

# City of Rutland

## Stormwater Infrastructure Mapping Project

August 2012



***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 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 2.1 inch 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.**

# *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.

<b>Abbreviation Key</b>	
<b>Code</b>	<b>Structure Type</b>
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

## Rutland City - Subwatershed Prioritization and Recommendations (p1)

\*Subwatershed includes area in Rutland Town and Rutland City

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)	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)
386	1	Wet Pond at End of Franklin Street	WP/CB		35.3	67	30,313	6,063	84.2	42.1	1.72	
271	1	Combine with 268	EDP/CB/OF	2-0731	84.4	23	23,231	4,646	64.5	32.3	1.31	2.17
87	1	EDP at WestView Upland Dr intersection	EDP/GS/CB		42.1	25	9,233	1,847	25.6	12.8	0.52	1.18
224	1	Bioretention/ Extended Detention Basin	BR/EDP/CB		16.4	21	4,196	839	11.7	4.7	0.24	0.39
301	1	Bioretention for Avenue A	BR/OF		21.4	19	3,592	718	10.0	4.0	0.20	0.46
235	1	Bioretention/ Extended Detention Basin/ Combine with 269	BR/EDP/OF		7.5	33	2,859	572	7.9	3.2	0.16	0.27
443	1	Erosion control	RR/OF/GS		14.1	15	1,859	929	5.2	3.9	0.11	
269	1	Bioretention, Combine with 235	BR/CB/OF		2.1	50	1,253	251	3.5	1.4	0.07	0.12
113	1	Extended Detention Pond	EDP/CB/OF		10.3	6	1,138	228	3.2	1.6	0.06	0.07
268	1	EDP/ Combine with 271 & 272	EDP/OF		8.8	11	950	190	2.6	1.3	0.05	0.10
272	1	Combine with 268	EDP/GS		4.8	22	912	182	2.5	1.3	0.05	0.12
265	1	Bioretention	BR/CB		1.0	47	435	87	1.2	0.5	0.02	0.05
234	2	Underground Retention/Swirl Separator	URB/VS/CB/VS	4268-INDO	124.5	30	16,523	13,219	57.4	50.5	1.56	4.11
262	2	Bioretention/ Extended Detention Basin	BR/EDP/CB		32.6	26	10,030	2,006	27.9	11.1	0.57	0.94
363	2	Bioretention behind 69 Park St	BR/OF		19.3	22	4,999	1,000	13.9	5.6	0.28	0.46
344	2	Upgrade Extended Detention Basin to 2002 Standards (combine with 345, 346 & 347)	EDP/CB/GS/EDP	1-1472	4.2	91	4,431	886	12.3	6.2	0.25	0.42
433	2	Bioretention	BR/OF		21.0	21	3,773	755	10.5	4.2	0.21	0.48
288	2	Extended Detention Ponds (2)	EDP/OF		21.1	19	3,489	698	9.7	4.8	0.20	0.44
342	2	Upgrade Extended Detention Basin to 2002 Standards	EDP/CB/GS/EDP	1-1472	7.0	52	1,628	977	5.7	4.2	0.15	0.40

## Rutland City - Subwatershed Prioritization and Recommendations (p1 cont.)

Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	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	Number of LID - Roof raingardens to treat WQv (Residential)	Raingarden Cost	Number of LID - Roof Raingardens to treat CPv (Residential)	Raingarden Cost
386	1	WP/CB	\$373,541		\$15	\$8,872	ERP, Section 319, LCBP				
271	1	EDP/CB/OF	\$727,480		\$36	\$18,175	ERP, Section 319, LCBP	657	\$302,301	1,083	\$498,048
87	1	EDP/GS/CB	\$359,162		\$49	\$28,007	ERP, Section 319, LCBP	261	\$120,151	589	\$270,911
224	1	BR/EDP/CB	\$118,276		\$35	\$16,911	ERP, Section 319, LCBP	119	\$54,606	194	\$89,214
301	1	BR/OF	\$104,769		\$36	\$17,503	ERP, Section 319, LCBP				
235	1	BR/EDP/OF	\$82,595		\$36	\$17,332	ERP, Section 319, LCBP				
443	1	RR/OF/GS	\$5,000		\$5	\$3,873	ERP, Section 319, LCBP				
269	1	BR/CB/OF	\$26,974		\$27	\$12,911	ERP, Section 319, LCBP	35	\$16,312	59	\$26,974
113	1	EDP/CB/OF	\$22,098		\$24	\$13,976	ERP, Section 319, LCBP				
268	1	EDP/OF	Combined with 272 & 271				ERP, Section 319, LCBP	27	\$12,367	52	\$23,863
272	1	EDP/GS	Combined with 268 & 271				ERP, Section 319, LCBP	26	\$11,874	58	\$26,816
265	1	BR/CB					ERP, Section 319, LCBP	12	\$5,663	25	\$11,483
234	2	URB/VS/CB/VS	\$50,000		\$15	\$7,262	ERP, Section 319, LCBP				
262	2	BR/EDP/CB	\$287,649		\$36	\$17,207	ERP, Section 319, LCBP	284	\$130,525	472	\$216,969
363	2	BR/OF					ERP, Section 319, LCBP	141	\$65,057	231	\$106,481
344	2	EDP/CB/GS/EDP	\$141,127		\$24	\$13,824	ERP, Section 319, LCBP				
433	2	BR/OF					ERP, Section 319, LCBP	107	\$49,094	241	\$110,638
288	2	EDP/OF	\$152,400		\$55	\$31,453	ERP, Section 319, LCBP	99	\$45,396	221	\$101,600
342	2	EDP/CB/GS/EDP	\$68,938		\$106	\$48,773	ERP, Section 319, LCBP				

## Rutland City - Subwatershed Prioritization and Recommendations (p2)

\*Subwatershed includes area in Rutland Town and Rutland City

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)	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)
346	2	Combine with 344	EDP/CB/GS	1-1472	5.3	51	2,012	402	5.6	2.8	0.11	0.30
312	2	Bioretention	BR/OF		3.4	54	1,795	359	5.0	2.0	0.10	0.20
296	2	Bioretention	BR/CB		1.8	66	1,509	302	4.2	1.7	0.09	0.13
244	2	Bioretention/ Extended Detention Basin	BR/EDP/CB/GS		4.6	25	1,017	203	2.8	1.1	0.06	
343	2	Extended Detention Basin in GS	EDP/CB/GS	1-1472	2.0	50	855	171	2.4	1.2	0.05	0.11
345	2	Combine with 344	EDP/CB/GS	1-1472	0.9	83	832	166	2.3	1.2	0.05	0.09
239	2	Combine with 238	CB		3.2	29	786	157	2.2	1.1	0.04	0.10
337	2	Extended Detention Basin in GS	EDP/CB/GS		1.1	44	479	96	1.3	0.7	0.03	0.06
240	2	Combine with 238	CB		2.6	13	323	65	0.9	0.4	0.02	0.04
238	2	Bioretention/ Extended Detention Basin	BR/EDP/CB		1.6	20	276	55	0.8	0.4	0.02	0.04
336	2	Bioretention	BR/CB		0.2	76	163	33	0.5	0.2	0.01	0.02
347	2	Combine with 344	EDP/CB/GS	1-1472	0.8	15	75	15	0.2	0.1	0.00	0.01
300	3	Extended Detention for RT 7	EDP/CB		1.7	57	1,254	251	3.5	1.7	0.07	0.11
3000					891.6	43	59,095	59,095	164.2	164.2	3.34	
368			CB/GS/EDP/SWPP P	3001-9015, 6350-9015, 5169-9003, 5252-9003	98.5	39	45,022	45,022	125.1	125.1	2.55	
236			CB		73.1	39	33,220	33,220	92.3	92.3	1.88	3.14
14			GS/WP/OF		446.9	3	30,226	30,226	84.0	84.0	1.71	
9			OF/CB		55.3	29	18,409	18,409	51.1	51.1	1.04	
13			OF/SWPPP	4804-9003 5324-9003	27.3	62	16,414	16,414	45.6	45.6	0.93	
299			CB		21.9	55	15,727	15,727	43.7	43.7	0.89	1.32
459			OF		183.6	4	14,148	14,148	39.3	39.3	0.80	
54			CB/GS		19.2	55	12,510	12,510	34.7	34.7	0.71	1.16
389			CB	3235-9010	17.4	67	11,712	11,712	32.5	32.5	0.66	
253			OF		116.3	9	11,524	11,524	32.0	32.0	0.65	1.17
51			OF/GS		46.2	29	11,456	11,456	31.8	31.8	0.65	1.45
373			GS/OF		41.0	32	11,417	11,417	31.7	31.7	0.65	1.43
210			CB		18.6	51	11,236	11,236	31.2	31.2	0.64	1.05
314			GS/IG/CB/EDP	6547-INDS	20.4	44	10,539	10,539	29.3	29.3	0.60	0.99





## Rutland City - Subwatershed Prioritization and Recommendations (p3)

\*Subwatershed includes area in Rutland Town and Rutland City

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)	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)
237			CB		23.5	38	10,279	10,279	28.6	28.6	0.58	0.97
120			GS/OF		66.3	18	10,209	10,209	28.4	28.4	0.58	1.28
408			CB/OF		117.0	7	10,096	10,096	28.0	28.0	0.57	
352			CB/GS		31.6	32	8,873	8,873	24.6	24.6	0.50	1.11
371			CB/OF		15.1	42	7,318	7,318	20.3	20.3	0.41	
178			OF		47.2	17	7,087	7,087	19.7	19.7	0.40	0.88
227			GS/CB/EDP	3217-9010	20.8	42	7,008	7,008	19.5	19.5	0.40	0.95
228			GS/CB		15.3	38	6,836	6,836	19.0	19.0	0.39	0.65
365			OF		17.7	33	6,805	6,805	18.9	18.9	0.39	0.64
331			OF		82.9	4	6,389	6,389	17.7	17.7	0.36	0.40
257			CB/OF		63.6	9	6,271	6,271	17.4	17.4	0.35	0.63
357			OF		76.7	5	6,248	6,248	17.4	17.4	0.35	0.46
410			OF/CB/GS		76.0	5	6,148	6,148	17.1	17.1	0.35	
327			OF		9.4	55	6,078	6,078	16.9	16.9	0.34	0.56
412			OF/GS/SW/SWPPP	5779-9003 4803-9003 4799-9010	42.5	19	5,829	5,829	16.2	16.2	0.33	
353			OF		64.6	7	5,780	5,780	16.1	16.1	0.33	0.51
325			CB/TT	1-0823	6.3	70	5,692	5,692	15.8	15.8	0.32	0.49
392			CB		5.5	84	5,634	5,634	15.6	15.6	0.32	
377			OF		21.7	29	5,565	5,565	15.5	15.5	0.31	0.70
400			OF/CB		11.9	40	5,553	5,553	15.4	15.4	0.31	
360			OF		63.4	6	5,382	5,382	14.9	14.9	0.30	0.44
442			OF/GS		65.2	5	5,256	5,256	14.6	14.6	0.30	
261			OF/CB		23.1	26	5,251	5,251	14.6	14.6	0.30	0.67
394			CB/IB/SWPPP	4383-9003 3640-9015	8.7	67	5,203	5,203	14.5	14.5	0.29	
250			CB/OF		25.3	24	5,165	5,165	14.3	14.3	0.29	0.66
68			OF/GS		23.0	26	5,140	5,140	14.3	14.3	0.29	0.66
379			CB/OF/SWPPP	5190-9003 5115-9003	35.2	20	5,127	5,127	14.2	14.2	0.29	
208			GS/OF		26.9	21	4,907	4,907	13.6	13.6	0.28	
80			GS/WP	4375-INDS	15.4	46	4,854	4,854	13.5	13.5	0.27	0.77
411			GS/OF		22.2	18	4,849	4,849	13.5	13.5	0.27	
415			OF/CB		16.6	32	4,654	4,654	12.9	12.9	0.26	0.58
112			GS/OF		28.9	18	4,643	4,643	12.9	12.9	0.26	0.59
305			GS/OF		31.2	16	4,467	4,467	12.4	12.4	0.25	0.55
382			OF		51.1	6	4,362	4,362	12.1	12.1	0.25	
361			CB		5.7	63	4,306	4,306	12.0	12.0	0.24	0.40
413			CB		15.7	31	4,286	4,286	11.9	11.9	0.24	0.54

**Rutland City - Subwatershed Prioritization and Recommendations (p3 cont.)**

Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	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	Number of LID - Roof raingardens to treat WQv (Residential)	Raingarden Cost	Number of LID - Roof Raingardens to treat CPv (Residential)	Raingarden Cost
237								291	\$133,761	487	\$223,801
120								289	\$132,844	640	\$294,373
408											
352								251	\$115,461	554	\$254,685
371								207	\$95,234		
178								200	\$92,226	442	\$203,450
227											
228											
365											
331								181	\$83,144	198	\$91,204
257								177	\$81,604	316	\$145,161
357								177	\$81,308	230	\$105,832
410								174	\$79,998		
327											
412											
353								164	\$75,215	257	\$118,211
325											
392											
377											
400								157	\$72,257		
360								152	\$70,033		
442											
261								149	\$68,329	334	\$153,760
394											
250								146	\$67,216	330	\$151,869
68											
379											
208								139	\$63,858		
80								137	\$63,171	387	\$178,075
411											
415								132	\$60,558	290	\$133,572
112								131	\$60,424	293	\$134,752
305											
382											
361								122	\$56,032		
413								121	\$55,777	268	\$123,467

## Rutland City - Subwatershed Prioritization and Recommendations (p4)

\*Subwatershed includes area in Rutland Town and Rutland City

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)	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)
423			OF/CB		23.9	20	4,169	4,169	11.6	11.6	0.24	
420			OF		20.8	23	4,132	4,132	11.5	11.5	0.23	0.53
206			GS		7.6	45	4,047	4,047	11.2	11.2	0.23	
356			CB/OF		16.6	27	3,851	3,851	10.7	10.7	0.22	0.49
324			CB		4.3	69	3,826	3,826	10.6	10.6	0.22	0.33
349			OF		41.8	7	3,747	3,747	10.4	10.4	0.21	0.33
454			OF/GS		35.2	10	3,705	3,705	10.3	10.3	0.21	
115			OF		21.9	19	3,629	3,629	10.1	10.1	0.21	0.46
395			CB		7.2	43	3,622	3,622	10.1	10.1	0.20	
275			OF		23.2	18	3,607	3,607	10.0	10.0	0.20	0.45
321			CB/EDP	1-1238	3.8	85	3,550	3,550	9.9	9.9	0.20	0.36
378			CB/OF/SWPPP	5190-9003	4.1	76	3,518	3,518	9.8	9.8	0.20	
316			OF		7.6	33	3,516	3,516	9.8	9.8	0.20	0.28
12			OF		34.2	17	3,514	3,514	9.8	9.8	0.20	
453			OF/GS/CB		32.3	11	3,476	3,476	9.7	9.7	0.20	
213			CB/OF		22.5	17	3,455	3,455	9.6	9.6	0.20	0.43
445			CB/GS	3026-9010	36.9	10	3,355	3,355	9.3	9.3	0.19	
380			OF/SWPPP	5115-9003	14.0	27	3,249	3,249	9.0	9.0	0.18	
248			GS		22.7	16	3,224	3,224	9.0	9.0	0.18	
399			EDP/CB/SWPPP	4794-9003 3245-9010	4.9	70	3,144	3,144	8.7	8.7	0.18	
458			GS/OF		24.1	14	3,057	3,057	8.5	8.5	0.17	
332			OF/CB		4.9	52	3,005	3,005	8.3	8.3	0.17	0.28
355			CB/OF		20.8	16	3,001	3,001	8.3	8.3	0.17	0.37
339			EDP/CB/GS		6.2	58	2,944	2,944	8.2	8.2	0.17	0.40
101			OF/GS		35.8	5	2,922	2,922	8.1	8.1	0.17	0.22
180			OF		33.1	6	2,835	2,835	7.9	7.9	0.16	0.23
391			OF		8.7	35	2,709	2,709	7.5	7.5	0.15	
116			CB		2.3	91	2,633	2,633	7.3	7.3	0.15	0.23
179			OF		33.9	4	2,630	2,630	7.3	7.3	0.15	0.17
374			OF/CB/GS/SWPPP	5040-9003	2.8	76	2,621	2,621	7.3	7.3	0.15	0.24
437			CB		12.0	25	2,552	2,552	7.1	7.1	0.14	
214			OF		32.3	4	2,469	2,469	6.9	6.9	0.14	0.15
256			OF/WP		29.1	12	2,453	2,453	6.8	6.8	0.14	0.39
216			CB		7.8	26	2,404	2,404	6.7	6.7	0.14	0.23
436			CB/GS		16.4	16	2,391	2,391	6.6	6.6	0.14	
448			OF/GS		14.9	18	2,346	2,346	6.5	6.5	0.13	
438			GS/OF	3680-9010	23.9	11	2,296	2,296	6.4	6.4	0.13	
406			OF/CB/GS		26.9	5	2,190	2,190	6.1	6.1	0.12	
222			CB		6.8	26	2,112	2,112	5.9	5.9	0.12	0.20
289			GS/OF	1-0470	22.4	8	2,042	2,042	5.7	5.7	0.12	0.19
251			GS/CB	5973-9010	15.6	17	1,985	1,985	5.5	5.5	0.11	0.30
427			OF		11.7	19	1,979	1,979	5.5	5.5	0.11	0.25
17			OF		23.4	11	1,899	1,899	5.3	5.3	0.11	
381			OF		22.9	6	1,875	1,875	5.2	5.2	0.11	
3001A					28.1	42	1,864	1,864	5.2	5.2	0.11	
278			OF/GS		13.2	16	1,862	1,862	5.2	5.2	0.11	0.23

**Rutland City - Subwatershed Prioritization and Recommendations (p4 cont.)**

Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	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	Number of LID - Roof raingardens to treat WQv (Residential)	Raingarden Cost	Number of LID - Roof Raingardens to treat CPv (Residential)	Raingarden Cost
423								118	\$54,247		
420								117	\$53,772	264	\$121,517
206											
356								109	\$50,112	245	\$112,640
324											
349								106	\$48,756	167	\$76,688
454								105	\$48,215		
115								103	\$47,222	230	\$105,720
395											
275								102	\$46,943	226	\$104,187
321											
378											
316											
12								99	\$45,726		
453								98	\$45,229		
213								98	\$44,965	216	\$99,587
445											
380											
248								91	\$41,959		
399											
458								86	\$39,778		
332											
355								85	\$39,050	186	\$85,409
339											
101								83	\$38,020	108	\$49,681
180								80	\$36,892	117	\$53,676
391								77	\$35,248		
116											
179								74	\$34,228	84	\$38,541
374											
437											
214								70	\$32,125	74	\$33,871
256											
216								68	\$31,283	113	\$52,016
436								68	\$31,111		
448								66	\$30,526		
438								65	\$29,877		
406								62	\$28,497		
222								60	\$27,488	99	\$45,697
289											
251								56	\$25,832	149	\$68,408
427								56	\$25,755	126	\$57,765
17								54	\$24,711		
381								53	\$24,396		
3001A											
278								53	\$24,224	115	\$52,697

## Rutland City - Subwatershed Prioritization and Recommendations (p5)

\*Subwatershed includes area in Rutland Town and Rutland City

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)	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)
218			CB		6.6	24	1,845	1,845	5.1	5.1	0.10	0.17
455			CB/GS	3026-9010	7.9	31	1,818	1,818	5.0	5.0	0.10	
207			CB		2.0	75	1,790	1,790	5.0	5.0	0.10	
451			OF/GS/CB		17.9	9	1,779	1,779	4.9	4.9	0.10	
447			CB/GS	3215-9010	14.8	16	1,763	1,763	4.9	4.9	0.10	
258			CB/TT	5412-INDO	9.6	25	1,754	1,754	4.9	4.9	0.10	0.27
396			CB/SWPPP	4803-9003 4731-9003	3.1	59	1,747	1,747	4.9	4.9	0.10	
414			CB		9.4	21	1,732	1,732	4.8	4.8	0.10	
215			OF		16.7	10	1,729	1,729	4.8	4.8	0.10	0.18
390			OF		4.4	42	1,721	1,721	4.8	4.8	0.10	
217			CB		5.6	26	1,714	1,714	4.8	4.8	0.10	0.16
461			CB/DP		1.8	85	1,705	1,705	4.7	4.7	0.10	0.16
280			CB/EDP/GS	1-1326	2.2	73	1,672	1,672	4.6	4.6	0.09	0.17
393			CB		1.3	99	1,635	1,635	4.5	4.5	0.09	
212			GS/OF		4.5	39	1,620	1,620	4.5	4.5	0.09	0.19
405			OF/CB/GS		5.4	25	1,613	1,613	4.5	4.5	0.09	
298			OF/CB		2.0	65	1,605	1,605	4.5	4.5	0.09	0.15
446			CB/GS	3215-9010	8.2	26	1,564	1,564	4.3	4.3	0.09	
341			CB		1.7	71	1,558	1,558	4.3	4.3	0.09	0.13
397			CB/SWPPP	4731-9003	6.9	30	1,538	1,538	4.3	4.3	0.09	
287			OF		8.7	20	1,533	1,533	4.3	4.3	0.09	0.20
370			CB/OF		2.7	56	1,532	1,532	4.3	4.3	0.09	0.17
364			CB		2.1	60	1,529	1,529	4.2	4.2	0.09	0.14
313			CB		1.4	82	1,501	1,501	4.2	4.2	0.08	0.13
450			GS		18.0	6	1,490	1,490	4.1	4.1	0.08	
317			CB	1-1041	8.4	20	1,484	1,484	4.1	4.1	0.08	0.19
274			OF		17.6	6	1,482	1,482	4.1	4.1	0.08	0.12
425			OF		6.9	25	1,467	1,467	4.1	4.1	0.08	0.19
211			CB		1.5	81	1,458	1,458	4.1	4.1	0.08	0.13
311			CB		1.2	94	1,453	1,453	4.0	4.0	0.08	0.13
329			GS/CB		4.1	31	1,445	1,445	4.0	4.0	0.08	0.14
273			OF/GS		2.3	52	1,444	1,444	4.0	4.0	0.08	0.13
247			CB		4.4	36	1,438	1,438	4.0	4.0	0.08	
242			CB		9.0	12	1,411	1,411	3.9	3.9	0.08	0.12
416			GS/CB		3.8	40	1,399	1,399	3.9	3.9	0.08	0.17
441			GS/OF	3680-9010	8.6	22	1,374	1,374	3.8	3.8	0.08	
209			GS/CB/WP	3401-9015	3.1	54	1,319	1,319	3.7	3.7	0.07	0.19
264			CB/OF		5.4	28	1,315	1,315	3.7	3.7	0.07	0.17
282			CB/GS		2.1	52	1,313	1,313	3.6	3.6	0.07	0.12
387			OF		11.1	12	1,272	1,272	3.5	3.5	0.07	
372			OF		8.3	17	1,262	1,262	3.5	3.5	0.07	0.16
366			OF/GS		2.0	50	1,183	1,183	3.3	3.3	0.07	0.11
449			OF/GS/CB		6.3	20	1,096	1,096	3.0	3.0	0.06	
307			CB		0.9	92	1,093	1,093	3.0	3.0	0.06	0.10
452			GS		9.3	11	1,047	1,047	2.9	2.9	0.06	
369			CB		10.1	10	1,028	1,028	2.9	2.9	0.06	



## Rutland City - Subwatershed Prioritization and Recommendations (p6)

\*Subwatershed includes area in Rutland Town and Rutland City

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)	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)
243			CB		5.2	23	1,022	1,022	2.8	2.8	0.06	
281			CB		1.0	82	1,001	1,001	2.8	2.8	0.06	0.09
114			CB		0.9	90	987	987	2.7	2.7	0.06	0.09
309			OF		1.6	52	985	985	2.7	2.7	0.06	0.09
310			OF		1.2	62	982	982	2.7	2.7	0.06	0.08
266			OF		7.3	14	967	967	2.7	2.7	0.05	0.12
350			OF		6.7	16	964	964	2.7	2.7	0.05	0.12
328			OF/CB		4.2	26	943	943	2.6	2.6	0.05	0.12
429			OF		6.3	17	939	939	2.6	2.6	0.05	0.12
384			CB		8.8	10	935	935	2.6	2.6	0.05	
225			OF/MP		11.0	12	932	932	2.6	2.6	0.05	0.15
226			GS/OF		42.9	8	932	932	2.6	2.6	0.05	0.39
403			OF/CB/GS		8.1	11	887	887	2.5	2.5	0.05	
434			OF		5.4	19	882	882	2.5	2.5	0.05	0.11
326			CB		1.5	51	881	881	2.4	2.4	0.05	0.08
290			CB		0.8	82	859	859	2.4	2.4	0.05	0.08
297			CB/GS		1.9	47	847	847	2.4	2.4	0.05	0.10
338			OF/GS	1-1002	1.6	50	802	802	2.2	2.2	0.05	0.09
428			CB		1.7	40	793	793	2.2	2.2	0.04	0.07
285			CB/GS	1-1326	1.0	72	787	787	2.2	2.2	0.04	0.08
431			CB		3.4	27	778	778	2.2	2.2	0.04	0.10
335			OF/CB		4.2	21	752	752	2.1	2.1	0.04	0.10
292			GS/OF/WP	1-0470	2.6	42	718	718	2.0	2.0	0.04	0.12
223			OF		6.2	12	715	715	2.0	2.0	0.04	0.08
259			OF		4.1	20	702	702	1.9	1.9	0.04	0.09
330			OF/GS		7.5	8	685	685	1.9	1.9	0.04	0.06
304			CB		0.6	94	668	668	1.9	1.9	0.04	0.06
444			CB/GS	3026-9010	3.0	30	661	661	1.8	1.8	0.04	
291			GS/SB		2.1	45	643	643	1.8	1.8	0.04	0.10
252			GS/CB	5973-9010	3.4	26	643	643	1.8	1.8	0.04	0.10
432			CB		0.6	85	642	642	1.8	1.8	0.04	0.06
422			OF/CB		3.2	23	636	636	1.8	1.8	0.04	
286			OF		5.1	13	621	621	1.7	1.7	0.04	0.07
404			OF/CB/GS		1.1	56	610	610	1.7	1.7	0.03	
53			CB	6736-INDS	0.5	97	599	599	1.7	1.7	0.03	0.05
318			CB/EDP	1-1238	0.6	85	591	591	1.6	1.6	0.03	0.06
385			CB		2.2	30	579	579	1.6	1.6	0.03	
315			CB		0.5	85	574	574	1.6	1.6	0.03	0.05
418			CB		1.3	45	562	562	1.6	1.6	0.03	0.07
52			CB/TT/URB	6736-INDS	0.5	90	561	561	1.6	1.6	0.03	0.05
457			CB		3.5	18	548	548	1.5	1.5	0.03	
359			OF		5.7	8	539	539	1.5	1.5	0.03	0.05
409			GS/SB/SWPPP	6193-9003	1.7	46	537	537	1.5	1.5	0.03	
270			OF		3.4	17	522	522	1.4	1.4	0.03	0.07
294			OF		2.3	18	500	500	1.4	1.4	0.03	0.05





## Rutland City - Subwatershed Prioritization and Recommendations (p7)

\*Subwatershed includes area in Rutland Town and Rutland City

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)	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)
293			CB/OF/WP		1.7	44	500	500	1.4	1.4	0.03	0.08
375			SD	5040-9003	0.4	98	495	495	1.4	1.4	0.03	0.04
229			DW/CB		0.5	89	486	486	1.4	1.4	0.03	0.05
306			DW		0.7	71	486	486	1.4	1.4	0.03	0.05
354			CB/OF		2.2	25	465	465	1.3	1.3	0.03	0.06
320			CB/GS	1-1238	0.4	94	463	463	1.3	1.3	0.03	0.04
319			CB/WP	6772-INDS	2.2	34	446	446	1.2	1.2	0.03	0.08
334			OF/CB		3.6	13	438	438	1.2	1.2	0.02	0.05
221			CB		0.7	54	433	433	1.2	1.2	0.02	0.04
284			CB		0.4	81	428	428	1.2	1.2	0.02	0.04
376			SD	5040-9003	0.4	89	419	419	1.2	1.2	0.02	0.04
219			CB		0.8	42	418	418	1.2	1.2	0.02	0.04
260			OF		2.7	17	408	408	1.1	1.1	0.02	0.05
232			DW		0.4	86	397	397	1.1	1.1	0.02	0.04
70			OF		5.3	1	360	360	1.0	1.0	0.02	0.01
388			DW/SB		0.3	97	349	349	1.0	1.0	0.02	
69			CB		0.3	85	338	338	0.9	0.9	0.02	0.03
246			OF		1.2	32	337	337	0.9	0.9	0.02	
254			OF/CB		1.6	23	327	327	0.9	0.9	0.02	0.04
430			CB/GS		0.4	66	318	318	0.9	0.9	0.02	0.03
241			GS		2.3	15	314	314	0.9	0.9	0.02	0.04
348			CB/OF		0.4	67	312	312	0.9	0.9	0.02	0.03
277			OF		1.2	28	300	300	0.8	0.8	0.02	0.04
220			CB		2.1	10	297	297	0.8	0.8	0.02	0.02
3001L					4.4	35	290	290	0.8	0.8	0.02	
456			OF	3026-9010	2.2	18	283	283	0.8	0.8	0.02	
245			CB		1.2	26	281	281	0.8	0.8	0.02	
267			OF		2.0	16	272	272	0.8	0.8	0.02	0.03
333			OF/CB		2.2	13	262	262	0.7	0.7	0.01	0.03
340			CB/DW		0.3	75	260	260	0.7	0.7	0.01	0.03
435			CB		0.6	46	246	246	0.7	0.7	0.01	0.03
279			CB		0.4	52	220	220	0.6	0.6	0.01	0.02
439			CB		0.2	98	209	209	0.6	0.6	0.01	
283			CB		0.3	63	201	201	0.6	0.6	0.01	0.02
383			DW		0.4	61	190	190	0.5	0.5	0.01	
426			CB		0.2	84	187	187	0.5	0.5	0.01	0.02
367			CB		0.2	90	181	181	0.5	0.5	0.01	0.02
351			CB		0.2	88	168	168	0.5	0.5	0.01	0.01
3001E					2.5	46	166	166	0.5	0.5	0.01	
3001I					2.5	71	166	166	0.5	0.5	0.01	
302			CB		0.2	57	162	162	0.5	0.5	0.01	0.02
362			CB		0.1	92	161	161	0.4	0.4	0.01	0.01
440			CB		0.2	83	159	159	0.4	0.4	0.01	
276			CB		0.5	28	150	150	0.4	0.4	0.01	0.01
231			DW		0.2	80	143	143	0.4	0.4	0.01	0.02
460			CB/EDP		1.3	20	142	142	0.4	0.4	0.01	0.03
3001H					2.1	93	139	139	0.4	0.4	0.01	



## Rutland City - Subwatershed Prioritization and Recommendations (p8)

\*Subwatershed includes area in Rutland Town and Rutland City

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)	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)
255			OF/CB		1.1	14	135	135	0.4	0.4	0.01	0.02
407			OF/CB/GS		0.3	40	124	124	0.3	0.3	0.01	
263			OF		0.7	21	124	124	0.3	0.3	0.01	0.02
3001B					1.8	54	122	122	0.3	0.3	0.01	
3001J					1.6	91	109	109	0.3	0.3	0.01	
3001C					1.4	31	96	96	0.3	0.3	0.01	
3001D					1.4	60	92	92	0.3	0.3	0.01	
3001G					1.4	8	92	92	0.3	0.3	0.01	
230			OF		0.1	94	76	76	0.2	0.2	0.00	0.01
322			GS		0.3	30	75	75	0.2	0.2	0.00	0.01
308			BR/OF		0.2	50	74	74	0.2	0.2	0.00	0.01
424			CB		0.1	69	74	74	0.2	0.2	0.00	0.01
323			CB		0.2	43	72	72	0.2	0.2	0.00	0.01
417			CB/WP		0.4	30	65	65	0.2	0.2	0.00	0.01
421			CB		0.1	79	63	63	0.2	0.2	0.00	0.01
249			CB		0.2	34	56	56	0.2	0.2	0.00	
3001K					0.8	100	54	54	0.1	0.1	0.00	
3001F					0.7	78	47	47	0.1	0.1	0.00	
303			CB		0.3	10	46	46	0.1	0.1	0.00	0.00
295			OF		0.6	1	41	41	0.1	0.1	0.00	0.00
233			DW		0.1	57	30	30	0.1	0.1	0.00	0.00
419			CB		0.0	84	30	30	0.1	0.1	0.00	0.00
398			DW/SWPPP	4803-9003	0.1	15	8	8	0.0	0.0	0.00	
401			CB	3230-9010	1.2							
402			CB	3230-9010	0.8							



# *Target Maps*

*Showing Priority Action List  
Drainage Areas*

*And Potential Retrofit Locations*

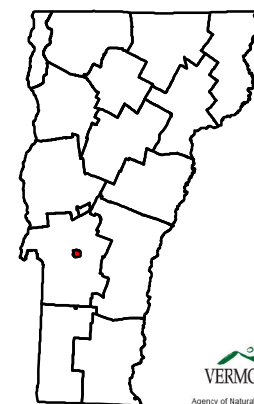


# Rutland City

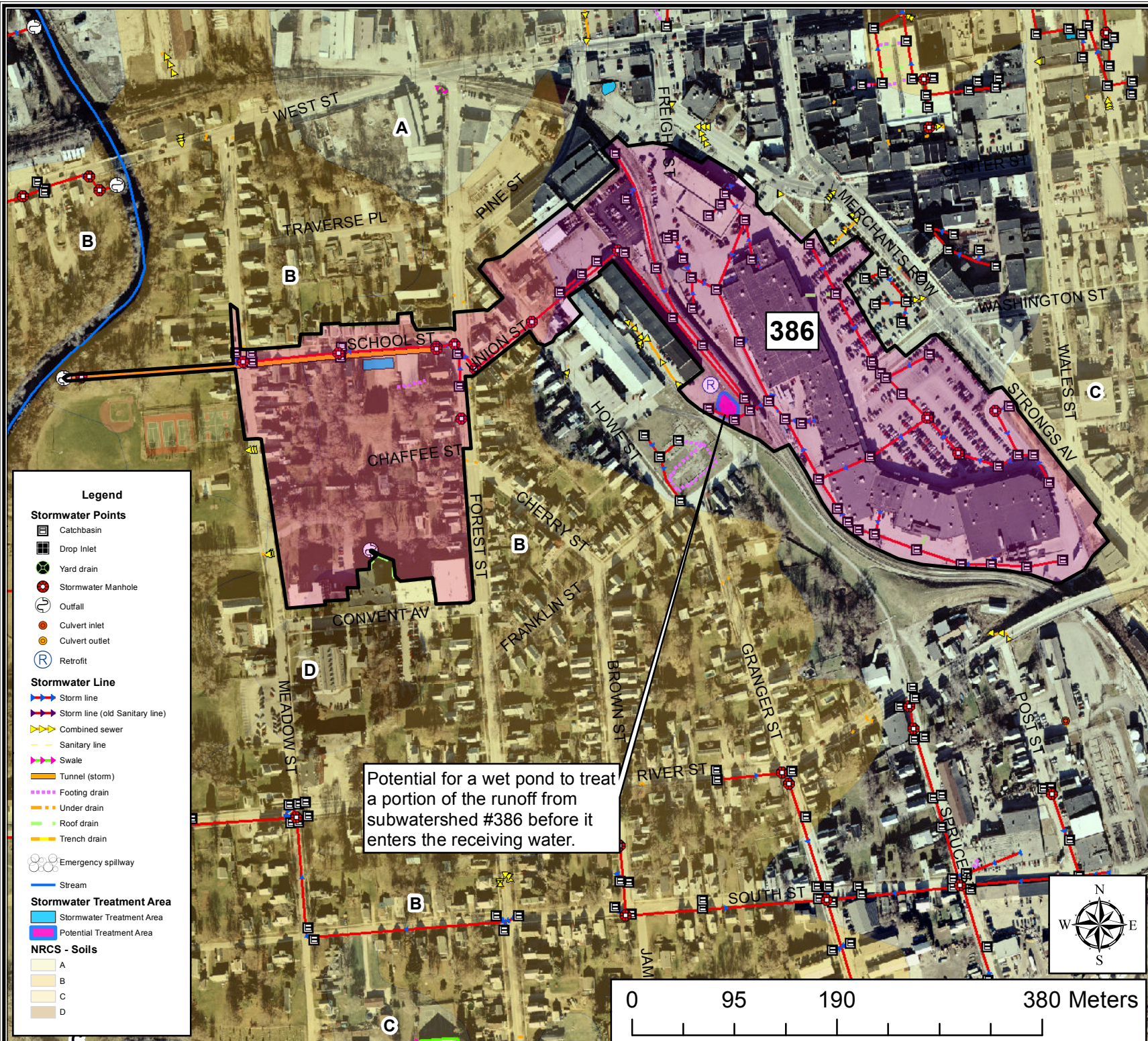
Action List 1  
Subwatershed: 386

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.



VTANR - DEC - WSMD  
 Creator: Jim Pease, Collin Smythe  
 Date: 6/26/2012  
 Data Sources: Field data, Town and stormwater permit plans, existing GIS data, GPS data, municipal member knowledge, VTRANS roads data, VT Hydrography dataset, NRCS soils map  
 Imagery Source: Rutland City .15m orthos (2001)



Potential for a wet pond to treat a portion of the runoff from subwatershed #386 before it enters the receiving water.

**Legend**

**Stormwater Points**

- Catchbasin
- Drop Inlet
- Yard drain
- Stormwater Manhole
- Outfall
- Culvert inlet
- Culvert outlet
- Retrofit

**Stormwater Line**

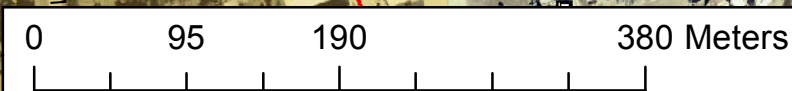
- Storm line
- Storm line (old Sanitary line)
- Combined sewer
- Sanitary line
- Swale
- Tunnel (storm)
- Footing drain
- Under drain
- Roof drain
- Trench drain
- Emergency spillway

**Stormwater Treatment Area**

- Stormwater Treatment Area
- Potential Treatment Area

**NRCS - Soils**

- A
- B
- C
- D



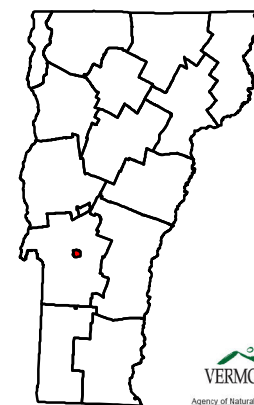


# Rutland City

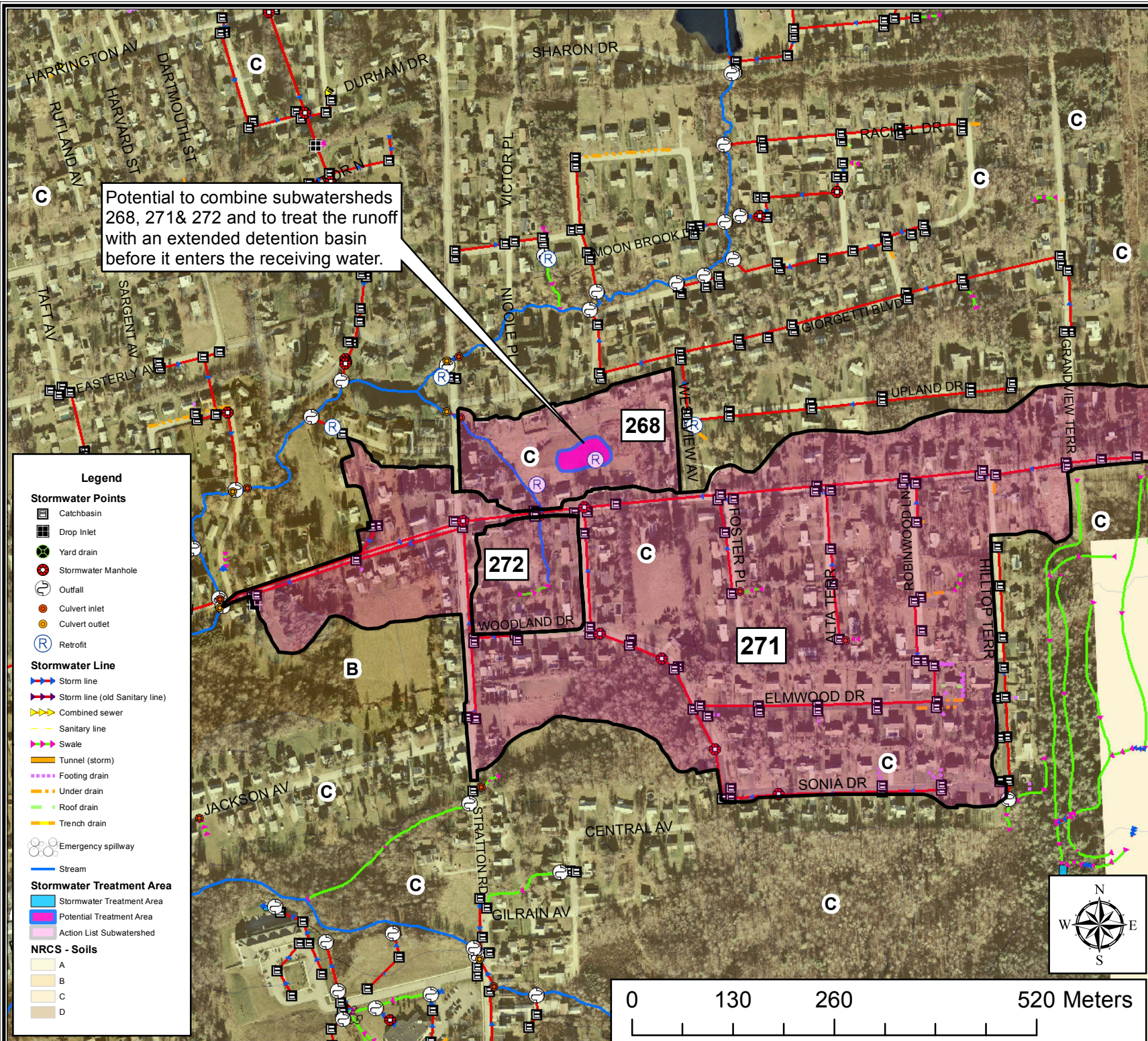
## Action List 1 Subwatersheds: 268 271 & 272

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.



VTANR - DEC - WSMD  
 Creator: Jim Pease, Collin Smythe  
 Date: 6/26/2012  
 Data Sources: Field data, Town and stormwater permit plans, existing GIS data, GPS data, municipal member knowledge, VTRANS roads data, VT Hydrography dataset, NRCS soils map  
 Imagery Source: Rutland City .15m orthos (2001)



**Legend**

**Stormwater Points**

- Catchbasin
- Drop Inlet
- Yard drain
- Stormwater Manhole
- Outfall
- Culvert inlet
- Culvert outlet
- Retrofit

**Stormwater Line**

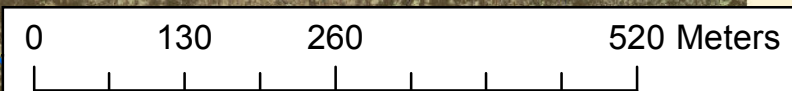
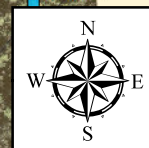
- Storm line
- Storm line (old Sanitary line)
- Combined sewer
- Sanitary line
- Swale
- Tunnel (storm)
- Footing drain
- Under drain
- Roof drain
- Trench drain
- Emergency spillway

**Stormwater Treatment Area**

- Stormwater Treatment Area
- Potential Treatment Area
- Action List Subwatershed

**NRCS - Soils**

- A
- B
- C
- D



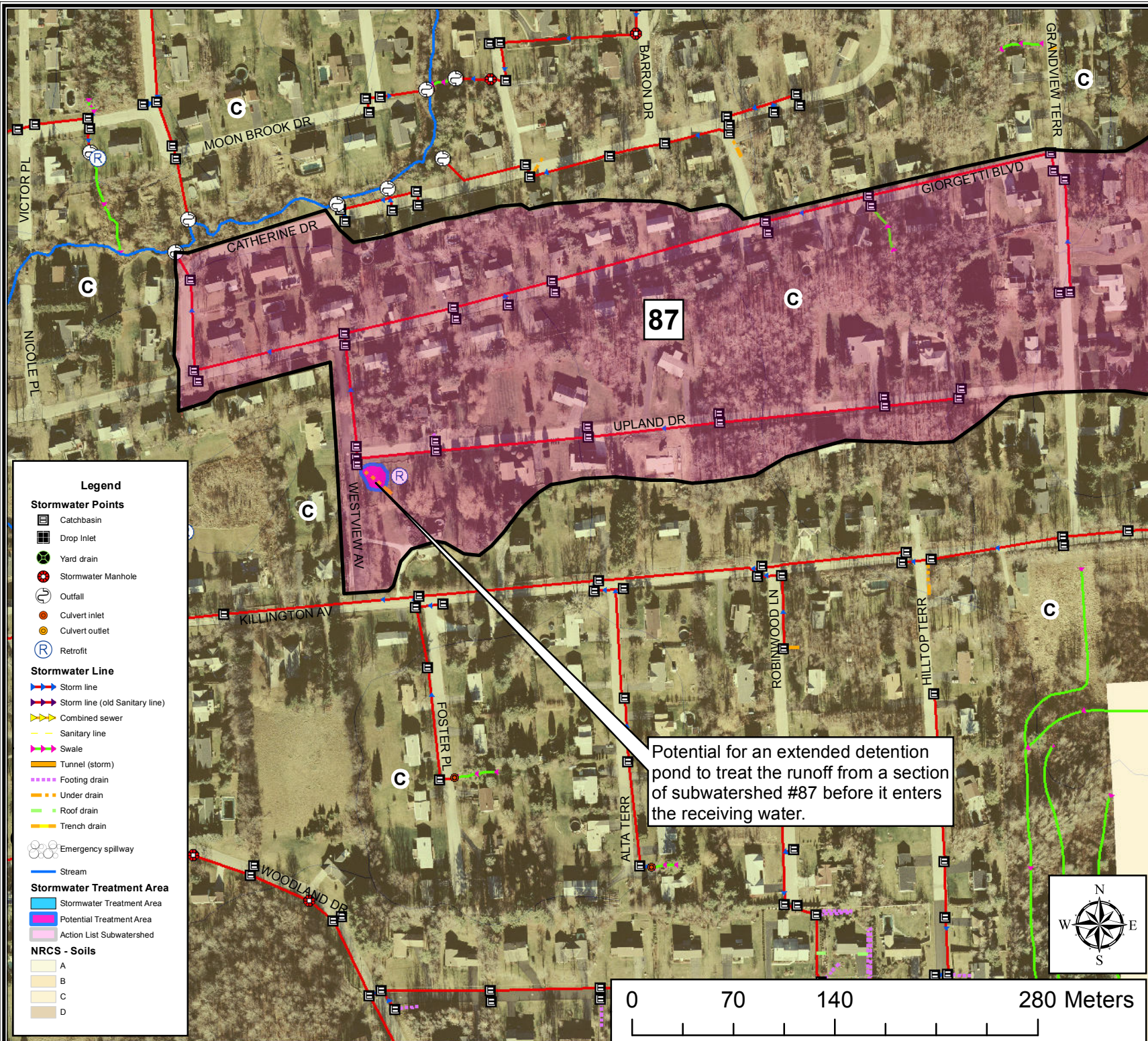


# Rutland City

## Action List 1 Subwatershed: 87

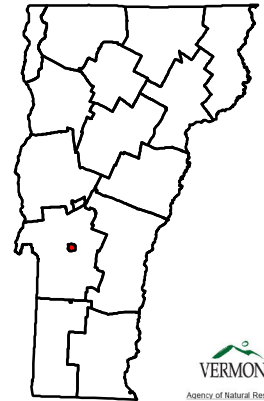
This map shows high priority subwatersheds which are ranked by connectedness, percent of impervious cover, field observations, and potential retrofit measures and locations.

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.

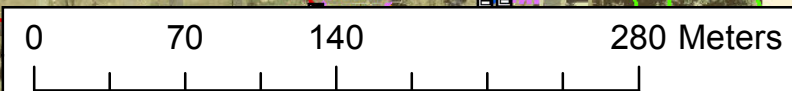
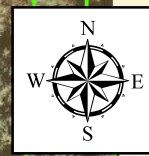


87

Potential for an extended detention pond to treat the runoff from a section of subwatershed #87 before it enters the receiving water.



VTANR - DEC - WSMD  
 Creator: Jim Pease, Collin Smythe  
 Date: 6/26/2012  
 Data Sources: Field data, Town and stormwater permit plans, existing GIS data, GPS data, municipal member knowledge, VTRANS roads data, VT Hydrography dataset, NRCS soils map  
 Imagery Source: Rutland City .15m orthos (2001)



- Legend**
- Stormwater Points**
- Catchbasin
  - Drop Inlet
  - Yard drain
  - Stormwater Manhole
  - Outfall
  - Culvert inlet
  - Culvert outlet
  - Retrofit
- Stormwater Line**
- Storm line
  - Storm line (old Sanitary line)
  - Combined sewer
  - Sanitary line
  - Swale
  - Tunnel (storm)
  - Footing drain
  - Under drain
  - Roof drain
  - Trench drain
  - Emergency spillway
- Stormwater Treatment Area**
- Stormwater Treatment Area
  - Potential Treatment Area
  - Action List Subwatershed
- NRCS - Soils**
- A
  - B
  - C
  - D



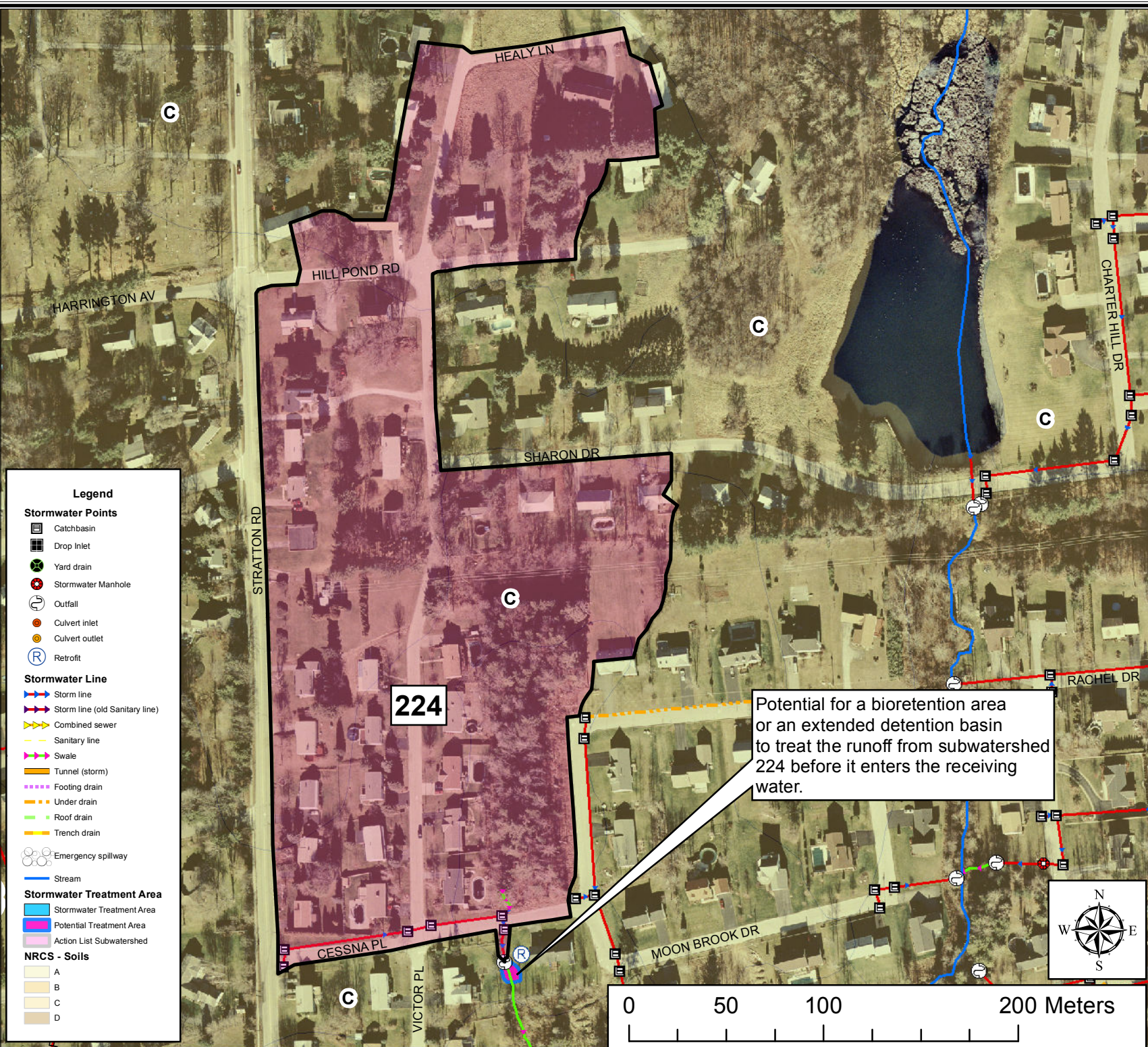
# Rutland City

## Action List 1

Subwatershed: 224

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.



**Legend**

**Stormwater Points**

- Catchbasin
- Drop Inlet
- Yard drain
- Stormwater Manhole
- Outfall
- Culvert inlet
- Culvert outlet
- Retrofit

**Stormwater Line**

- Storm line
- Storm line (old Sanitary line)
- Combined sewer
- Sanitary line
- Swale
- Tunnel (storm)
- Footing drain
- Under drain
- Roof drain
- Trench drain

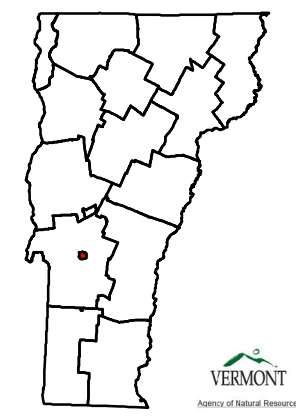
Emergency spillway

**Stormwater Treatment Area**

- Stormwater Treatment Area
- Potential Treatment Area
- Action List Subwatershed

**NRCS - Soils**

- A
- B
- C
- D



VTANR - DEC - WSMD  
 Creator: Jim Pease, Collin Smythe  
 Date: 6/26/2012  
 Data Sources: Field data, Town and stormwater permit plans, existing GIS data, GPS data, municipal member knowledge, VTRANS roads data, VT Hydrography dataset, NRCS soils map  
 Imagery Source: Rutland City .15m orthos (2001)

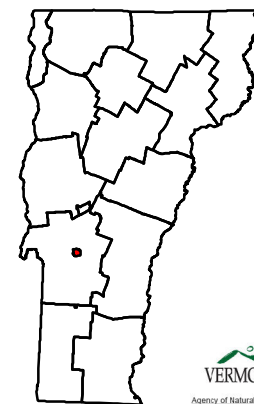


# Rutland City

## Action List 1 Subwatershed: 301

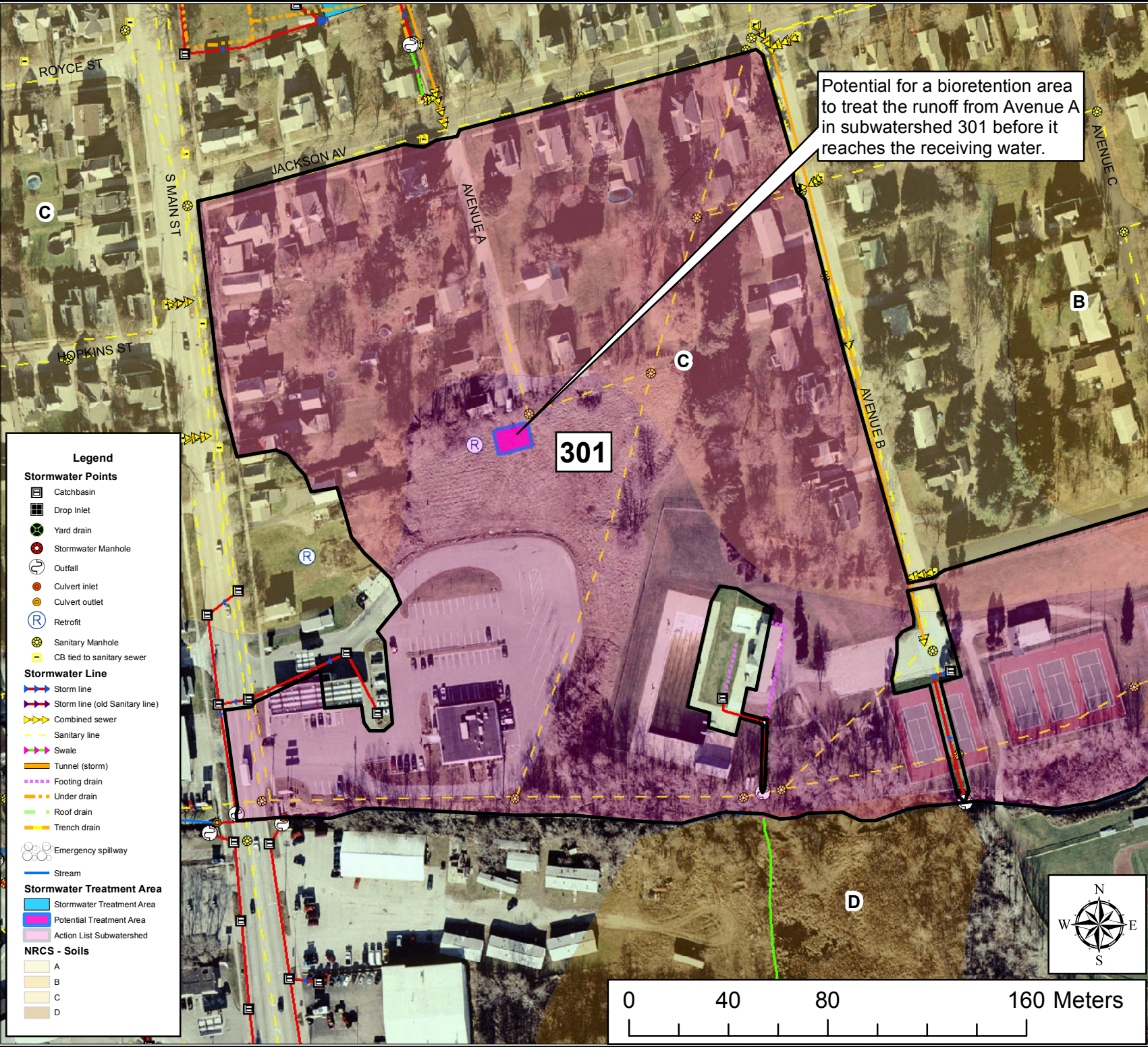
This map shows high priority subwatersheds which are ranked by connectedness, percent of impervious cover, field observations, and potential retrofit measures and locations.

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.



VTANR - DEC - WSMD  
 Creator: Jim Pease, Collin Smythe  
 Date: 6/26/2012  
 Data Sources: Field data, Town and stormwater permit plans, existing GIS data, GPS data, municipal member knowledge, VTRANS roads data, VT Hydrography dataset, NRCS soils map  
 Imagery Source: Rutland City .15m orthos (2001)

Potential for a bioretention area to treat the runoff from Avenue A in subwatershed 301 before it reaches the receiving water.



**Legend**

**Stormwater Points**

- Catchbasin
- Drop Inlet
- Yard drain
- Stormwater Manhole
- Outfall
- Culvert inlet
- Culvert outlet
- Retrofit
- Sanitary Manhole
- CB tied to sanitary sewer

**Stormwater Line**

- Storm line
- Storm line (old Sanitary line)
- Combined sewer
- Sanitary line
- Swale
- Tunnel (storm)
- Footing drain
- Under drain
- Roof drain
- Trench drain
- Emergency spillway
- Stream

**Stormwater Treatment Area**

- Stormwater Treatment Area
- Potential Treatment Area
- Action List Subwatershed

**NRCS - Soils**

- A
- B
- C
- D

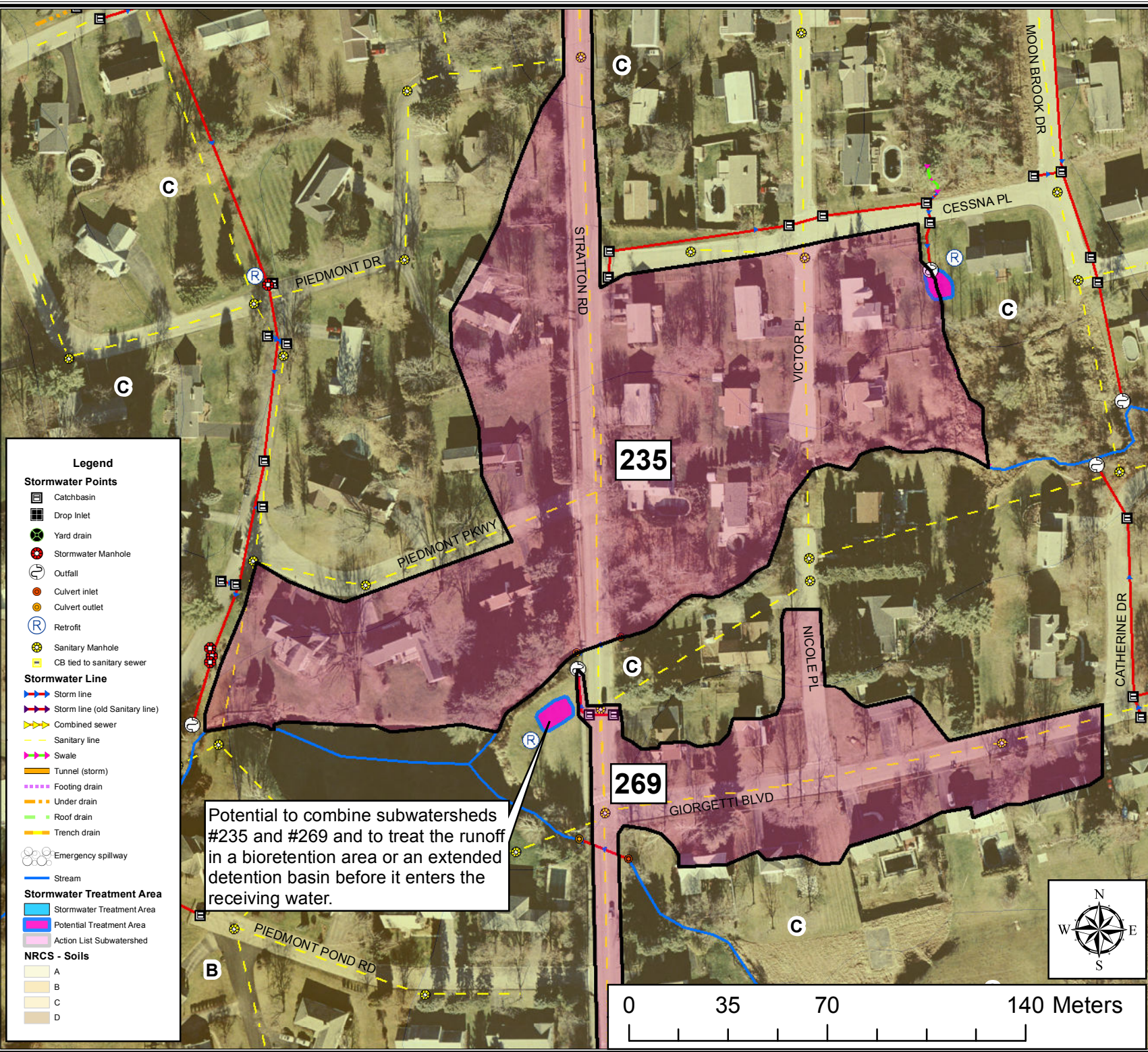


# Rutland City

## Action List 1 Subwatersheds: 235 & 269

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.



**Legend**

**Stormwater Points**

- Catchbasin
- Drop Inlet
- Yard drain
- Stormwater Manhole
- Outfall
- Culvert inlet
- Culvert outlet
- Retrofit
- Sanitary Manhole
- CB tied to sanitary sewer

**Stormwater Line**

- Storm line
- Storm line (old Sanitary line)
- Combined sewer
- Sanitary line
- Swale
- Tunnel (storm)
- Footing drain
- Under drain
- Roof drain
- Trench drain
- Emergency spillway
- Stream

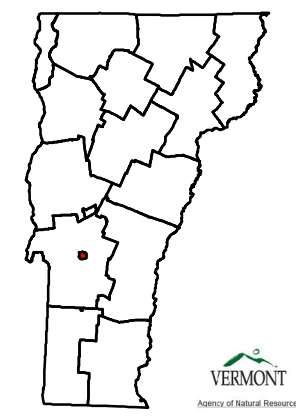
**Stormwater Treatment Area**

- Stormwater Treatment Area
- Potential Treatment Area
- Action List Subwatershed

**NRCS - Soils**

- A
- B
- C
- D

Potential to combine subwatersheds #235 and #269 and to treat the runoff in a bioretention area or an extended detention basin before it enters the receiving water.



VTANR - DEC - WSMD  
 Creator: Jim Pease, Collin Smythe  
 Date: 6/26/2012  
 Data Sources: Field data, Town and stormwater permit plans, existing GIS data, GPS data, municipal member knowledge, VTRANS roads data, VT Hydrography dataset, NRCS soils map  
 Imagery Source: Rutland City .15m orthos (2001)



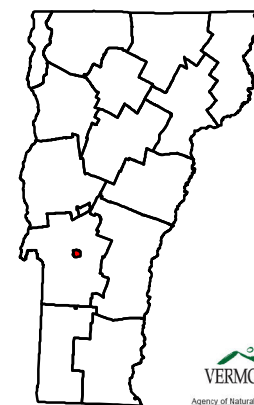


# Rutland City

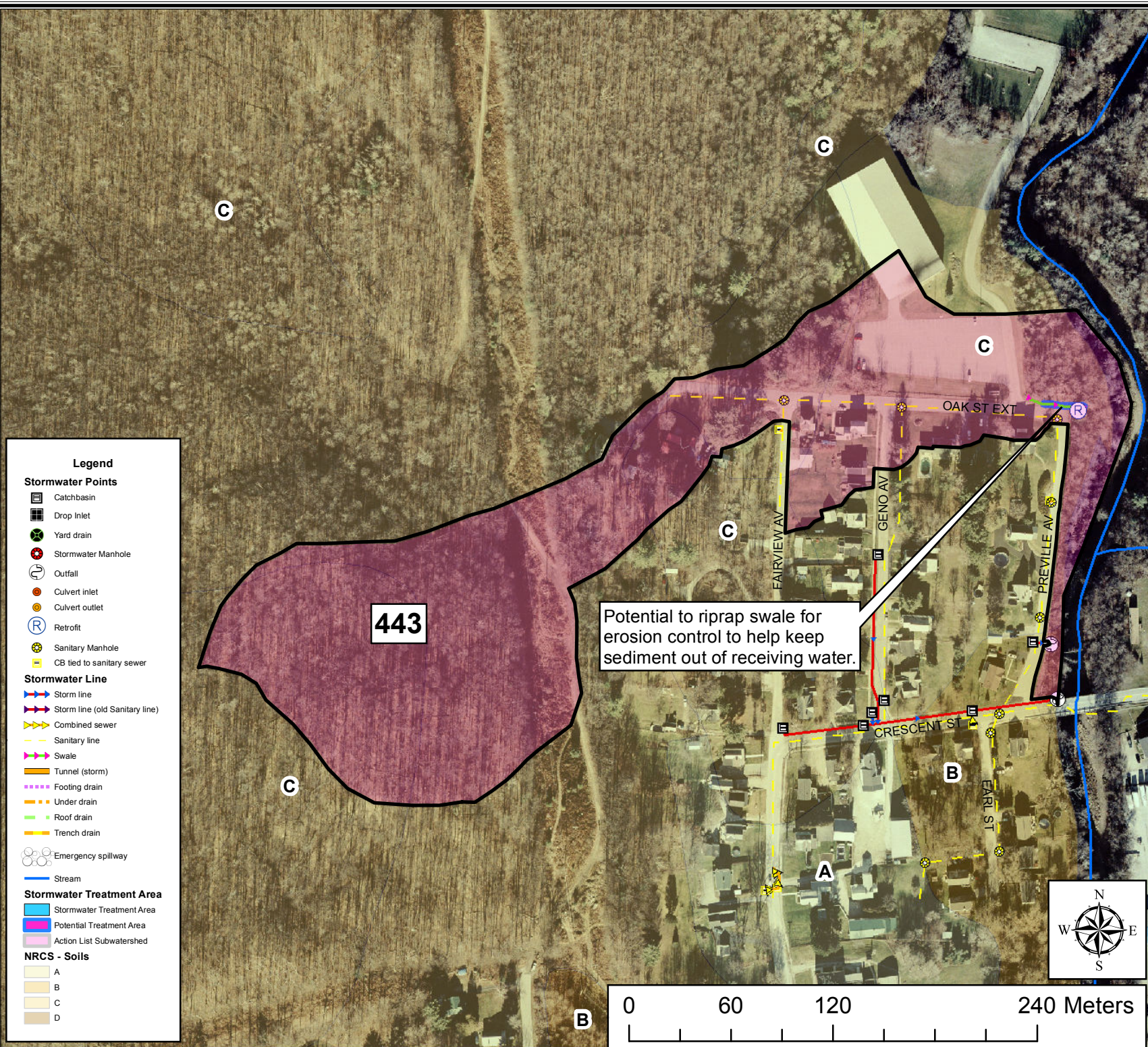
## Action List 1 Subwatershed: 443

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.



VTANR - DEC - WSMD  
 Creator: Jim Pease, Collin Smythe  
 Date: 6/26/2012  
 Data Sources: Field data, Town and stormwater permit plans, existing GIS data, GPS data, municipal member knowledge, VTRANS roads data, VT Hydrography dataset, NRCS soils map  
 Imagery Source: Rutland City .15m orthos (2001)



**Legend**

**Stormwater Points**

- Catchbasin
- Drop Inlet
- Yard drain
- Stormwater Manhole
- Outfall
- Culvert inlet
- Culvert outlet
- Retrofit
- Sanitary Manhole
- CB tied to sanitary sewer

**Stormwater Line**

- Storm line
- Storm line (old Sanitary line)
- Combined sewer
- Sanitary line
- Swale
- Tunnel (storm)
- Footing drain
- Under drain
- Roof drain
- Trench drain
- Emergency spillway

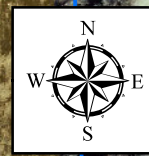
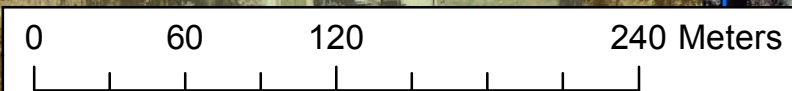
**Stormwater Treatment Area**

- Stormwater Treatment Area
- Potential Treatment Area
- Action List Subwatershed

**NRCS - Soils**

- A
- B
- C
- D

Potential to riprap swale for erosion control to help keep sediment out of receiving water.





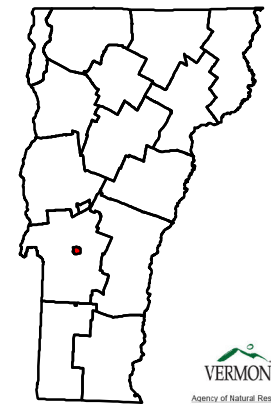
# Rutland City

## Action List 1

Subwatershed: 113

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.



VTANR - DEC - WSMD  
Creator: Jim Pease, Collin Smythe  
Date: 6/26/2012  
Data Sources: Field data, Town and stormwater permit plans, existing GIS data, GPS data, municipal member knowledge, VTRANS roads data, VT Hydrography dataset, NRCS soils map  
Imagery Source: Rutland City .15m orthos (2001)

Potential for an extended detention pond to treat the runoff from subwatershed #113 before it enters the receiving water.

**Legend**

**Stormwater Points**

- Catchbasin
- Drop Inlet
- Yard drain
- Stormwater Manhole
- Junction Box
- Outfall
- Culvert inlet
- Culvert outlet
- Retrofit
- Sanitary Manhole
- CB tied to sanitary sewer

**Stormwater Line**

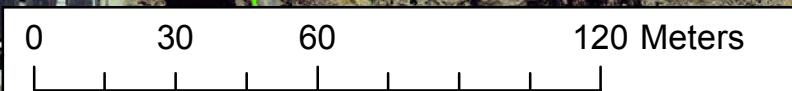
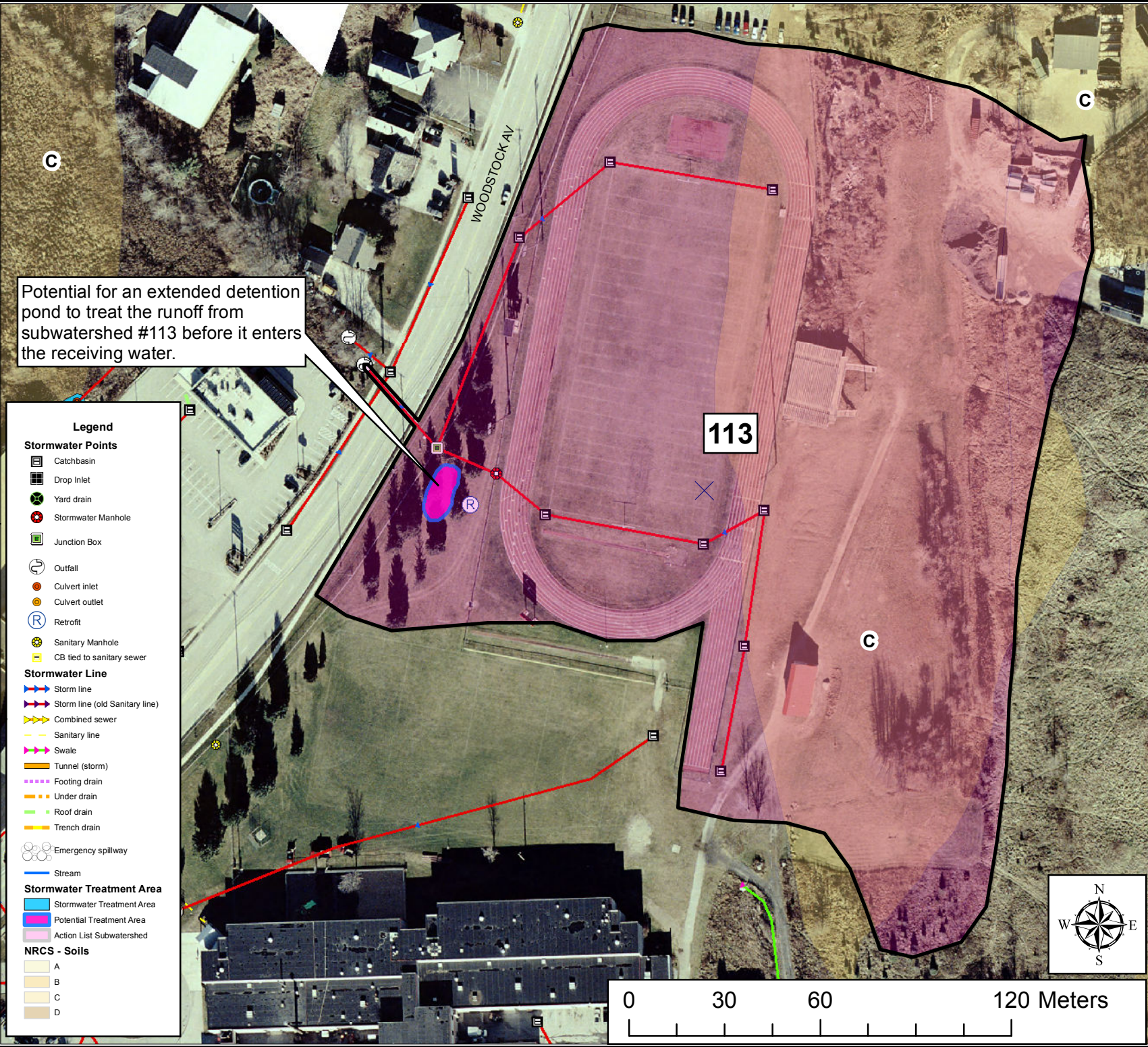
- Storm line
- Storm line (old Sanitary line)
- Combined sewer
- Sanitary line
- Swale
- Tunnel (storm)
- Footing drain
- Under drain
- Roof drain
- Trench drain
- Emergency spillway
- Stream

**Stormwater Treatment Area**

- Stormwater Treatment Area
- Potential Treatment Area
- Action List Subwatershed

**NRCS - Soils**

- A
- B
- C
- D



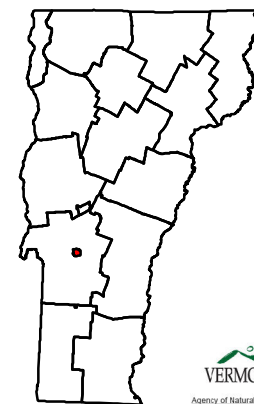


# Rutland City

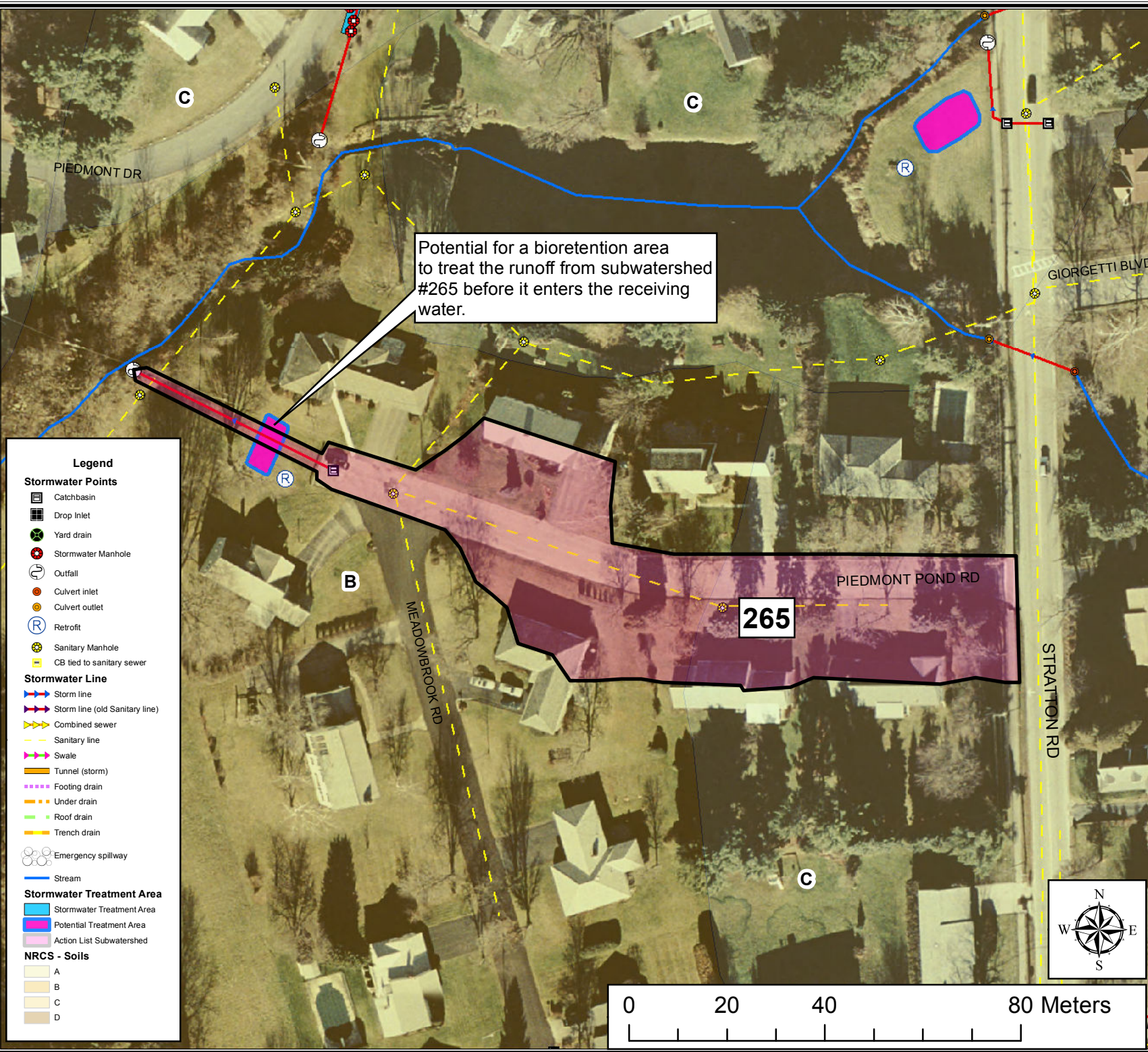
## Action List 1 Subwatershed: 265

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.



VTANR - DEC - WSMD  
 Creator: Jim Pease, Collin Smythe  
 Date: 6/26/2012  
 Data Sources: Field data, Town and stormwater permit plans, existing GIS data, GPS data, municipal member knowledge, VTRANS roads data, VT Hydrography dataset, NRCS soils map  
 Imagery Source: Rutland City .15m orthos (2001)



Potential for a bioretention area to treat the runoff from subwatershed #265 before it enters the receiving water.

**Legend**

**Stormwater Points**

- Catchbasin
- Drop Inlet
- Yard drain
- Stormwater Manhole
- Outfall
- Culvert inlet
- Culvert outlet
- Retrofit
- Sanitary Manhole
- CB tied to sanitary sewer

**Stormwater Line**

- Storm line
- Storm line (old Sanitary line)
- Combined sewer
- Sanitary line
- Swale
- Tunnel (storm)
- Footing drain
- Under drain
- Roof drain
- Trench drain

Emergency spillway

**Stream**

- Stream

**Stormwater Treatment Area**

- Stormwater Treatment Area
- Potential Treatment Area
- Action List Subwatershed

**NRCS - Soils**

- A
- B
- C
- D



*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.

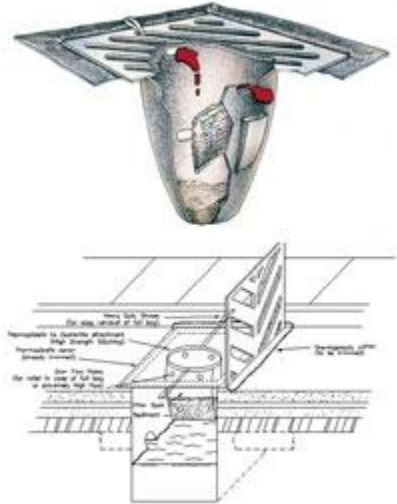
A periodic spill “fire drill” should be conducted to help prepare Town personnel in the event of a spill.

# *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.

# VERMONT HAZARDOUS WASTE MANAGEMENT REGULATIONS

## § 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.

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- (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.

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(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

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(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.



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(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**.

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(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.

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(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.