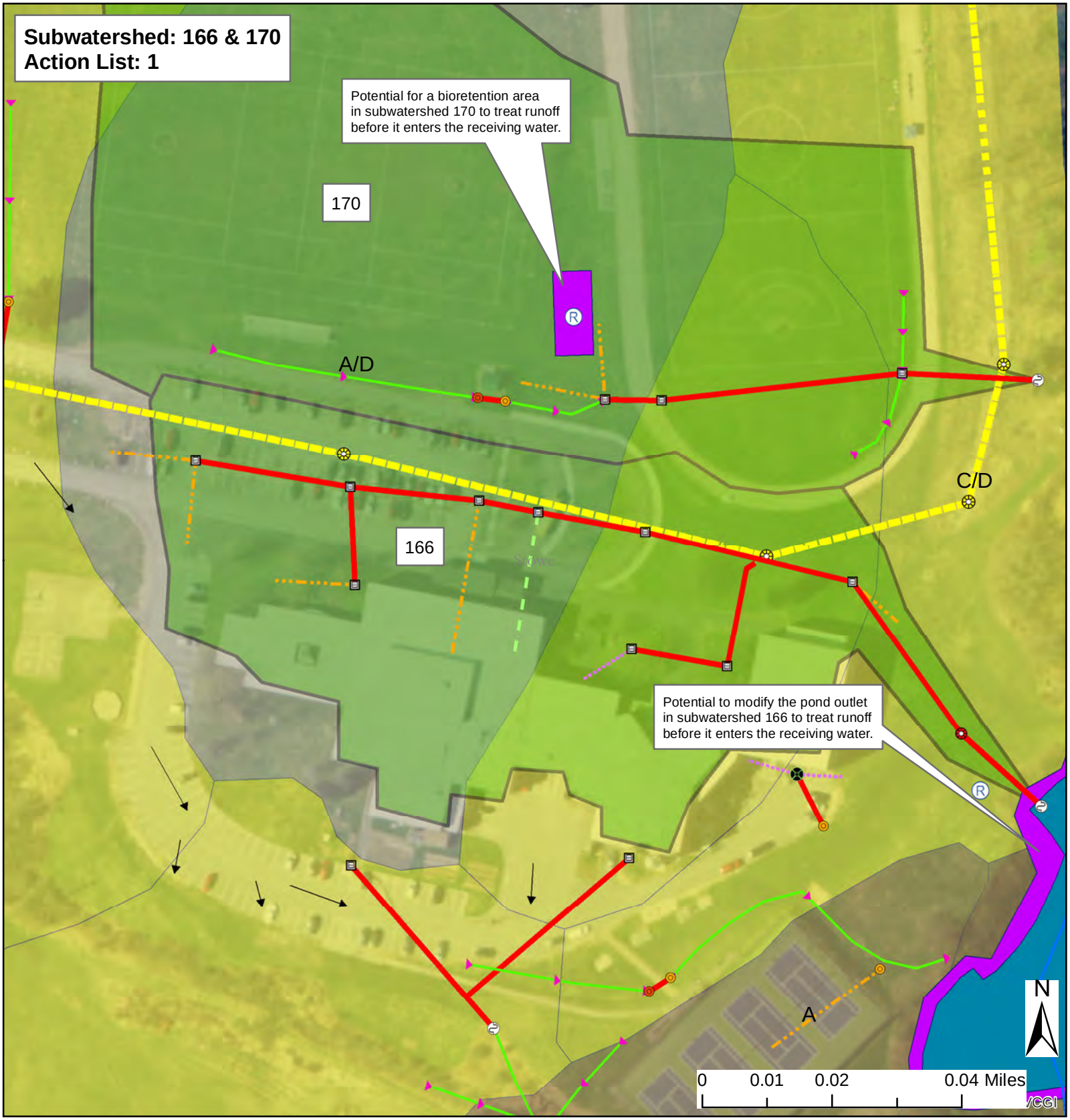

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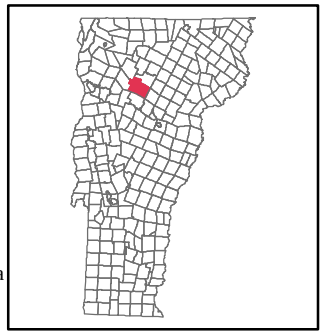

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NRCS - Soils

- A
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- B
- C
- C/D
- D

SubwatershedID

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

Creator: Jim Pease, David Ainley
DEC - WID - Clean Water Initiative Program
Plotted Date: 9/20/2021
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survery
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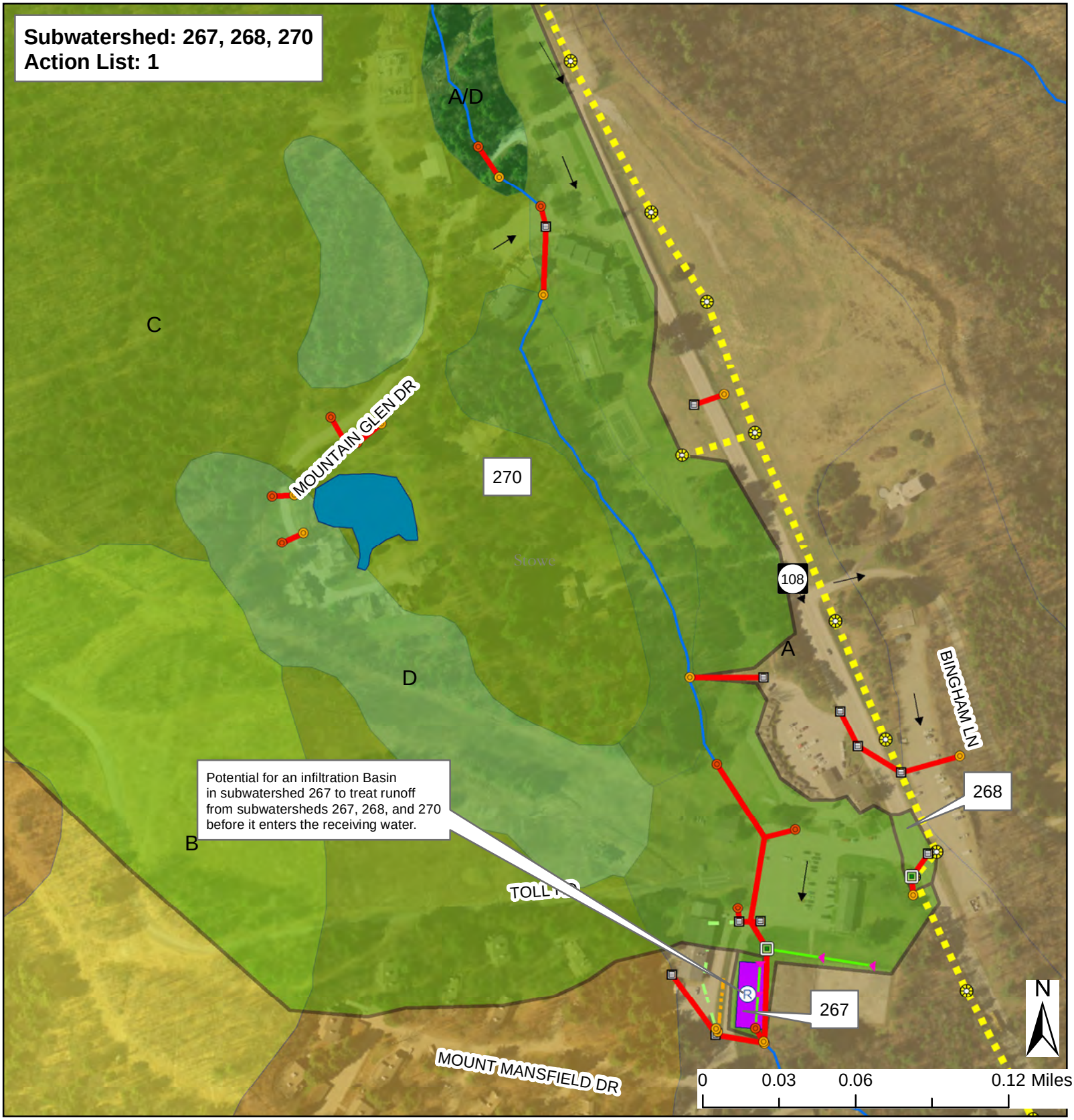

Stowe, VT

DEC Stormwater Infrastructure Mapping Project

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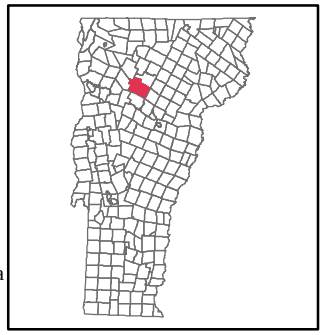

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Creator: Jim Pease, David Ainley
DEC - WID - Clean Water Initiative Program
Plotted Date: 8/10/2021
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survery
Imagery Source: VCGI Best Available Imagery

Spill Control

and

Vermont Hazardous Waste Management Regulations

Have a spill control plan for accidental spills at municipal facilities and on municipal streets

These stormwater infrastructure maps show the connectivity of the stormwater system for the municipality as accurately as it could be determined with the collected and existing data. In the event of a spill this can be a valuable tool for controlling spills and in spill response.

Towns should be equipped with suitable equipment to contain and clean up spills of hazardous materials. Accidental spills of materials can be sources of runoff pollution if not addressed appropriately. If possible Towns should be prepared to address spills on municipal streets while at the same time contacting the state Waste Management Division. DPW managers should be aware of all applicable requirements and should contact regulatory authorities if requirements are not known.

All spills should be cleaned up immediately after they occur. For municipal facilities the creation of a site specific spill control and response plan in combination with spill response training for designated on-site personnel can be effective in dealing with accidental spills and preventing the contamination of soil, water, and runoff. Preparation of a spill containment, control, and countermeasures (SPCC) plan might be required to meet regulatory requirements (e.g., requirements regarding storage of specified chemicals above certain volume thresholds).

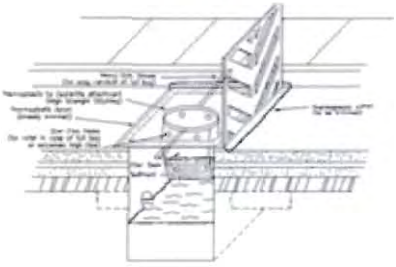
Even if a formal plan is not required, preparing one is a good idea. In general, an SPCC plan should include guidance to site personnel on the following:

— Proper notification when a spill occurs;
— Site responsibility with respect to addressing the cleanup of a spill;
— Stopping the source of a spill;
— Cleaning up a spill;
— Proper disposal of materials contaminated by the spill;
— Location of spill response equipment programs; and
— Training for designated on-site personnel.

A periodic spill "fire drill" should be conducted to help prepare Town personnel in the event of a spill.

Spill Prevention and Response Measures

Catch Basin Inserts



Catch Basin Inserts (Drain Guards / Sediment Traps) protect our rivers and streams by capturing sediment, debris, oil and grease at storm water catch basins. Catch Basin Inserts are an economical and effective method to protect you from costly clean-up work.

The standard filter material is a non-woven geotextile with built-in overflow ports for cases of abnormally high water flow or over-filled filter bags. Catch Basin Inserts are available with a replaceable 5" x 15" oil absorbent boom that floats to absorb any oil, gas or diesel entering a storm water catch basin.

Urethane Drain Protector

Urethane Drain Protectors are positive sealing drain covers that ensure spills do not enter drains. Drain Protectors are environmentally safe and resistant to chemicals, solvents and hydrocarbons. After use, the Drain Protector can be washed and stored in its tube storage container.

Absorbent Socks

Absorbent socks are flexible tubes used to contain and clean-up spilled fluids. Socks are widely used in industrial applications and are ideal for Spill Kits. Fast spreading spills are quickly stopped with a sock.

Drums & Intermediate Bulk Containers (IBC's)

New and reconditioned steel drums are ideal for storing solid and liquid waste. Poly drums available for durable outdoor storage or for building your own spill kits. Steel and poly drums are available in both tight-head (TH) and full open-head styles (FOH).

Pads & Rolls

Absorbent pads and rolls made from polypropylene fibers are the most popular form of absorbents on the market. Various types of absorbent pads and rolls can be used for different liquids and site applications.

The most widely used absorbent pads and rolls are oil-only (white) and universal (grey). Pads and rolls are great for spills on water or land, easily absorbing 20 to 25 times their own weight in recovered liquid. Rolls can easily be cut to the exact size required.

Booms

Linkable Absorbent Booms

Absorbent booms are ideal for containing and cleaning up spills on water. Booms repel water and float even when completely saturated.

Absorbent booms are constructed with a strong mesh outer skin encasing non-linting and highly absorbent polypropylene filler. Linkable booms come complete with end rings and clips attached to nylon rope running the length of the boom.

Collection basins

Collection basins are permanent structures in which large spills or contaminated storm water is contained and stored before cleanup or treatment. Collection basins are designed to receive spills, leaks, etc., and to prevent pollutants from being released into the environment. Unlike containment dikes, collection basins can receive and contain materials from many locations across a facility.

Containment diking

Containment dikes are temporary or permanent earth or concrete berms or retaining walls that are designed to hold spills. Diking can be used at any industrial facility, but is most common for controlling large spills or releases from liquid storage and transfer areas. Diking can provide one of the best protective measures against the contamination of storm water because it surrounds the area of concern and keeps spilled materials separated from the storm water outside of the diked area.

Curbing

Similar to containment diking, a curb is a barrier that surrounds an area of concern. Unlike diking, curbing is unable to contain large spills and is usually implemented on a small-scale basis. However, curbing is common at many facilities and in small areas where liquids are handled and transferred.

Granular Absorbents

A variety of granular and powdered absorbents are available for the effective clean-up of spills on streets, construction sites and in repair shops. These products absorb spilled liquids of various kinds to greatly lower the viscosity, aiding in the clean-up of the spill.

Sorbents, Gels, and Foams

Sorbents are compounds that immobilize materials by surface absorption or adsorption in the sorbent bulk. Gelling agents interact with the spilled chemical(s) by concentrating and congealing to form a rigid or viscous material more conducive to a mechanical cleanup. Foams are mixtures of air and aqueous solutions of proteins and surfactant-based foaming agents. The primary purpose of foams is to reduce the vapor concentration above the spill surface, thereby controlling the rate of evaporation.

§ **7-105** EMERGENCY AND CORRECTIVE ACTIONS

(a) Emergency actions

(1) In the event of a discharge of hazardous waste or a release of a hazardous material, the person in control of such waste or material shall:

(A) Take all appropriate immediate actions to protect human health and the environment including, but not limited to, emergency containment measures and notification as described below; and

(B) Take any further clean up actions as may be required and approved by federal, state, or local officials, or corrective actions as specified under **subsection (b)** of this section so that the discharged waste or released material and related contaminated materials no longer present a hazard to human health or the environment.

(2) Reporting

(A) All discharges and/or releases that meet any of the following criteria shall be immediately reported to the Secretary by the person or persons exercising control over such waste by calling the Waste Management Division at **(802) 241-3888**, Monday through Friday, 7:45 a.m. to 4:30 p.m. or the Department of Public Safety, Emergency Management Division at **(800) 641-5005**, 24 hours/day:

(i) A discharge of hazardous waste, or release of hazardous material that exceeds 2 gallons;

(ii) A discharge of hazardous waste, or release of hazardous material that is less than or equal to 2 gallons and poses a potential or actual threat to human health or the environment; or

(iii) A discharge of hazardous waste, or release of hazardous material that equals or exceeds its corresponding reportable quantity under CERCLA as specified under **40 CFR § 302.4.**

Note: Under the Federal Water Pollution Control Act, certain spills of "oil" and/or "hazardous substances" are prohibited and must be reported pursuant to the requirements of **40 CFR Part 110** / Discharge of Oil. Certain spills of hazardous substances must also be reported pursuant to CERCLA. In both

(B) A written report shall be submitted to the Secretary within ten (10) days following any discharge or release subject to **subsection (a)(1)** of this section. The report should be sent to: The Vermont Department of Environmental Conservation, Waste Management Division, 103 South Main Street, Waterbury, VT 05671-0404. The person responsible for submitting the written report may request that it not be submitted for small discharges and/or releases that were reported pursuant to subsection (a)(2)(A) of this section, and that have been entirely remediated within the ten (10) day period immediately following the discharge and/or release

(3) If the discharge or release occurred during transportation, the transporter shall, in addition to notifying the Secretary:

(A) Notify the National Response Center at (800) 424-8802 or (202) 426-2675, if required by **49 CFR § 171.15**; and

(B) Report in writing to the Director, Office of Hazardous Materials Regulations, Materials Transportation Bureau, Department of Transportation, Washington, D.C. 20590, if required by **49 CFR § 171.16**; and

(C) A water (bulk shipment) transporter who has discharged hazardous wastes must give the same notice as required by **33 CFR § 153.203** for oil and hazardous substances.

(4) If a discharge or release occurs and the Secretary determines that immediate removal of the waste is necessary to protect human health or the environment, the Secretary may authorize its removal by unpermitted transporters without the preparation of a manifest. Such hazardous waste may be transported to a site authorized by the Secretary under the provisions of **§ 7-503** to temporarily accept hazardous waste generated during an emergency cleanup of a discharge or release.

(5) In the case of an explosives or munitions emergency response, if a Federal, State, Tribal or local official acting within the scope of his or her official responsibilities, or an explosives or munitions emergency response specialist, determines that immediate removal of the material or waste is necessary to protect human health or the environment, that official or specialist may authorize the removal of the material or waste by transporters who do not have EPA identification numbers or hold Vermont hazardous waste transportation permits and without the preparation of a manifest. In the case of emergencies involving military munitions, the responding military emergency response specialist's organizational unit must retain records for three years identifying the dates of the response, the responsible persons responding, the type and description of material addressed, and its disposition.

(6) All clean up debris and residues that are hazardous waste must be transported ultimately to either:

(A) A designated facility;

(B) A person authorized by the Secretary to use such waste if the waste has been delisted pursuant to **§ 7-218**;

(C) Some other location specified and authorized by the Secretary to receive clean up debris and residues if the waste has been delisted pursuant to **§ 7-218**; or

(D) For hazardous waste not defined as hazardous in 40 CFR Part 261 (i.e., waste regulated as hazardous by Vermont), to a facility, that is not a designated facility, located in a state other than Vermont provided the facility can receive such waste under applicable state and local laws, regulations and ordinances.

(b) Corrective actions

(1) If a discharge of hazardous waste, or a release of hazardous material has not been adequately addressed under **subsection (a)(1)(A)** of this section the Secretary may require that the person or persons responsible pursuant to **10 V.S.A. § 6615** complete the following:

(A) Engage the services of an environmental consultant experienced in the investigation and remediation of hazardous waste-contaminated sites; and

(B) Within thirty (30) days from either the date of the discharge/release or the date that the release was discovered if the date of discharge/release is not known, or within a period of time established by an alternative schedule approved by the Secretary, submit for approval by the Secretary a work plan for an investigation of the contaminated site (i.e., site investigation) prepared by the environmental consultant. The site investigation shall define the nature, degree and extent of the contamination; and shall assess potential impacts to human health and the environment (refer to the document titled: "Site Investigation Procedure" which is available from the Secretary upon request); and

(C) Perform the site investigation within either ninety (90) days of receiving written approval of the work plan by the Secretary, or a period of time established by an alternative schedule approved by the Secretary. A report detailing the findings of the site investigation shall be sent to the Secretary for review; and

(D) Within either thirty (30) days from the date of final acceptance of the site investigation report by the Secretary, or a period of time established by an alternative schedule approved by the Secretary, submit a corrective action plan prepared by the environmental consultant (refer to the document titled: "Corrective Action Guidance" which is available from the Secretary upon request); and

(E) Implement the corrective action plan within either ninety (90) days of receiving
written approval of the plan by the Secretary, or a period of time established by an alternative schedule approved by the Secretary. The corrective action activity shall continue until the contamination is remediated to levels approved by the Secretary; and

(F) Submit to the Secretary all investigative, corrective action and monitoring reports, and all analytical results related to **subsections (b)(1)(C) through (E) of this section**, as they become available.

(2) A used or fired military munition is a waste and is potentially subject to corrective action authorities pursuant to **10 V.S.A. § 6615**, and the process described by **subsection (b)(1) of this section** if the munition lands off-range and is not promptly rendered safe or retrieved. Any imminent and substantial threats associated with any remaining material must be addressed. If remedial action is infeasible, the operator of the range must maintain a record of the event for as long as any threat remains. The record must include the type of munition and its location (to the extent the location is known).

§ 7-106 LAND DISPOSAL RESTRICTIONS

(a) Certain hazardous wastes shall not be disposed of in or on the land. **40 CFR Part 268**, which is hereby incorporated by reference, except for **40 CFR §§ 268.5, 268.6, and 268.42(b)**, identifies those wastes which shall not be land disposed and describes the limited circumstances under which an otherwise prohibited waste may continue to be land disposed. The authority for implementing the CFR sections not incorporated by reference remains with the EPA.

Note: A copy of 40 CFR Part 268 (the Land Disposal Restrictions rule), as incorporated by these regulations, is available from the Secretary upon request.

(b) In addition to the prohibitions of **40 CFR Part 268**, the Secretary may restrict the land disposal of any hazardous waste in the State of Vermont:

(1) Which may present an undue risk to human health or the environment, immediately or over a period of time; or

(2) Which would be incompatible with the **groundwater protection rule and strategy** of chapter 12 of the environmental protection rules.

(c) Dilution of hazardous waste subject to the land disposal restrictions of **40 CFR Part 268** is prohibited pursuant to **40 CFR § 268.3.**

§ 7-107 ENFORCEMENT

(a) Information that the generation, transportation, treatment, storage or disposal of hazardous waste may present an actual or potential threat to human health or the environment, or is a violation of the 10 V.S.A. chapter 159, or these regulations, or any term or condition of certification, order, or assurance, may serve as grounds for an enforcement action by the Secretary, including, but not limited to:

(1) After notice and opportunity for hearing, issuing an order directing any person to take such steps as are necessary to:

(A) Immediately cease and desist any operation or practice;

(B) Correct or prevent environmental damage likely to result from any deficiency in operation or practice;

(C) Suspend or revoke any certification and require temporary or permanent cessation of the operation of such facility;

(2) A request that the Attorney General or appropriate State's Attorney commence an action for injunctive relief, the imposition of penalties and fines provided in **10 V.S.A. § 6612** and other relief as may be appropriate.

(3) An order for reimbursement to any agency of federal, state, or local government from any person whose act caused governmental expenditures under **10 V.S.A § 1283**.

(4) All other powers of enforcement available to the Secretary through **10 V.S.A., chapter 201**.

(b) The hearing by the Secretary identified under **subsection (a)(1)** of this section shall be conducted as a contested case. Pursuant to **10 V.S.A. § 6610(b)**, the Secretary may issue an emergency order without a prior hearing when an ongoing violation presents an immediate threat of substantial harm to the environment or an immediate threat to public health. An emergency order shall be effective upon actual notice to the person against whom the order is issued. Any person to whom an emergency order is issued shall be given the opportunity for a hearing within five (5) business days of the date the order is issued.

(c) Inspections, investigations, and property access (**10 V.S.A. § 8005**)

(1) Inspections and investigations

(A) An investigator may perform routine inspections to determine compliance.

(B) An investigator may investigate upon receipt or discovery of information that an activity is being or has been conducted that may constitute or cause a violation.

(C) An investigator, upon presentation of credentials, may seek permission to inspect or investigate any portion of the property, fixtures, or other appurtenances belonging to or used by a person whose activity is required to be in compliance. The investigator shall state the purpose of the inspection or investigation. An inspection or investigation may include monitoring, sampling, testing, and copying of any records, reports, or other documents relating to the purposes to be served by compliance.

(D) If permission for an inspection or investigation is refused, the investigator may seek an access order from the district or superior court in whose jurisdiction the property is located enabling the investigator to perform the inspection or investigation.

(2) Access orders

(A) If access has been refused, an access order may be sought pursuant to either **10 V.S.A. § 8005** or **10 V.S.A. § 6609**.

(B) Issuance of an access order shall not negate the Secretary's authority to initiate criminal proceedings in the same matter by referring the matter to the office of the attorney general or a state's attorney.

(d) In an action to enforce these regulations, anyone raising a claim that a certain material is not a hazardous waste, or is exempt from regulation as hazardous waste, must demonstrate that there is a known market or disposition for the material, and that they meet the terms of the exclusion or exemption. Appropriate documentation (such as contracts showing that a second person uses the material as an ingredient in a production process) to demonstrate that the material is not a waste, or is exempt from regulation, must be provided. Owners and operators of facilities claiming that they are actually recycling materials must show that they have the necessary equipment to do so.