City of Montpelier

Stormwater Infrastructure Mapping Project

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VTDEC – ECOSYSTEM RESTORATION SECTION
WATERSHED MANAGEMENT DIVISION

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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. Knowledge of where storm drains are located can also assist municipalities and residents with emergency preparedness for large rainfall events (i.e. Tropical Storm or Hurricanes) or spring snowmelt runoff events. By keeping storm drains clean, clear and open a good deal of localized flooding could be prevented. 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 3 (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.

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.**

Main Lake and Winooski River Nonpoint Phosphorus Overview

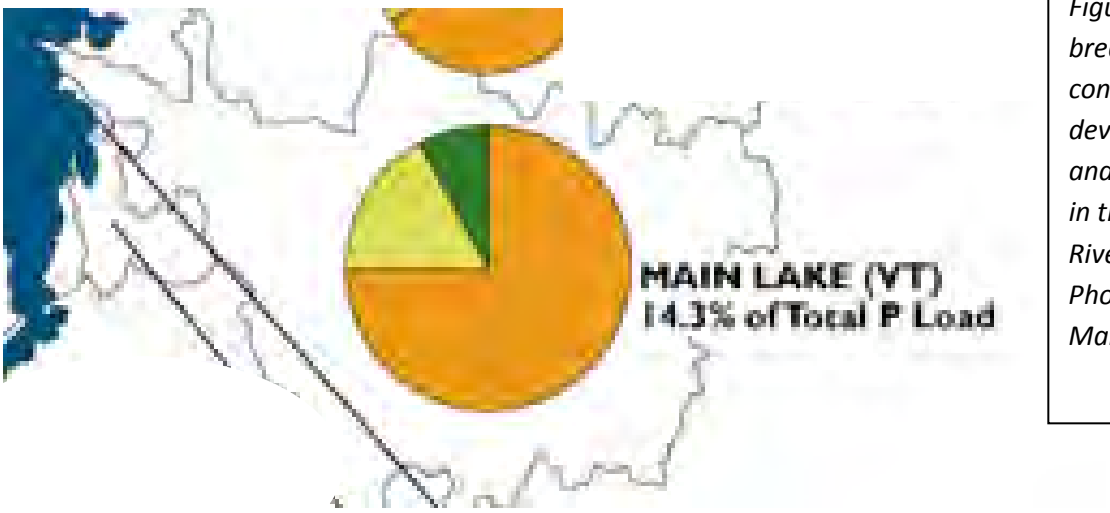
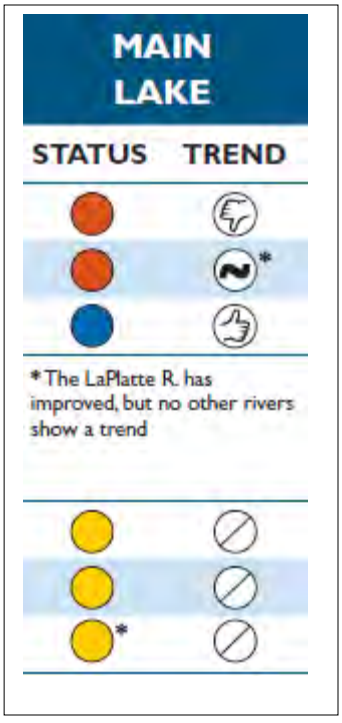
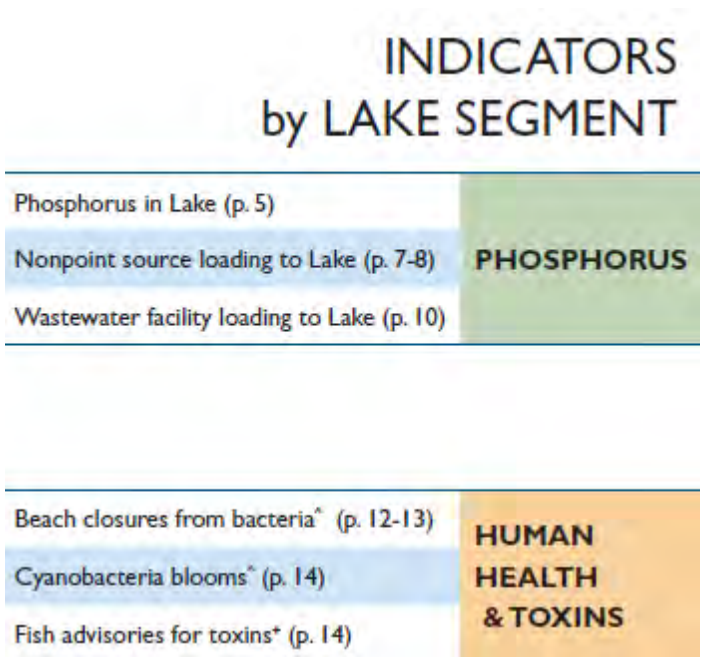


Figure shows the breakdown of contributions from developed, agricultural and forested land sources in the Main Lake-Winooski River Watershed to Total Phosphorus loading of the Main Lake, VT side.





* Figures taken from Lake Champlain Basin Program – *State of the Lake and Ecosystem Indicators Report (2012).* 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

Montpelier - Subwatershed Prioritization and Recommendations

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	Sediment Load with Current Reductions (lbs)	Sediment Load with Priority Action (lbs)	Phosphorus Load with Current Reductions (lbs)	Phosphorus Load with Priority Action (lbs)
1 Montpelier	1	Add sediment forebay or sand filter to underground detention basin	SF/CB/GS/URB/PP	3405-9010	23.4	38.1	4,209	2,315	14.6	9.5
38 Montpelier	1	Extended detention basin at north end of 101 Northfield St	EDP/CB/GS/SW		125.8	9.5	12,711	2,542	35.3	21.2
91 Montpelier	1	SWPPP for food waste around building	SWPPP/CB/OF		0.9	70.1	754	453	2.1	1.3
104 Montpelier	1	Enhanced buffer or linear rain garden along river edge	BRA/OF		2.3	90.2	2,626	1,576	7.3	5.8
126 Montpelier	1	Upgrade WP behind 8 McKinley St	WP/CB/OF		5.3	28.6	1,058	423	3.3	2.3
127 Montpelier	1	Wet pond behind 75 Grandview Terrace	WP/OF/GS/CB		77.5	14.5	10,247	2,049	28.5	17.1
129 Montpelier	1	Wet pond behind 60 Chestnut Hill Rd	WP/OF/GS/CB		55.8	11.3	6,234	2,494	17.3	12.1
149 Montpelier	1	Bioretention at rear of parking lot behind 107 State St	BRA/CB	3229-9010	19.3	38.3	8,602	6,882	23.9	21.5
150 Montpelier	1	Bioretention at or near outfall	BRA/CB		1.8	79.4	1,794	359	5.0	2.0
151 Montpelier	1	Bioretention at or near outfall	BRA/CB		2.7	80.3	2,621	524	7.3	2.9
169 Montpelier	1	Wet pond behind 75 Clarendon Ave	WP/CB/GS		19.4	20.7	3,458	692	9.6	5.8
6 Montpelier	2	Wet pond at entrance to NL access road	WP/GS/CB		26.7	15.6	5,214	3,129	14.5	11.6

Montpelier - Subwatershed Prioritization and Recommendations

Watershed Number	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	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	# LID-Roof Raingardens to Treat Water Quality Volume	Raingarden Cost
1 Montpelier	0.40	0.98	$200,000		$106	$39,103	ERP,SRF, LCBP	198	$91,278
38 Montpelier	0.72	FALSE	$219,285		$22	$15,527	ERP,SRF, LCBP	360	$165,403
91 Montpelier	0.04	FALSE		$5,000	$17	$5,966	ERP,SRF, LCBP	21	$9,816
104 Montpelier	0.15	FALSE	$34,177		$33	$23,423	ERP,SRF, LCBP	74	$34,177
126 Montpelier	0.07	FALSE		$20,000	$32	$14,719	ERP,SRF, LCBP	37	$17,204
127 Montpelier	0.58	FALSE	$176,783		$27	$3,367	ERP,SRF, LCBP	290	$133,345
129 Montpelier	0.35	FALSE	$107,549		$16	$2,049	ERP,SRF, LCBP	176	$81,123
149 Montpelier	0.49	FALSE		$30,000	$17	$12,555	ERP,SRF, LCBP	243	$111,937
150 Montpelier	0.10	FALSE	$23,346		$16	$7,808	ERP,SRF, LCBP	51	$23,346
151 Montpelier	0.15	FALSE	$34,101		$16	$7,808	ERP,SRF, LCBP	74	$34,101
169 Montpelier	0.20	FALSE	$59,650		$22	$15,527	ERP,SRF, LCBP	98	$44,993
6 Montpelier	0.30	FALSE	$100,000		$48	$34,519	ERP,SRF, LCBP	148	$67,855

Montpelier - Subwatershed Prioritization and Recommendations

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	Sediment Load with Current Reductions (lbs)	Sediment Load with Priority Action (lbs)	Phosphorus Load with Current Reductions (lbs)	Phosphorus Load with Priority Action (lbs)
21 Montpelier	2	Infiltration basin on western edge of property	IB/GS/OF		5.5	64.3	3,714	371	10.3	2.1
23 Montpelier	2	Infiltration basin or rain garden to treat parking lots	IB/CB/GS		5.3	50.0	2,577	129	7.2	1.4
24 Montpelier	2	Infiltration basin to treat driveway	IB/CB/GS		3.1	49.7	1,517	834	4.2	2.5
50 Montpelier	2	Treatment Tank in park opposite 169 Berlin St	ST/CB/GS		122.7	7.8	14,985	8,991	41.6	31.2
56 Montpelier	2	Micropool Ext Detention basin at outfall at 11 Valley View Rd	EDP/CB/OF/GS		34.1	8.4	3,244	649	9.0	5.4
109 Montpelier	2	Upgrade WP behind 66 Liberty St	CB/GS/WP/SWPPP	4658-9003, 4620-9003	122.3	33.1	46,943	28,166	104.3	104.3
164 Montpelier	2	Wet pond at Park n' Ride	WP/CB/GS		28.2	14.7	3,777	755	10.5	6.3
71 Montpelier	3	Wet pond at outfall if not in flood plain	WP/CB/GS		42.9	23.4	8,634	2,590	24.0	15.6
83 Montpelier	3	Tank or sediment basin at outfall between berms	ST/OF/SWPPP	4790-9003	2.7	69.1	1,796	1,437	5.6	4.8
2 Montpelier			CB		0.4	66.1	245	245	0.7	0.7
3 Montpelier			CB/RS	3405-9010	2.4	71.9	1,447	1,447	4.5	4.5
4 Montpelier			CB/GS	3405-9010	1.6	59.8	710	710	2.2	2.2
5 Montpelier			GS/CB	3405-9010	2.7	17.9	287	287	0.9	0.9
7 Montpelier			CB/GS	3405-9010	4.0	17.1	398	398	1.2	1.2
8 Montpelier			CB/GS		2.5	25.8	555	555	1.5	1.5
9 Montpelier			CB/GS		3.5	16.3	507	507	1.4	1.4
10 Montpelier			CB		2.2	84.9	2,303	2,303	6.4	6.4

Montpelier - Subwatershed Prioritization and Recommendations

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21 Montpelier	0.21	FALSE	$192,219		$58	$23,290	ERP,SRF, LCBP	105	$48,329
23 Montpelier	0.15	FALSE	$133,367		$54	$23,290	ERP,SRF, LCBP	73	$33,532
24 Montpelier	0.09	FALSE	$78,501		$115	$46,580	ERP,SRF, LCBP	43	$19,737
50 Montpelier	0.85	FALSE	$194,996		$33	$18,739	ERP,SRF, LCBP	424	$194,996
56 Montpelier	0.18	FALSE	$55,972		$22	$15,527	ERP,SRF, LCBP	92	$42,219
109 Montpelier	2.66	FALSE		$10,000	$1	$383	ERP,SRF, LCBP	1328	$610,867
164 Montpelier	0.21	FALSE	$65,158		$22	$15,527	ERP,SRF, LCBP	107	$49,148
71 Montpelier	0.49	FALSE	$148,956		$25	$17,745	ERP,SRF, LCBP	244	$112,356
83 Montpelier	0.13	FALSE	$29,220		$81	$34,701	ERP,SRF, LCBP	64	$29,220
2 Montpelier	0.01	FALSE					ERP,SRF, LCBP	7	$3,189
3 Montpelier	0.10	FALSE					ERP,SRF, LCBP	51	$23,530
4 Montpelier	0.05	FALSE					ERP,SRF, LCBP	25	$11,555
5 Montpelier	0.02	FALSE					ERP,SRF, LCBP	10	$4,666
7 Montpelier	0.03	FALSE					ERP,SRF, LCBP	14	$6,481
8 Montpelier	0.03	FALSE					ERP,SRF, LCBP	16	$7,224
9 Montpelier	0.03	0.06					ERP,SRF, LCBP	14	$6,591
10 Montpelier	0.13	FALSE					ERP,SRF, LCBP	65	$29,973

Montpelier - Subwatershed Prioritization and Recommendations

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	Sediment Load with Current Reductions (lbs)	Sediment Load with Priority Action (lbs)	Phosphorus Load with Current Reductions (lbs)	Phosphorus Load with Priority Action (lbs)
11 Montpelier			CB/GS		7.3	43.2	3,679	3,679	10.2	10.2
12 Montpelier			OF/CB		10.3	17.6	1,588	1,588	4.4	4.4
13 Montpelier			OF/GS/CB		4.8	12.8	584	584	1.6	1.6
14 Montpelier			CB/GS		10.1	10.4	1,074	1,074	3.0	3.0
15 Montpelier			CB/GS		1.5	33.8	438	438	1.2	1.2
16 Montpelier			OF/CB		19.3	18.9	3,171	3,171	8.8	8.8
17 Montpelier			OF/CB		9.7	12.7	1,633	1,633	4.5	4.5
18 Montpelier			OF/CB		1.5	46.4	686	686	1.9	1.9
19 Montpelier			CB		1.7	48.5	942	942	2.6	2.6
20 Montpelier			CB/GS	3405-9015	1.1	71.0	151	151	1.3	1.3
22 Montpelier			GS		2.8	21.5	521	521	1.4	1.4
25 Montpelier			CB		1.5	67.9	1,258	1,258	3.5	3.5
26 Montpelier			CB		0.3	58.8	236	236	0.7	0.7
27 Montpelier			CB		0.8	59.2	586	586	1.6	1.6
28 Montpelier			GS/WP		112.4	2.4	7,957	7,957	22.1	22.1
30 Montpelier			CB/GS		25.9	7.2	2,316	2,316	6.4	6.4
31 Montpelier			CB/GS/WP		5.0	40.6	1,893	1,893	5.3	5.3
32 Montpelier			OF/GS/CB		11.1	4.0	841	841	2.3	2.3
33 Montpelier			GS/CB	3248-9010	46.3	16.1	5,571	5,571	15.5	15.5
34 Montpelier			CB/OF		3.3	9.4	336	336	0.9	0.9
35 Montpelier			CB/RS/WP	5596-9010	86.9	4.5	1,194	1,194	10.0	10.0
36 Montpelier			CB/GS		81.7	14.5	10,818	10,818	30.1	30.1
37 Montpelier			CB		0.6	77.2	602	602	1.7	1.7
39 Montpelier			CB		18.0	9.6	2,482	2,482	6.9	6.9
40 Montpelier			CB		26.2	3.0	2,196	2,196	6.1	6.1
43 Montpelier			CB		2.1	40.6	981	981	2.7	2.7
45 Montpelier			CB		8.5	6.7	953	953	2.6	2.6
46 Montpelier			CB		1.1	39.0	478	478	1.3	1.3
47 Montpelier			CB		2.5	40.1	1,180	1,180	3.3	3.3
48 Montpelier			CB		1.4	19.5	331	331	0.9	0.9
49 Montpelier			CB		16.8	7.3	1,980	1,980	5.5	5.5
51 Montpelier			CB		1.7	40.2	786	786	2.2	2.2
52 Montpelier			CB/OF		7.5	25.1	2,204	2,204	6.1	6.1
53 Montpelier			CB/OF		13.7	21.2	3,475	3,475	9.7	9.7
54 Montpelier			CB		4.2	37.8	1,842	1,842	5.1	5.1
55 Montpelier			CB/OF/GS		94.9	4.9	7,501	7,501	20.8	20.8
57 Montpelier			CB/OF/GS		63.9	14.3	11,677	11,677	32.4	32.4
58 Montpelier			CB/OF/GS		14.5	23.7	4,029	4,029	11.2	11.2
59 Montpelier			OF		8.6	72.5	7,617	7,617	21.2	21.2
60 Montpelier			CB/GS		31.1	18.7	5,051	5,051	14.0	14.0

Montpelier - Subwatershed Prioritization and Recommendations

Watershed Number	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	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	# LID-Roof Raingardens to Treat Water Quality Volume	Raingarden Cost
11 Montpelier	0.21	0.35					ERP,SRF, LCBP	104	$47,874
12 Montpelier	0.09	0.20					ERP,SRF, LCBP	45	$20,670
13 Montpelier	0.03	0.07					ERP,SRF, LCBP	17	$7,601
14 Montpelier	0.06	0.12					ERP,SRF, LCBP	30	$13,974
15 Montpelier	0.02	0.05					ERP,SRF, LCBP	12	$5,703
16 Montpelier	0.18	FALSE					ERP,SRF, LCBP	90	$41,261
17 Montpelier	0.09	FALSE					ERP,SRF, LCBP	46	$21,251
18 Montpelier	0.04	FALSE					ERP,SRF, LCBP	19	$8,930
19 Montpelier	0.05	FALSE					ERP,SRF, LCBP	27	$12,254
20 Montpelier	0.04	FALSE					ERP,SRF, LCBP	21	$9,804
22 Montpelier	0.03	FALSE					ERP,SRF, LCBP	15	$6,786
25 Montpelier	0.07	FALSE					ERP,SRF, LCBP	36	$16,369
26 Montpelier	0.01	FALSE					ERP,SRF, LCBP	7	$3,072
27 Montpelier	0.03	FALSE					ERP,SRF, LCBP	17	$7,630
28 Montpelier	0.45	FALSE					ERP,SRF, LCBP	225	$103,544
30 Montpelier	0.13	FALSE					ERP,SRF, LCBP	66	$30,135
31 Montpelier	0.11	FALSE					ERP,SRF, LCBP	54	$24,636
32 Montpelier	0.05	FALSE					ERP,SRF, LCBP	24	$10,945
33 Montpelier	0.32	FALSE					ERP,SRF, LCBP	158	$72,488
34 Montpelier	0.02	FALSE					ERP,SRF, LCBP	10	$4,378
35 Montpelier	0.34	FALSE					ERP,SRF, LCBP	169	$77,691
36 Montpelier	0.61	1.31					ERP,SRF, LCBP	306	$140,778
37 Montpelier	0.03	0.05					ERP,SRF, LCBP	17	$7,836
39 Montpelier	0.14	FALSE					ERP,SRF, LCBP	70	$32,295
40 Montpelier	0.12	FALSE					ERP,SRF, LCBP	62	$28,582
43 Montpelier	0.06	FALSE					ERP,SRF, LCBP	28	$12,766
45 Montpelier	0.05	FALSE					ERP,SRF, LCBP	27	$12,401
46 Montpelier	0.03	0.05					ERP,SRF, LCBP	14	$6,221
47 Montpelier	0.07	FALSE					ERP,SRF, LCBP	33	$15,354
48 Montpelier	0.02	FALSE					ERP,SRF, LCBP	9	$4,302
49 Montpelier	0.11	FALSE					ERP,SRF, LCBP	56	$25,769
51 Montpelier	0.04	FALSE					ERP,SRF, LCBP	22	$10,222
52 Montpelier	0.12	FALSE					ERP,SRF, LCBP	62	$28,675
53 Montpelier	0.20	FALSE					ERP,SRF, LCBP	98	$45,220
54 Montpelier	0.10	FALSE					ERP,SRF, LCBP	52	$23,969
55 Montpelier	0.42	FALSE					ERP,SRF, LCBP	212	$97,615
57 Montpelier	0.66	FALSE					ERP,SRF, LCBP	330	$151,956
58 Montpelier	0.23	FALSE					ERP,SRF, LCBP	114	$52,429
59 Montpelier	0.43	0.69					ERP,SRF, LCBP	215	$99,125
60 Montpelier	0.29	0.64					ERP,SRF, LCBP	143	$65,727

Montpelier - Subwatershed Prioritization and Recommendations

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	Sediment Load with Current Reductions (lbs)	Sediment Load with Priority Action (lbs)	Phosphorus Load with Current Reductions (lbs)	Phosphorus Load with Priority Action (lbs)
62 Montpelier			CB/GS/WP		42.9	11.3	4,798	4,798	13.3	13.3
63 Montpelier			CB/GS		32.7	11.3	3,638	3,638	10.1	10.1
64 Montpelier			CB/GS		3.1	60.3	1,947	1,947	5.4	5.4
65 Montpelier			CB/GS		61.0	4.2	4,668	4,668	13.0	13.0
66 Montpelier			CB/GS		11.3	14.0	1,454	1,454	4.0	4.0
67 Montpelier			CB/GS		17.8	23.9	4,999	4,999	13.9	13.9
68 Montpelier			CB/GS		8.1	39.8	3,745	3,745	10.4	10.4
69 Montpelier			CB		1.5	16.3	214	214	0.6	0.6
70 Montpelier			CB/DW/WP	4257-9015	3.4	87.5	666	666	5.5	5.5
72 Montpelier			CB/GS		2.9	50.9	1,724	1,724	4.8	4.8
73 Montpelier			CB/GS	3492-9010	10.0	13.9	651	651	2.4	2.4
75 Montpelier			CB/GS	4216-9015	10.5	15.0	600	600	2.5	2.5
76 Montpelier			CB/GS		4.8	21.2	880	880	2.4	2.4
77 Montpelier			CB		4.7	24.4	988	988	2.7	2.7
78 Montpelier			CB/GS		6.0	26.6	1,374	1,374	3.8	3.8
79 Montpelier			CB/OF		399.6	4.8	31,506	31,506	87.5	87.5
80 Montpelier			CB/GS		4.4	37.2	1,493	1,493	4.1	4.1
81 Montpelier			CB/GS	3146-9010	19.0	51.4	5,173	5,173	19.2	19.2
82 Montpelier			CB/GS/SWPPP	4790-9003	3.8	88.4	3,315	3,315	10.4	10.4
84 Montpelier			WP/CB/GS/DW	3146-9010, 3146-9015.1	109.1	8.9	1,653	1,653	13.8	13.8
85 Montpelier			OF		4.6	47.5	2,568	2,568	7.1	7.1
86 Montpelier			GS/CB		38.0	13.5	4,768	4,768	13.2	13.2
87 Montpelier			GS/OF		27.0	9.6	2,751	2,751	7.6	7.6
88 Montpelier			CB/OF		73.9	7.0	6,527	6,527	18.1	18.1
90 Montpelier			CB/OF		0.4	73.1	379	379	1.1	1.1
92 Montpelier			CB		8.8	66.2	7,557	7,557	21.0	21.0
94 Montpelier			CB		1.6	78.3	1,555	1,555	4.3	4.3
95 Montpelier			CB/OF		38.9	32.4	14,634	14,634	40.6	40.6
96 Montpelier			CB		6.1	54.9	3,944	3,944	11.0	11.0
97 Montpelier			CB		3.4	64.4	2,654	2,654	7.4	7.4
98 Montpelier			CB		3.0	78.0	2,830	2,830	7.9	7.9
99 Montpelier			CB		1.1	88.6	1,222	1,222	3.4	3.4
100 Montpelier			CB/GS/OF		45.0	36.6	19,158	19,158	53.2	53.2
101 Montpelier			GS/OF		24.5	17.0	3,672	3,672	10.2	10.2
102 Montpelier			CB/GS		17.6	12.8	2,129	2,129	5.9	5.9
103 Montpelier			CB		7.0	84.1	7,472	7,472	20.8	20.8
105 Montpelier			CB		0.4	99.9	509	509	1.4	1.4
108 Montpelier			OF		0.6	98.5	746	746	2.1	2.1
110 Montpelier			GS/EDP	3206-9015	85.3	5.1	2,368	2,368	11.5	11.5
111 Montpelier			OF/GS/CB		27.4	3.3	2,013	2,013	5.6	5.6

Montpelier - Subwatershed Prioritization and Recommendations

Watershed Number	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	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	# LID-Roof Raingardens to Treat Water Quality Volume	Raingarden Cost
62 Montpelier	0.27	0.54					ERP,SRF, LCBP	136	$62,434
63 Montpelier	0.21	0.40					ERP,SRF, LCBP	103	$47,338
64 Montpelier	0.11	0.21					ERP,SRF, LCBP	55	$25,337
65 Montpelier	0.26	0.28					ERP,SRF, LCBP	132	$60,738
66 Montpelier	0.08	FALSE					ERP,SRF, LCBP	41	$18,927
67 Montpelier	0.28	FALSE					ERP,SRF, LCBP	141	$65,055
68 Montpelier	0.21	FALSE					ERP,SRF, LCBP	106	$48,739
69 Montpelier	0.01	FALSE					ERP,SRF, LCBP	6	$2,788
70 Montpelier	0.19	FALSE					ERP,SRF, LCBP	94	$43,318
72 Montpelier	0.10	FALSE					ERP,SRF, LCBP	49	$22,431
73 Montpelier	0.06	FALSE					ERP,SRF, LCBP	31	$14,125
75 Montpelier	0.07	0.17					ERP,SRF, LCBP	34	$15,611
76 Montpelier	0.05	FALSE					ERP,SRF, LCBP	25	$11,451
77 Montpelier	0.06	FALSE					ERP,SRF, LCBP	28	$12,861
78 Montpelier	0.08	FALSE					ERP,SRF, LCBP	39	$17,878
79 Montpelier	1.78	FALSE					ERP,SRF, LCBP	891	$409,980
80 Montpelier	0.08	FALSE					ERP,SRF, LCBP	42	$19,429
81 Montpelier	0.49	FALSE					ERP,SRF, LCBP	244	$112,185
82 Montpelier	0.23	FALSE					ERP,SRF, LCBP	117	$53,915
84 Montpelier	0.47	FALSE					ERP,SRF, LCBP	234	$107,528
85 Montpelier	0.15	FALSE					ERP,SRF, LCBP	73	$33,420
86 Montpelier	0.27	FALSE					ERP,SRF, LCBP	135	$62,049
87 Montpelier	0.16	FALSE					ERP,SRF, LCBP	78	$35,796
88 Montpelier	0.37	FALSE					ERP,SRF, LCBP	185	$84,929
90 Montpelier	0.02	FALSE					ERP,SRF, LCBP	11	$4,933
92 Montpelier	0.43	FALSE					ERP,SRF, LCBP	214	$98,340
94 Montpelier	0.09	FALSE					ERP,SRF, LCBP	44	$20,236
95 Montpelier	0.83	FALSE					ERP,SRF, LCBP	414	$190,426
96 Montpelier	0.22	FALSE					ERP,SRF, LCBP	112	$51,323
97 Montpelier	0.15	FALSE					ERP,SRF, LCBP	75	$34,542
98 Montpelier	0.16	FALSE					ERP,SRF, LCBP	80	$36,824
99 Montpelier	0.07	0.11					ERP,SRF, LCBP	35	$15,906
100 Montpelier	1.08	1.81					ERP,SRF, LCBP	542	$249,302
101 Montpelier	0.21	0.46					ERP,SRF, LCBP	104	$47,782
102 Montpelier	0.12	FALSE					ERP,SRF, LCBP	60	$27,706
103 Montpelier	0.42	FALSE					ERP,SRF, LCBP	211	$97,228
105 Montpelier	0.03	FALSE					ERP,SRF, LCBP	14	$6,620
108 Montpelier	0.04	FALSE					ERP,SRF, LCBP	21	$9,705
110 Montpelier	0.33	FALSE					ERP,SRF, LCBP	167	$77,025
111 Montpelier	0.11	0.10					ERP,SRF, LCBP	57	$26,191

Montpelier - Subwatershed Prioritization and Recommendations

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	Sediment Load with Current Reductions (lbs)	Sediment Load with Priority Action (lbs)	Phosphorus Load with Current Reductions (lbs)	Phosphorus Load with Priority Action (lbs)
112 Montpelier			OF/GS/EDP	3206-9010, 3205-9010	17.1	28.7	2,155	2,155	8.0	8.0
113 Montpelier			CB/GS		4.6	14.1	832	832	2.3	2.3
114 Montpelier			CB		45.5	25.0	13,323	13,323	37.0	37.0
115 Montpelier			CB		2.1	60.9	1,530	1,530	4.3	4.3
116 Montpelier			CB		1.4	42.4	821	821	2.3	2.3
117 Montpelier			OF/CB/GS		66.6	3.0	4,830	4,830	13.4	13.4
118 Montpelier			OF/CB/GS		47.9	3.9	3,613	3,613	10.0	10.0
119 Montpelier			CB		0.9	31.2	248	248	0.7	0.7
120 Montpelier			OF/GS		14.5	7.2	1,296	1,296	3.6	3.6
121 Montpelier			GS/OF		38.3	5.8	3,178	3,178	8.8	8.8
122 Montpelier			GS/OF/CB	3205-9010	25.1	12.3	1,514	1,514	5.6	5.6
124 Montpelier			CB/SWPPP/SB	6472-9003	23.6	5.7	1,069	1,069	4.0	4.0
125 Montpelier			CB		2.6	80.4	2,534	2,534	7.0	7.0
130 Montpelier			WP/GS		5.9	7.1	471	471	1.3	1.3
131 Montpelier			GS/WP/OF		57.9	7.2	4,619	4,619	12.8	12.8
132 Montpelier			GS/OF		87.2	3.2	6,389	6,389	17.7	17.7
133 Montpelier			WP/GS/CB		99.4	10.1	14,216	14,216	39.5	39.5
134 Montpelier			URB/GS/CB	6679-INDS	34.3	11.8	569	569	3.2	3.2
135 Montpelier			CB		15.6	19.7	2,668	2,668	7.4	7.4
136 Montpelier			CB/UD		7.3	27.7	2,345	2,345	6.5	6.5
137 Montpelier			GS/CB/OF	3239-9010	115.3	2.8	4,771	4,771	17.7	17.7
138 Montpelier			WP/CB		104.6	4.5	8,137	8,137	22.6	22.6
139 Montpelier			CB		12.8	8.4	1,219	1,219	3.4	3.4
140 Montpelier			CB		34.4	22.4	9,123	9,123	25.3	25.3
141 Montpelier			CB		0.5	46.1	252	252	0.7	0.7
142 Montpelier			CB		6.8	29.9	2,383	2,383	6.6	6.6
144 Montpelier			CB		17.6	20.6	4,332	4,332	12.0	12.0
145 Montpelier			CB		0.8	87.3	932	932	2.6	2.6
146 Montpelier			CB		2.3	79.2	2,336	2,336	6.5	6.5
147 Montpelier			CB		0.2	93.8	203	203	0.6	0.6
152 Montpelier			CB/GS		58.4	16.1	8,360	8,360	23.2	23.2
153 Montpelier			CB		2.9	85.6	3,103	3,103	8.6	8.6
154 Montpelier			CB/OF	3229-9010	20.0	25.1	5,879	5,879	16.3	16.3
155 Montpelier			CB		3.9	29.1	1,319	1,319	3.7	3.7
156 Montpelier			CB/BRA	4036-9010, 3229-9010	10.4	66.5	8,310	8,310	23.1	23.1
157 Montpelier			OF/GS		70.8	6.5	6,102	6,102	16.9	16.9
158 Montpelier			IG/CB	7196-9015	101.8	5.9	7,168	358	19.9	4.0

Montpelier - Subwatershed Prioritization and Recommendations

Watershed Number	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	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	# LID-Roof Raingardens to Treat Water Quality Volume	Raingarden Cost
112 Montpelier	0.20	0.54					ERP,SRF, LCBP	102	$46,741
113 Montpelier	0.05	0.07					ERP,SRF, LCBP	24	$10,822
114 Montpelier	0.75	1.25					ERP,SRF, LCBP	377	$173,375
115 Montpelier	0.09	0.14					ERP,SRF, LCBP	43	$19,913
116 Montpelier	0.05	0.07					ERP,SRF, LCBP	23	$10,688
117 Montpelier	0.27	0.22					ERP,SRF, LCBP	137	$62,856
118 Montpelier	0.20	0.21					ERP,SRF, LCBP	102	$47,017
119 Montpelier	0.01	0.03					ERP,SRF, LCBP	7	$3,225
120 Montpelier	0.07	0.11					ERP,SRF, LCBP	37	$16,862
121 Montpelier	0.18	0.25					ERP,SRF, LCBP	90	$41,358
122 Montpelier	0.14	0.34					ERP,SRF, LCBP	71	$32,834
124 Montpelier	0.10	FALSE					ERP,SRF, LCBP	50	$23,191
125 Montpelier	0.14	FALSE					ERP,SRF, LCBP	72	$32,978
130 Montpelier	0.03	FALSE					ERP,SRF, LCBP	13	$6,127
131 Montpelier	0.26	FALSE					ERP,SRF, LCBP	131	$60,106
132 Montpelier	0.36	0.31					ERP,SRF, LCBP	181	$83,145
133 Montpelier	0.80	FALSE					ERP,SRF, LCBP	402	$184,993
134 Montpelier	0.16	FALSE					ERP,SRF, LCBP	80	$37,005
135 Montpelier	0.15	FALSE					ERP,SRF, LCBP	75	$34,713
136 Montpelier	0.13	FALSE					ERP,SRF, LCBP	66	$30,520
137 Montpelier	0.45	FALSE					ERP,SRF, LCBP	225	$103,481
138 Montpelier	0.46	FALSE					ERP,SRF, LCBP	230	$105,887
139 Montpelier	0.07	FALSE					ERP,SRF, LCBP	34	$15,868
140 Montpelier	0.52	FALSE					ERP,SRF, LCBP	258	$118,723
141 Montpelier	0.01	FALSE					ERP,SRF, LCBP	7	$3,277
142 Montpelier	0.13	FALSE					ERP,SRF, LCBP	67	$31,009
144 Montpelier	0.25	FALSE					ERP,SRF, LCBP	123	$56,371
145 Montpelier	0.05	FALSE					ERP,SRF, LCBP	26	$12,129
146 Montpelier	0.13	FALSE					ERP,SRF, LCBP	66	$30,394
147 Montpelier	0.01	FALSE					ERP,SRF, LCBP	6	$2,637
152 Montpelier	0.47	FALSE					ERP,SRF, LCBP	236	$108,785
153 Montpelier	0.18	FALSE					ERP,SRF, LCBP	88	$40,385
154 Montpelier	0.33	FALSE					ERP,SRF, LCBP	166	$76,503
155 Montpelier	0.07	0.12					ERP,SRF, LCBP	37	$17,159
156 Montpelier	0.47	FALSE					ERP,SRF, LCBP	235	$108,143
157 Montpelier	0.35	FALSE					ERP,SRF, LCBP	173	$79,398
158 Montpelier	0.41	FALSE					ERP,SRF, LCBP	203	$93,279

Montpelier - Subwatershed Prioritization and Recommendations

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	Sediment Load with Current Reductions (lbs)	Sediment Load with Priority Action (lbs)	Phosphorus Load with Current Reductions (lbs)	Phosphorus Load with Priority Action (lbs)
159 Montpelier			CB		39.5	5.3	3,183	3,183	8.8	8.8
160 Montpelier			CB/GS		55.7	19.4	9,391	9,391	26.1	26.1
162 Montpelier			CB/GS	3261-9010	27.2	19.9	3,736	3,736	11.7	11.7
163 Montpelier			CB		21.5	12.9	2,609	2,609	7.2	7.2
165 Montpelier			IB/GS/OF	6428-9015	56.7	27.2	10,709	10,709	33.5	33.5
166 Montpelier			OF/GS/CB		39.3	20.2	6,863	6,863	19.1	19.1
167 Montpelier			OF/GS		22.2	20.8	3,999	3,999	11.1	11.1
168 Montpelier			CB/GS		26.3	13.8	3,341	3,341	9.3	9.3
170 Montpelier			GS/OF/CB		35.1	7.7	3,229	3,229	9.0	9.0
171 Montpelier			GS/OF/CB/SB/WP		100.3	2.9	7,252	7,252	20.1	20.1
172 Montpelier			CB/OF		7.3	31.5	2,036	2,036	5.7	5.7
173 Montpelier			CB/OF		22.5	10.4	2,391	2,391	6.6	6.6
174 Montpelier			CB/OF		45.3	2.2	3,186	3,186	8.9	8.9
175 Montpelier			CB/OF		24.0	6.6	2,084	2,084	5.8	5.8
176 Montpelier			CB/OF/GS		41.7	12.4	4,927	4,927	13.7	13.7
177 Montpelier			CB/OF/GS		29.0	23.8	8,136	8,136	22.6	22.6
179 Montpelier			CB/GS/OF		6.1	23.8	1,701	1,701	4.7	4.7
180 Montpelier			CB	4820-9010	2.3	59.1	1,630	1,630	4.8	4.8
181 Montpelier			CB/OF		3.3	82.2	3,345	3,345	9.3	9.3
182 Montpelier			CB/OF		6.6	21.3	1,210	1,210	3.4	3.4
183 Montpelier			CB		3.0	72.8	2,804	2,804	7.8	7.8
184 Montpelier			CB		3.3	93.9	3,917	3,917	10.9	10.9
3000a Montpelier			CB		0.3	34.4	157	157	0.4	0.4
3000b Montpelier			CB/OF		0.3	56.0	197	197	0.5	0.5
3000c Montpelier			CB/OF/GS		11.9	7.5	1,078	1,078	3.0	3.0
3000e Montpelier			CB		4.7	58.5	3,609	3,609	10.0	10.0
3000f Montpelier			CB		0.5	36.9	256	256	0.7	0.7
3000g Montpelier			CB		0.1	95.7	116	116	0.3	0.3
3000h Montpelier			CB		0.0	100.0	51	51	0.1	0.1
3000i Montpelier			CB		10.4	39.6	5,600	5,600	15.6	15.6
3000j Montpelier			CB		5.9	1.5	405	405	1.1	1.1
3000l Montpelier			CB		1.1	19.8	262	262	0.7	0.7
3000m Montpelier			CB		9.0	14.1	1,166	1,166	3.2	3.2

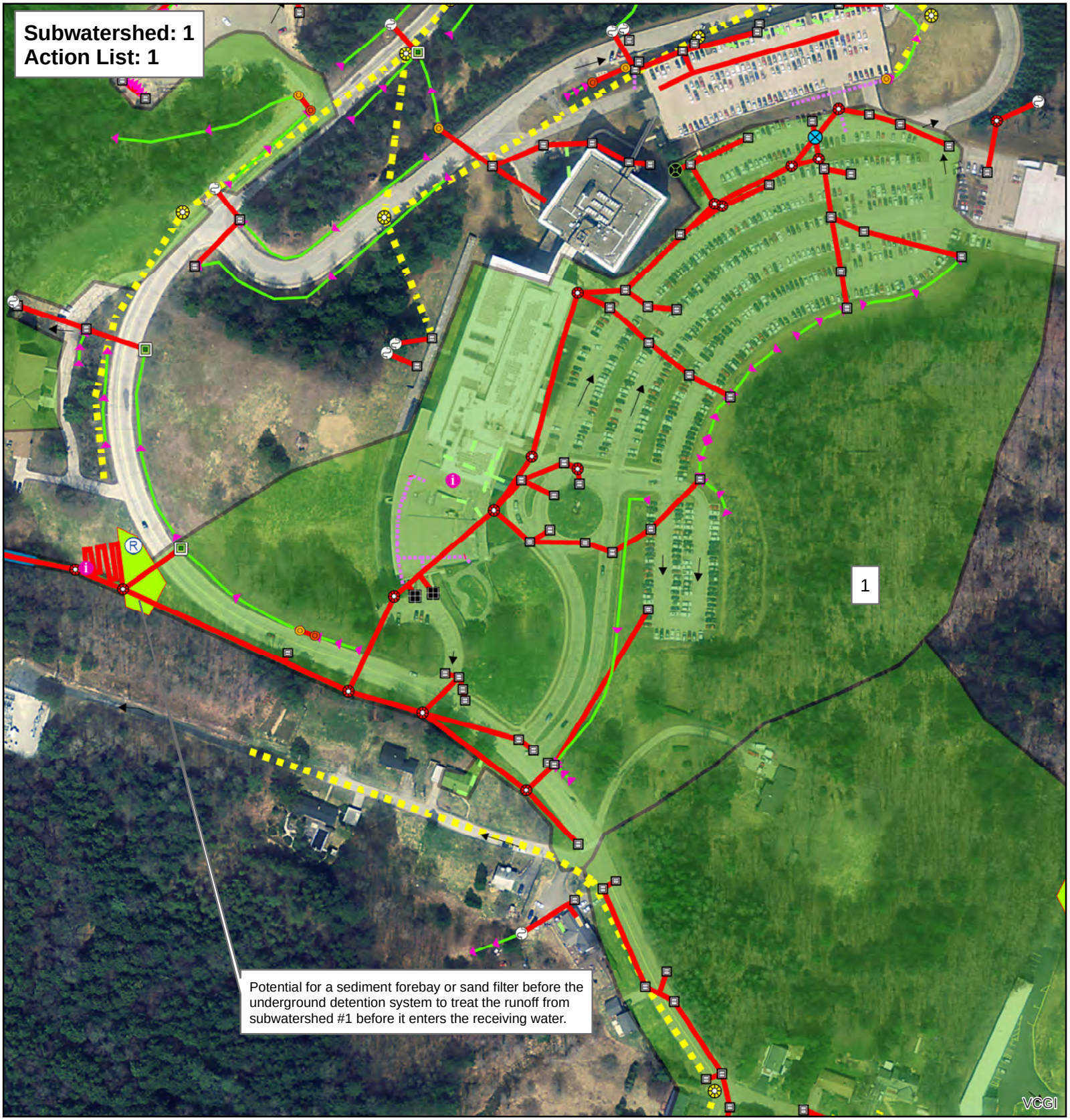
Montpelier - Subwatershed Prioritization and Recommendations

Watershed Number	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	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	# LID-Roof Raingardens to Treat Water Quality Volume	Raingarden Cost
159 Montpelier	0.18	FALSE					ERP,SRF, LCBP	90	$41,426
160 Montpelier	0.53	FALSE					ERP,SRF, LCBP	266	$122,210
162 Montpelier	0.26	FALSE					ERP,SRF, LCBP	132	$60,773
163 Montpelier	0.15	FALSE					ERP,SRF, LCBP	74	$33,950
165 Montpelier	0.76	1.70					ERP,SRF, LCBP	379	$174,201
166 Montpelier	0.39	FALSE					ERP,SRF, LCBP	194	$89,309
167 Montpelier	0.23	0.51					ERP,SRF, LCBP	113	$52,035
168 Montpelier	0.19	0.40					ERP,SRF, LCBP	95	$43,479
170 Montpelier	0.18	0.30					ERP,SRF, LCBP	91	$42,024
171 Montpelier	0.41	0.32					ERP,SRF, LCBP	205	$94,372
172 Montpelier	0.12	0.25					ERP,SRF, LCBP	58	$26,496
173 Montpelier	0.14	0.26					ERP,SRF, LCBP	68	$31,111
174 Montpelier	0.18	0.11					ERP,SRF, LCBP	90	$41,461
175 Montpelier	0.12	0.18					ERP,SRF, LCBP	59	$27,123
176 Montpelier	0.28	0.57					ERP,SRF, LCBP	139	$64,109
177 Montpelier	0.46	FALSE					ERP,SRF, LCBP	230	$105,868
179 Montpelier	0.10	FALSE					ERP,SRF, LCBP	48	$22,137
180 Montpelier	0.10	FALSE					ERP,SRF, LCBP	51	$23,564
181 Montpelier	0.19	FALSE					ERP,SRF, LCBP	95	$43,532
182 Montpelier	0.07	FALSE					ERP,SRF, LCBP	34	$15,743
183 Montpelier	0.16	FALSE					ERP,SRF, LCBP	79	$36,494
184 Montpelier	0.22	FALSE					ERP,SRF, LCBP	111	$50,973
3000a Montpelier	0.01	FALSE					ERP,SRF, LCBP	4	$2,046
3000b Montpelier	0.01	0.02					ERP,SRF, LCBP	6	$2,563
3000c Montpelier	0.06	FALSE					ERP,SRF, LCBP	30	$14,030
3000e Montpelier	0.20	FALSE					ERP,SRF, LCBP	102	$46,960
3000f Montpelier	0.01	FALSE					ERP,SRF, LCBP	7	$3,333
3000g Montpelier	0.01	FALSE					ERP,SRF, LCBP	3	$1,504
3000h Montpelier	0.00	FALSE					ERP,SRF, LCBP	1	$670
3000i Montpelier	0.32	FALSE					ERP,SRF, LCBP	158	$72,874
3000j Montpelier	0.02	FALSE					ERP,SRF, LCBP	11	$5,273
3000l Montpelier	0.01	FALSE					ERP,SRF, LCBP	7	$3,406
3000m Montpelier	0.07	FALSE					ERP,SRF, LCBP	33	$15,175

Target Maps

Showing Priority Action List Drainage Areas

And Potential Retrofit Locations



Montpelier, 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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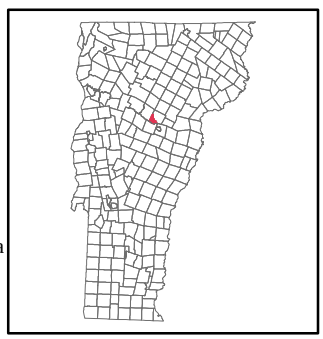
VERMONT



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
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- Swale
- Footing drain
- Under drain
- Roof drain
- Infiltration pipe
- French drain
- Trench drain
- Emergency spillway
- Stream
- Overland flow

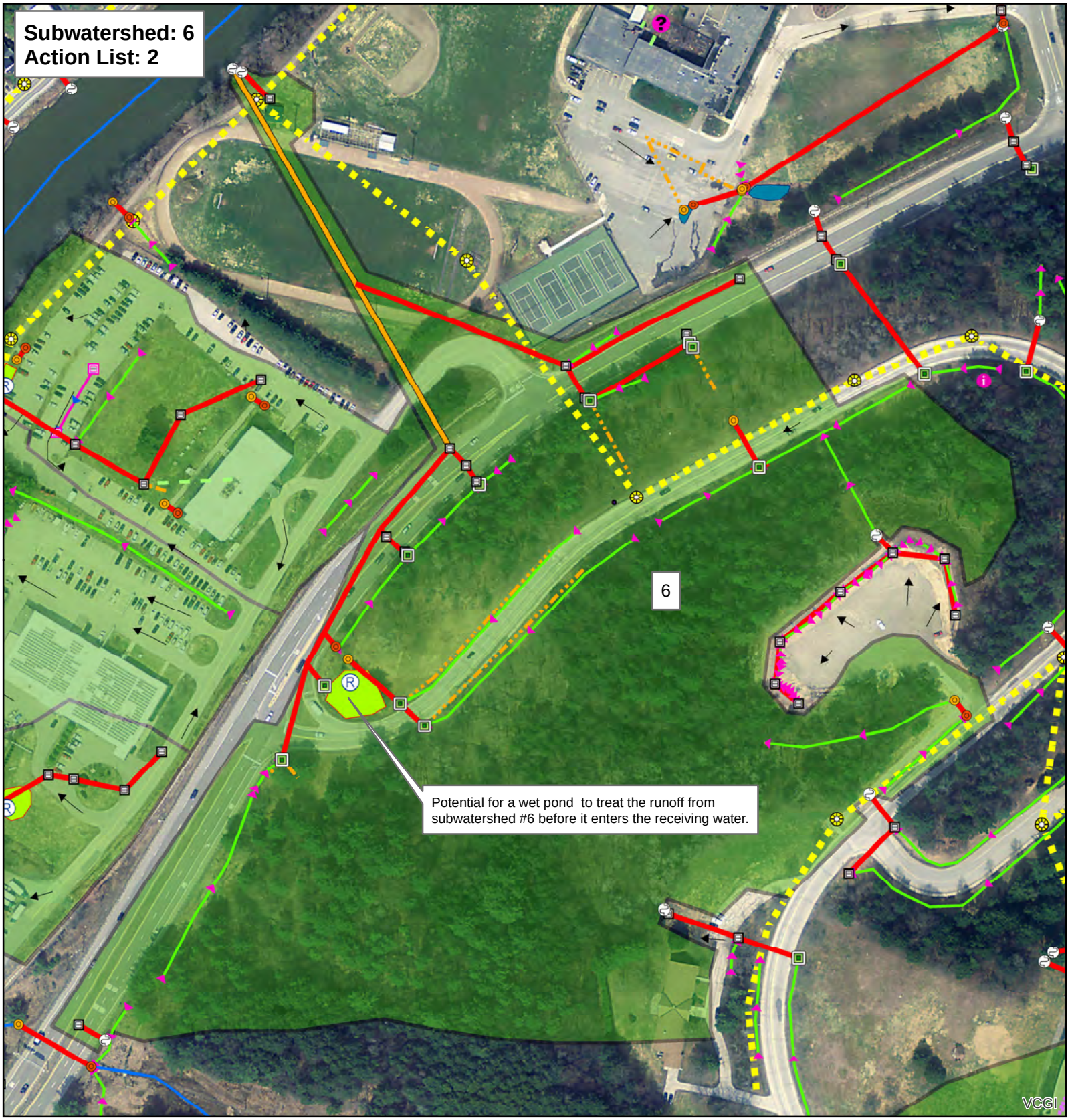
NRCS - Soils

- 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: 7/23/2015
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survery
Imagery Source: VCGI



Montpelier, VT

DEC Stormwater Infrastructure Mapping Project

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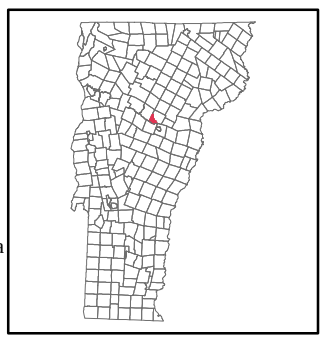

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NRCS - Soils

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SubwatershedID

- Priority Subwatershed
- Stormwater Treatment Area
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Creator: Jim Pease, David Ainley
DEC - WSMD - Ecosystem Restoration Program
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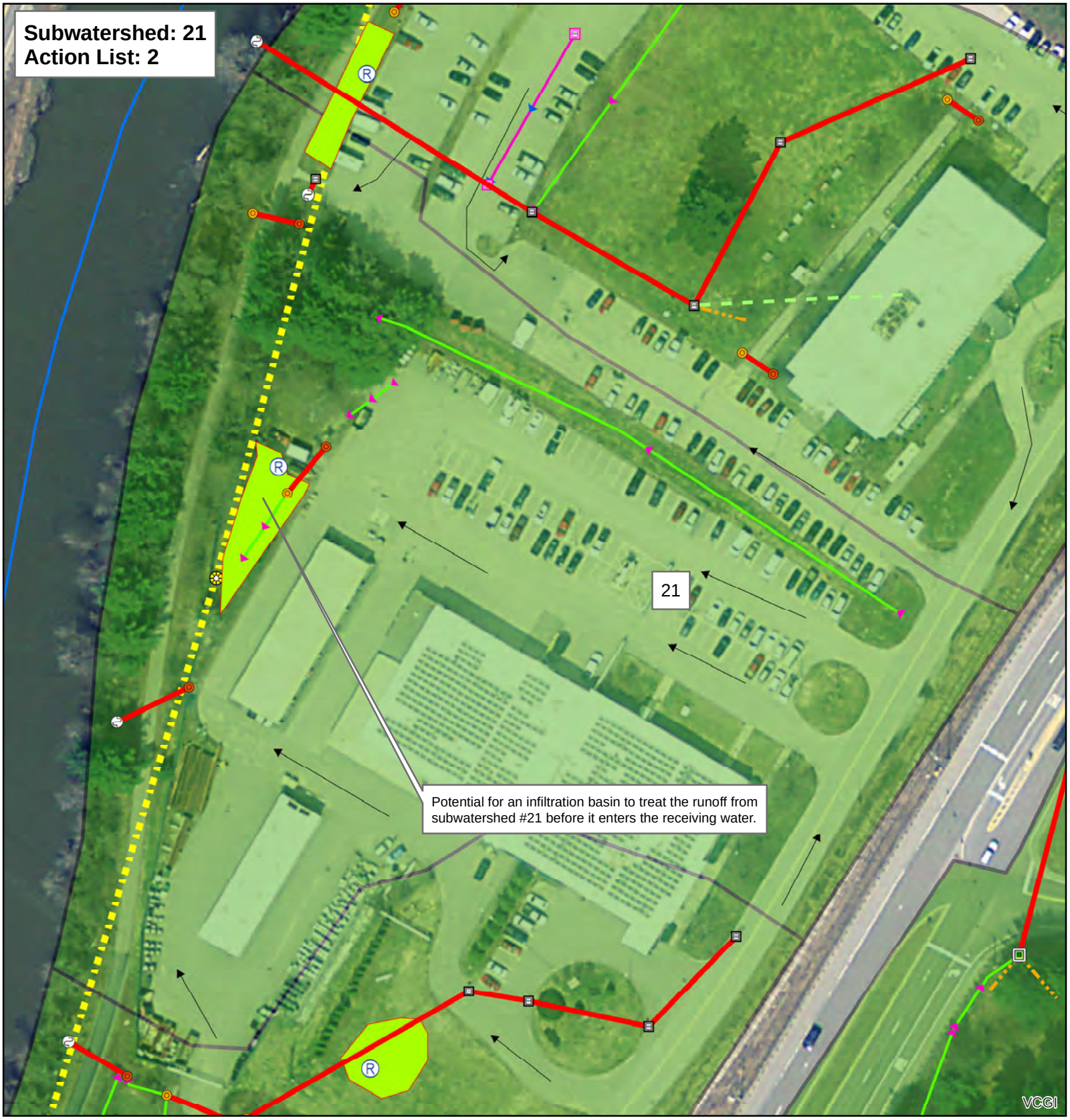

Montpelier, VT

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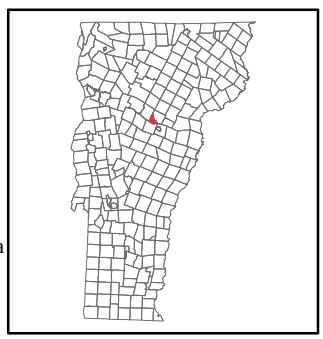

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NRCS - Soils

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SubwatershedID

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Creator: Jim Pease, David Ainley
DEC - WSMD - Ecosystem Restoration Program
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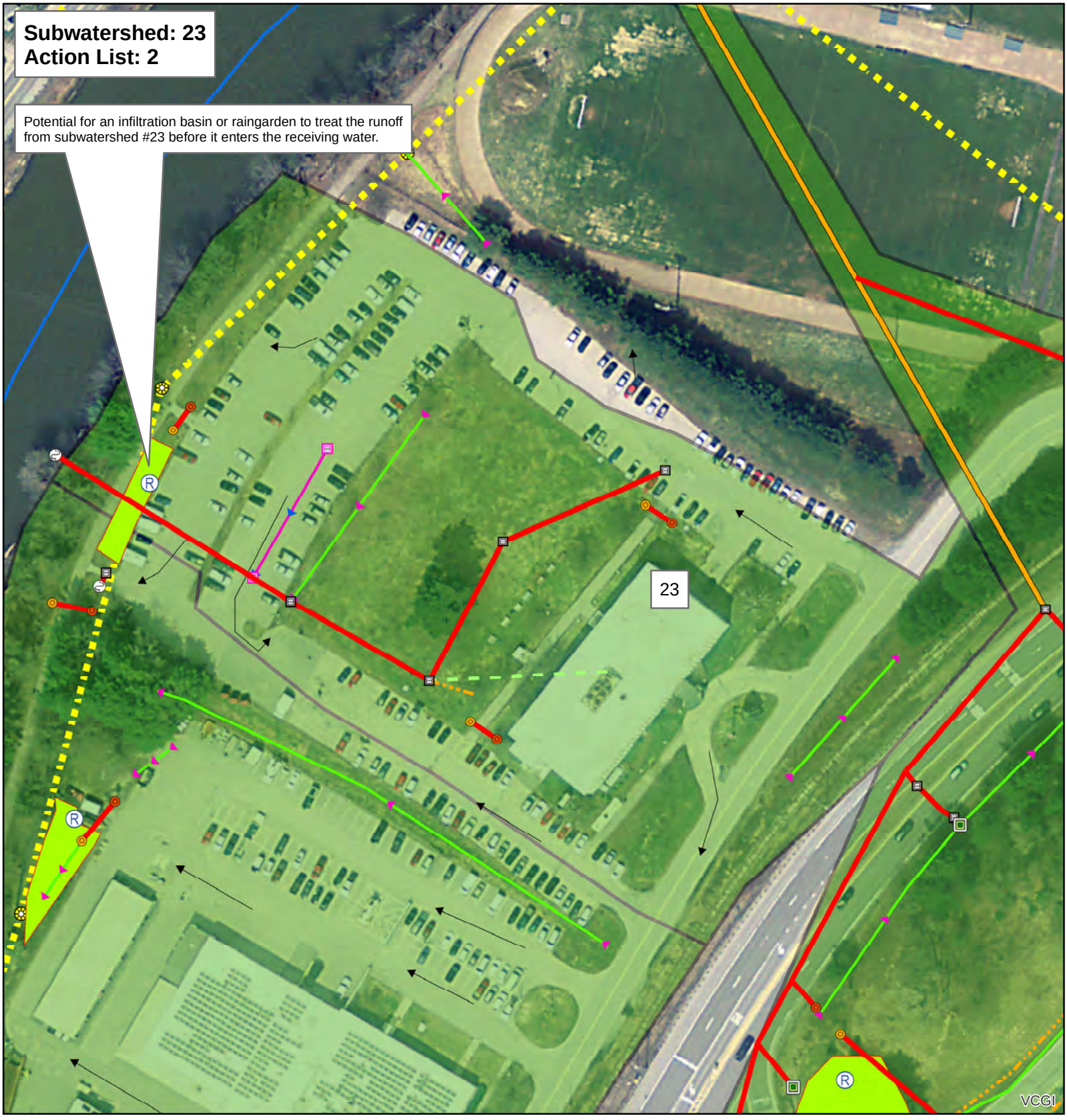

Montpelier, VT

DEC Stormwater Infrastructure Mapping Project

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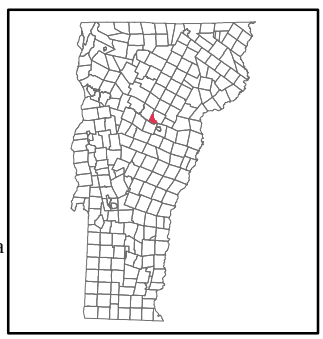

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NRCS - Soils

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SubwatershedID

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- Potential Stormwater Treatment Area

Creator: Jim Pease, David Ainley
DEC - WSMD - Ecosystem Restoration Program
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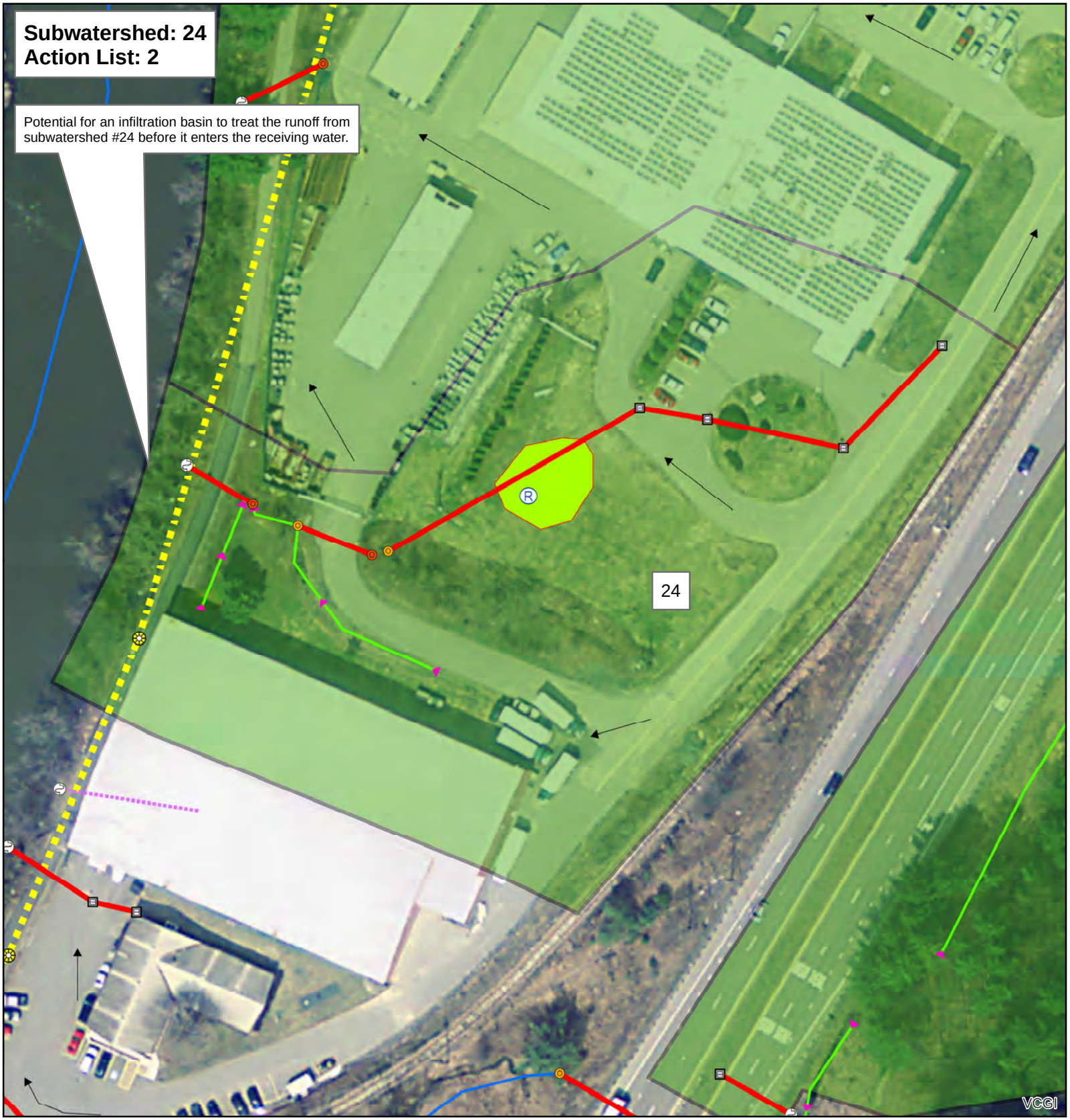

Montpelier, VT

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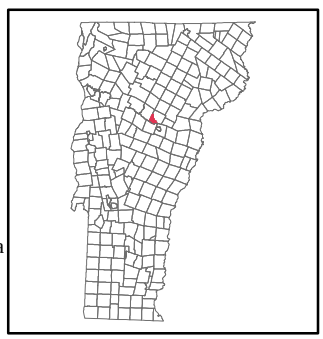

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NRCS - Soils

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SubwatershedID

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Creator: Jim Pease, David Ainley
DEC - WSMD - Ecosystem Restoration Program
Plotted Date: 7/23/2015
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survery
Imagery Source: VCGI

Subwatershed: 38
Action List: 1

Potential for an extended detention basin to treat the runoff from subwatershed #38 before it enters the receiving water.

38

VCGI

Montpelier, VT

DEC Stormwater Infrastructure Mapping Project

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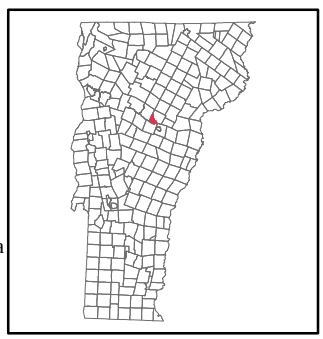

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NRCS - Soils

- A
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SubwatershedID

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

Creator: Jim Pease, David Ainley
DEC - WSMD - Ecosystem Restoration Program
Plotted Date: 7/23/2015
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survery
Imagery Source: VCGI

Subwatershed: 50
Action List: 2

Potential for a treatment tank opposite 169 Berlin Street to treat the runoff from subwatershed #50 before it enters the receiving water.

50

VCGI

Montpelier, VT

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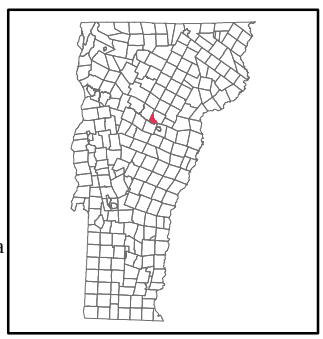

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NRCS - Soils

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SubwatershedID

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DEC - WSMD - Ecosystem Restoration Program
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Subwatershed: 56
Action List: 2

56

Potential for a micropool extended detention basin to treat the runoff from subwatershed #56 before it enters the receiving water.

VCGI

Montpelier, VT

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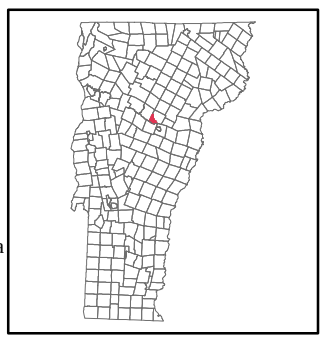

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NRCS - Soils

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SubwatershedID

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- Stormwater Treatment Area
- Potential Stormwater Treatment Area

Creator: Jim Pease, David Ainley
DEC - WSMD - Ecosystem Restoration Program
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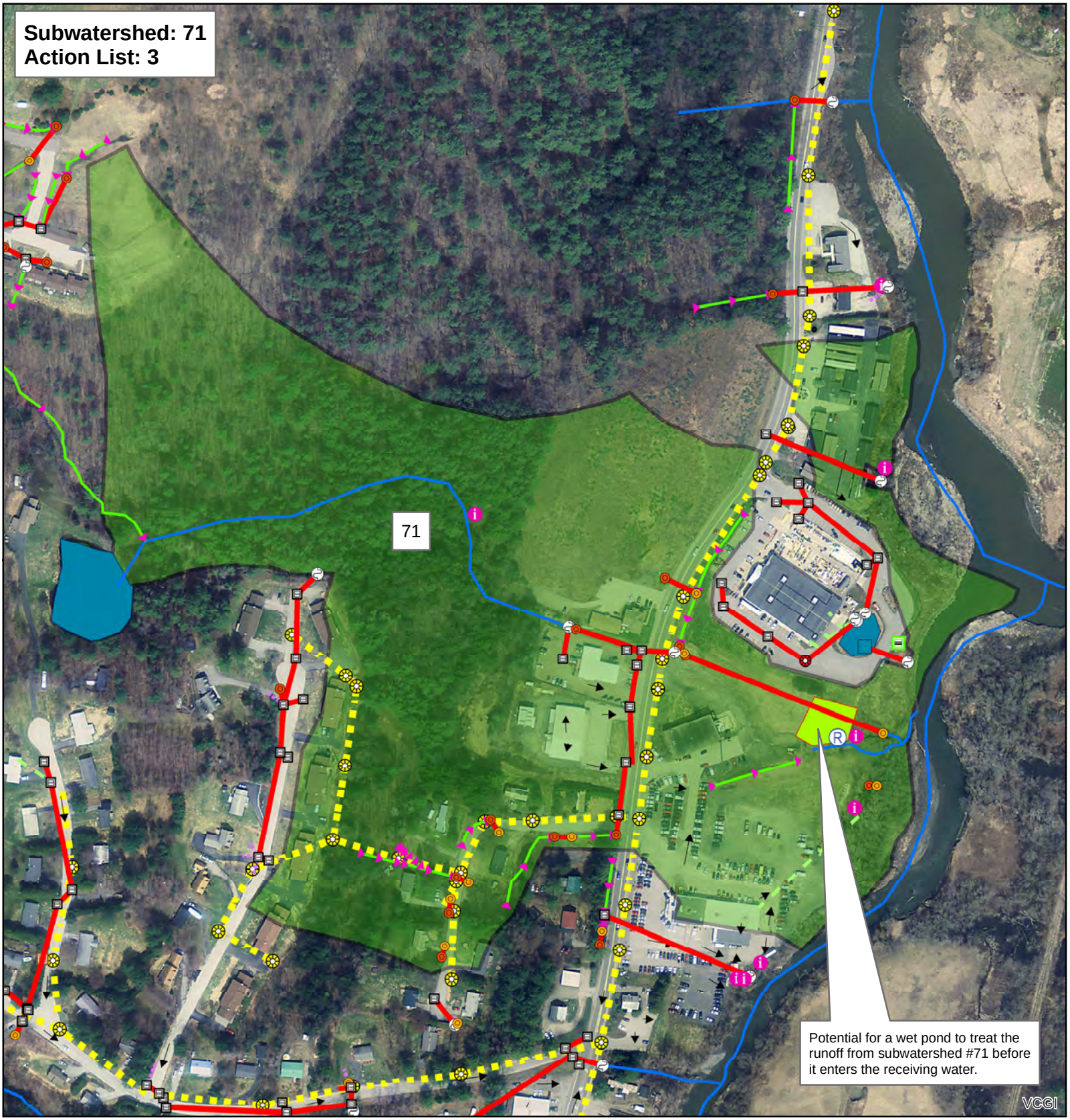

Montpelier, VT

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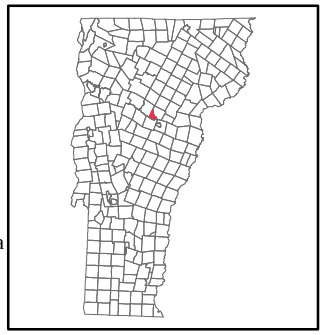

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NRCS - Soils

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SubwatershedID

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DEC - WSMD - Ecosystem Restoration Program
Plotted Date: 7/23/2015
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survery
Imagery Source: VCGI

Subwatershed: 83
Action List: 3

83

Potential for a sedimentation tank or basin to treat the runoff from subwatershed #83 before it enters the receiving water.

VCGI

Montpelier, VT

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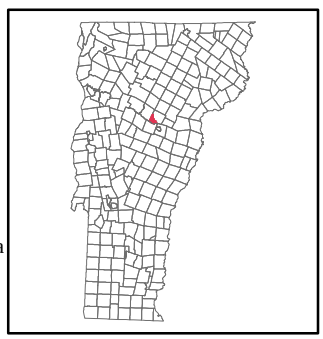

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Creator: Jim Pease, David Ainley
DEC - WSMD - Ecosystem Restoration Program
Plotted Date: 7/23/2015
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Imagery Source: VCGI

Subwatershed: 91
Action List: 1

91

Potential for a SWPPP for food waste behind the building to protect the receiving water from the runoff from subwatershed #91.

VCGI

Montpelier, VT

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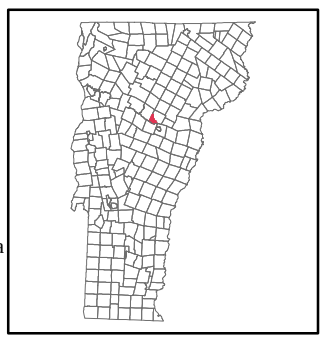

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Creator: Jim Pease, David Ainley
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Montpelier, VT

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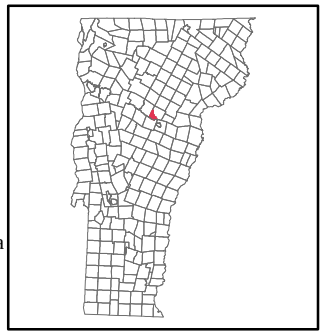

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Imagery Source: VCGI

Subwatershed: 109
Action List: 2

109

Potential for an upgrade to the wet pond behind 66 Liberty Street to treat the runoff from subwatershed #109 before it enters the receiving water.

VCGI

Montpelier, VT

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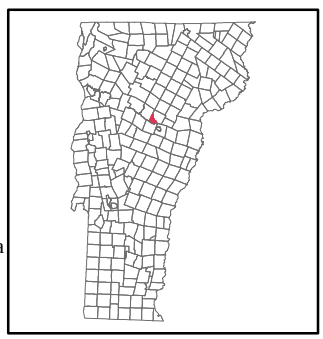

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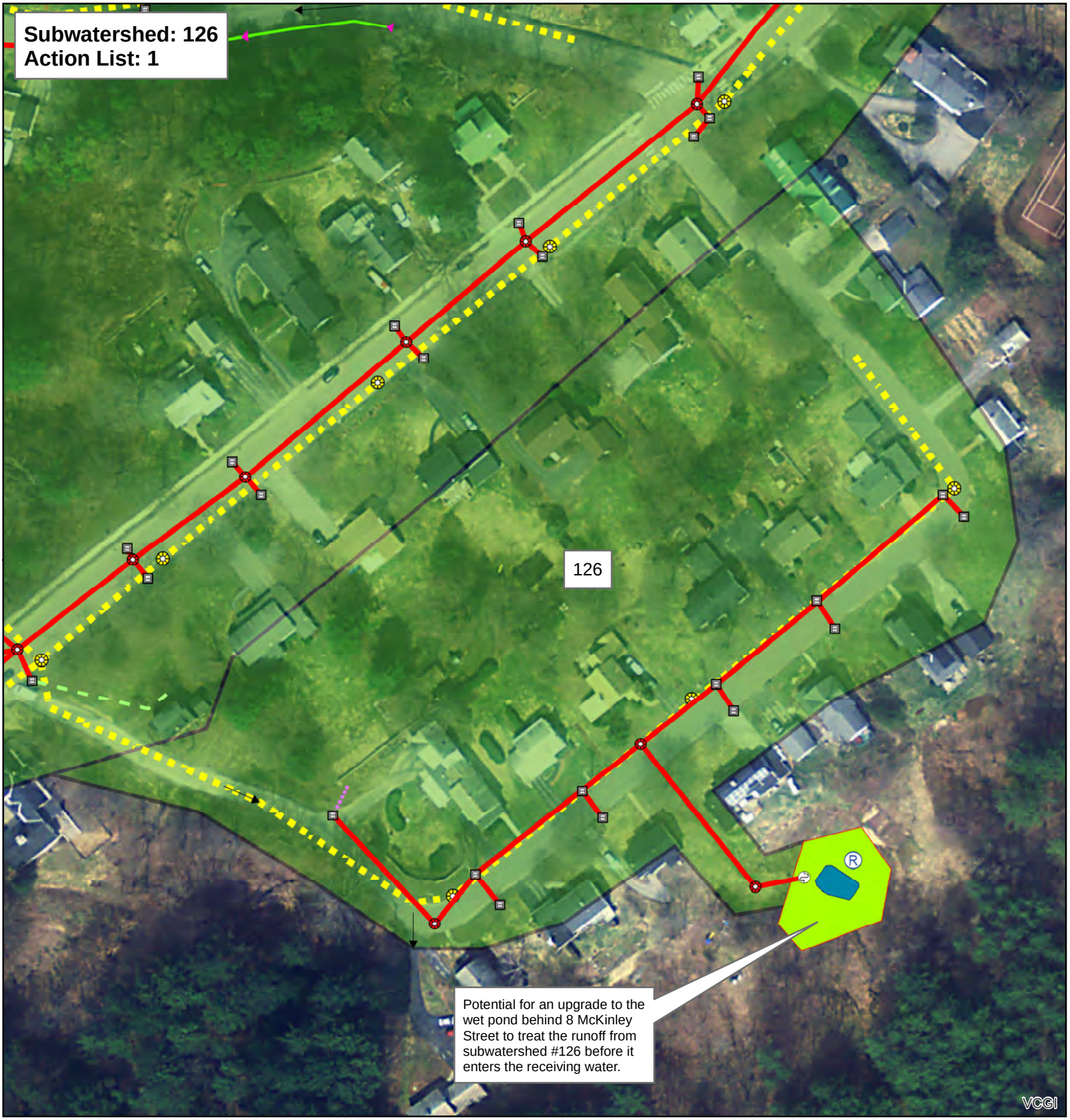
- Potential Stormwater Treatment Area

Creator: Jim Pease, David Ainley
DEC - WSMD - Ecosystem Restoration Program
Plotted Date: 7/23/2015
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survery
Imagery Source: VCGI



Montpelier, 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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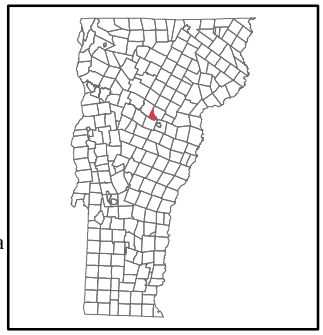
VERMONT



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
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- Swale
- Footing drain
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- 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: 7/23/2015
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survery
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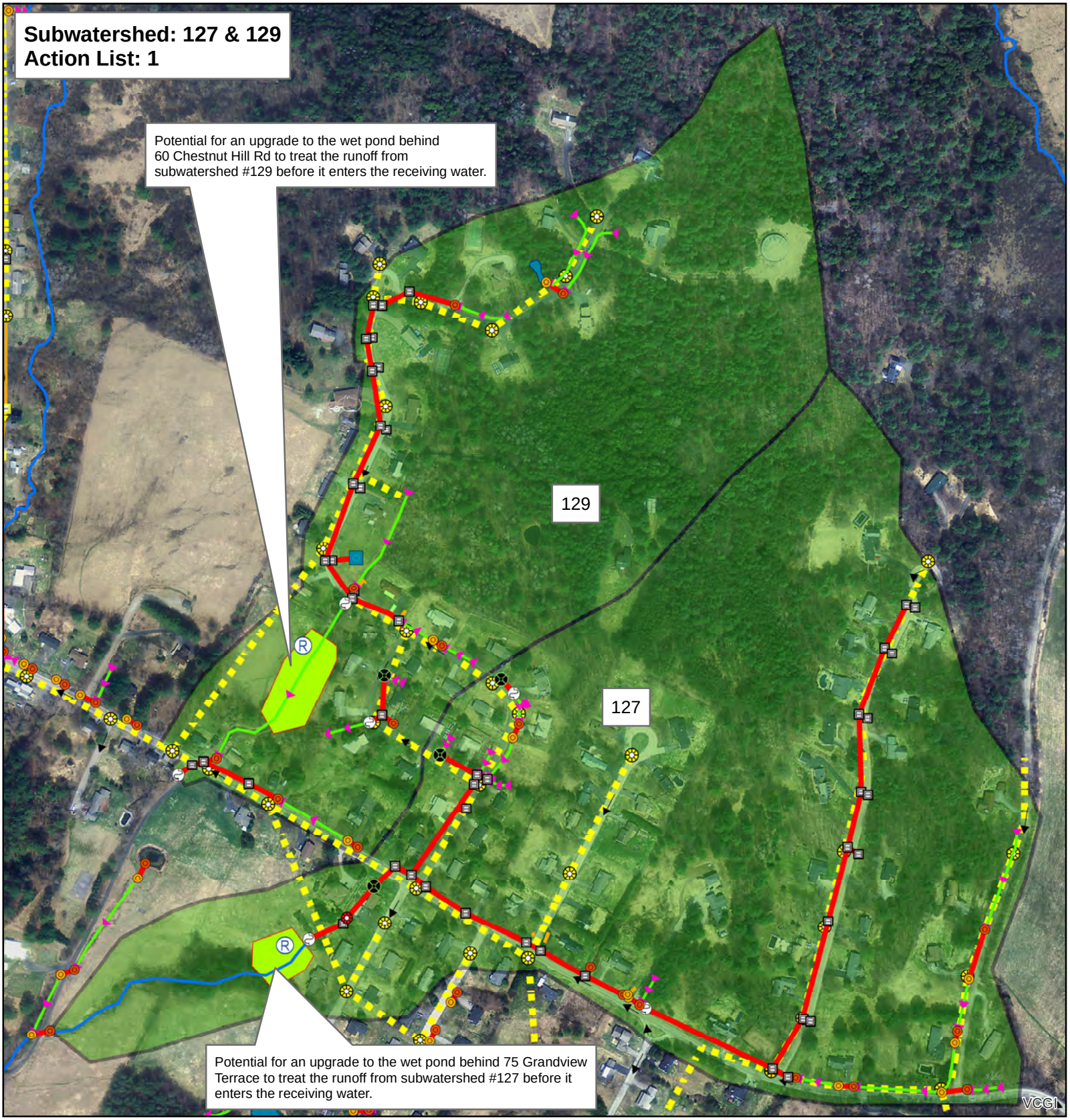

Montpelier, VT

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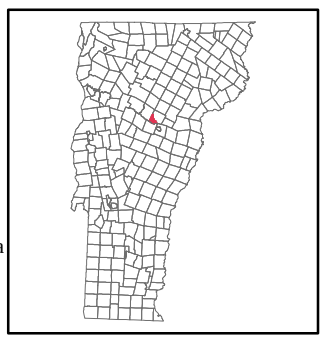

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DEC - WSMD - Ecosystem Restoration Program
Plotted Date: 7/23/2015
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Imagery Source: VCGI

Subwatershed: 149
Action List: 1

149

Potential for a bioretention area at the rear of the parking lot behind 107 State Street to treat the runoff from subwatershed #149 before it enters the receiving water.

VCGI

Montpelier, VT

DEC Stormwater Infrastructure Mapping Project

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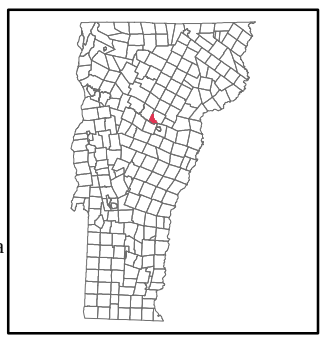

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SubwatershedID

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

Creator: Jim Pease, David Ainley
DEC - WSMD - Ecosystem Restoration Program
Plotted Date: 7/23/2015
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survery
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Montpelier, VT

DEC Stormwater Infrastructure Mapping Project

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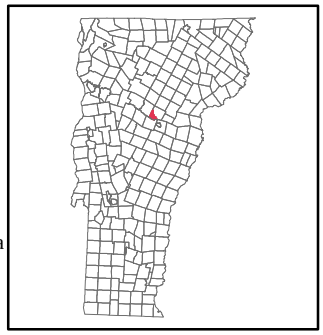

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SubwatershedID

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Creator: Jim Pease, David Ainley
DEC - WSMD - Ecosystem Restoration Program
Plotted Date: 7/23/2015
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Montpelier, VT

DEC Stormwater Infrastructure Mapping Project

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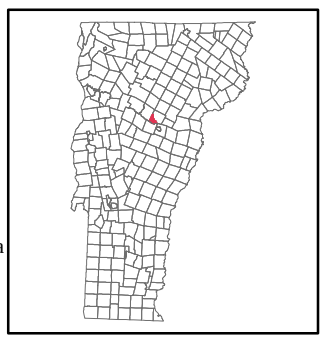

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Creator: Jim Pease, David Ainley
DEC - WSMD - Ecosystem Restoration Program
Plotted Date: 7/23/2015
Data Sources: VTRANS Roads data, VT Hydrography data set, DEC Stormwater database, NRCS soils survery
Imagery Source: VCGI

Subwatershed: 169
Action List: 1

169

Potential for a wet pond to treat the runoff from subwatershed #169 before it enters the receiving water.

VCGI

Montpelier, 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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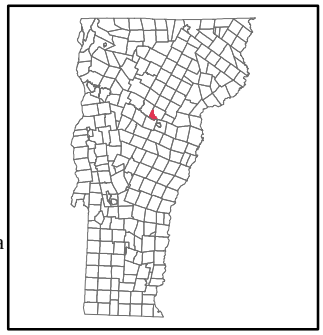

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Spill Control

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).

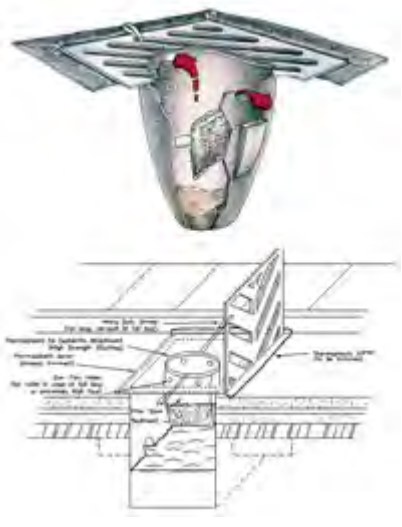
Even if a formal plan is not required, preparing one is a good idea. In general, an SPCC plan should include guidance to site personnel on the following:

— 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

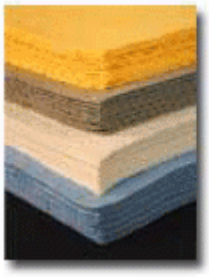
Absorbent socks are flexible tubes used to contain and clean-up spilled fluids. Socks are widely used in industrial applications and are ideal for Spill Kits. Fast spreading spills are quickly stopped with a sock.

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 land, easily absorbing 20 to 25 times their own weight in recovered liquid. Rolls can easily be cut to the exact size required.

water or

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 cases, the National Response Center must be notified at **(800) 424-8802**. Finally, in addition to federal and state spill reporting, EPCRA requires that spills are also reported to local authorities.

(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. § 80**05 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.