TOWNS OF:

ST JOHNSBURY, SPRINGFIELD and BRATTLEBORO

STORMWATER MAPPING PROJECT

August 2010

VTDEC - WATER QUALITY DIVISION, STORMWATER SECTION

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See reverse for Overview and Project Summary

Overview

Overview

This stormwater infrastructure mapping project was completed for the municipality by the ANR Clean and Clear 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. Another benefit of knowing the layout and extent of the stormwater system is the possibility to address existing untreated 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 main 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 things such as 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, existing GIS data from contractors, and the input and guidance of knowledgeable members from 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, Digital Elevation Models (DEMs), and 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 more impervious cover. Combining the drainage polygons with an effective impervious connectivity rating (Sutherland, 1995) of the stormwater subwatersheds was the first step in determining potential locations for the best cost/benefit stormwater retrofits.

Impervious cover layers were created 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 as accurate as possible. A 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. This percentage of impervious surface area for each subwatershed was then adjusted with the connectivity rating. This rating depended upon existing stormwater treatment practices for the area and how directly connected the area was to the outfall (Sutherland, 1995), for example whether it went directly into a pipe versus flowing over a grassy area where it would infiltrate.

The drainage areas were selected generally by size and percentage of impervious of the subwatershed, which correlates with the sediment, phosphorus, or nitrogen loads produced. Larger areas that have a greater percentage of their areas as impervious cover were the focus. These subwatershed selections were then modified depending on knowledge gained through field visits, or other available information. After the drainage areas were chosen they were prioritized based on the relative amounts of sediment and phosphorus they could potentially produce. These subwatersheds were given an Action List number ranging from 1 (highest priority) to 3 (lower priority)/ A potential retrofit treatment structure/practice was suggested for each Action List subwatershed, the type of treatment varied depending on availability of potentially "open" land where a treatment structure could be put in place. Availability of "open" land was based solely upon ortho photos and does not indicate land ownership or actual availability.

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.

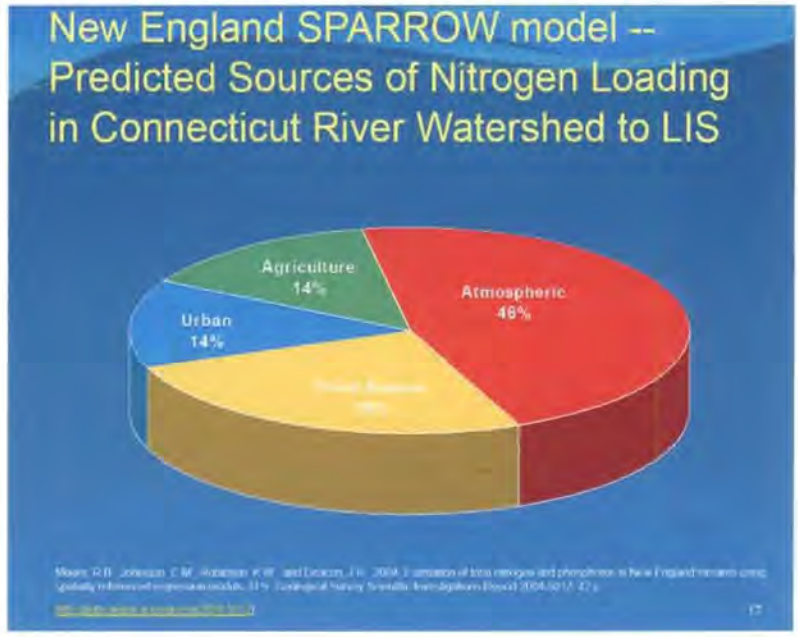
Schueler, T. et.al., 2007. Urban Stormwater Retrofit Practices, Version 1.0. Manual 3, Center for Watershed Protection, August 2007.

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

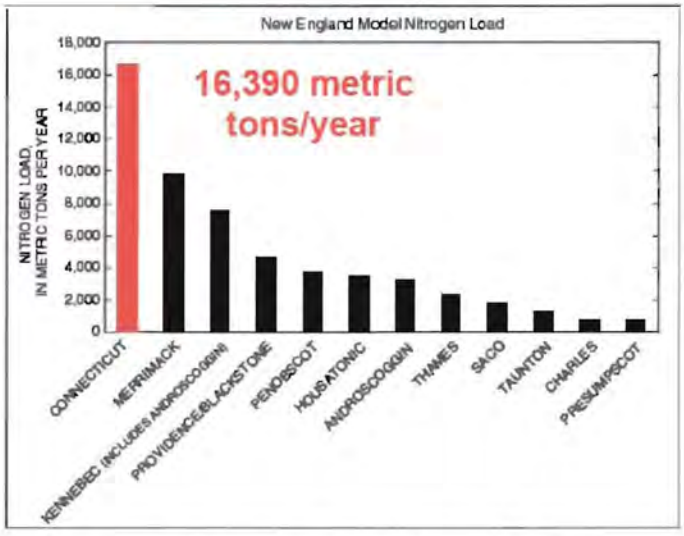
***All data was created in a ArcGIS 9.3.1 Geodatabase format and is available from VTDEC.**

Long Island Sound – Connecticut River Watershed Nitrogen Overview

- *This map shows an overview of the extent of the Connecticut River watershed including areas of Vermont, New Hampshire, Massachusetts, and Connecticut.*



- *This figure shows the modeled nitrogen loading contribution per year from the Connecticut River basin to the Long Island Sound.*



- *This graph shows the breakdown of the modeled nitrogen load from the Connecticut River watershed to the Long Island Sound from various sources.*

- Above figure taken from USGS – *Assessment of Total Nitrogen in the Upper Connecticut River Basin in New Hampshire, Vermont, and Massachusetts. Dec 2002 – Sept 2005.* http://pubs.usgs.gov/sir/2006/5144/pdf/sir2006-5144.pdf

- Above figures taken from EPA/USGS – *Application of NHDPlus for SPARROW nutrient modeling of the Northeastern and Mid-Atlantic Region of the US* http://www.awra.org/orlando2010/presentations/Session22/NHDPlus_SPARROW_AWRA20100330-good.pdf

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	Ext.Det.Pond with Micropool (aka Micropool ED Pond)
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 Attenuator
RDD	Roof Drain Disconnect
RR	Rock RipRap
RS	RipRap Swale
SB	Sediment Basin (10 YR OR >)
SF	Sand Filter (aka Surface Sand Filter)
SS-SF	Swirl Separator – Sand Filter
ST	Septic Tank
TT	Treatment Tank
WL	Wetland (Constructed)
WP	Wet Pond (Retention)
WS	Wet Swale

St. Johnsbury - Subwatershed Prioritization and Recommendations (p1)

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	EIA Equation (RANK)	Percent Effective Impervious Area	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	# LID-Roof Raingardens to equal WQv	# LID-Roof Raingardens to equal CPv
11	1	Extended Detention Pond	EDP/CB/OF		161.9	28	3	28	3.62	4.90	1808	2452
1	2	Sand Filter/Swirl Separator	SF-SS/CB		25.2	70	3	70	1.29	1.95	647	977
104	2	Sand Filter/Swirl Separator	SF-SS/CB/GS/OF		80.2	17	2	12	0.94	1.47	468	736
7	1	CB Cleaning	CB		30.0	28	3	28	0.67	0.91	335	454
32			OF		24.5	48	1	33	0.63	1.28	317	641
73			OF		114.0	8	1	2	0.61	1.04	305	518
111			CB/GS/OF		113.6	6	1	1	0.54	0.75	269	375
65	3	Extended Det. Basin or Bioretention Area in median	(Option 1) EDP/ BFCB/GS	3284-9010	20.0	41	2	35	0.54	0.91	272	455
65	3	Extended Det. Basin or Bioretention Area in median	(Option 2) BR/ BFCB/GS	3284-9010	20.0	41	2	35	0.54	0.91	272	455
63	3	CB Cleaning	CB/DW/OF	3284-9010	29.0	44	2	38	0.85	1.42	425	708
2	3	CB Cleaning	CB/GS/OF		9.3	56	2	50	0.35	0.57	175	287
60	3	CB Cleaning	CB/GS/OF/IP	3364-9010	51.4	27	1	14	0.68	1.53	341	765
83	2	SWPPP-Town Garage	CB/OF		51.7	11	1	4	0.33	0.64	163	321
90	1	CB Cleaning	CB		20.4	23	2	18	0.32	0.53	160	263
109			CB		39.5	9	2	5	0.29	0.37	144	185
58	3	CB Cleaning	CB/OF		10.6	38	2	32	0.27	0.45	133	223
44	1	Extended Detention Basins both sides of road islands in shopping center could be modified to raingardens	EDP/BR/CB/GS/OF	3185-9010 3683-9010 5304-9015.A1	17.1	55	1	40	0.53	1.02	264	512
70			CB/GS/OF		23.3	23	1	11	0.26	0.59	130	293
10			CB/GS/OF		26.5	7	3	7	0.23	0.20	113	102
120			OF		15.5	28	1	15	0.21	0.48	106	238
35			CB/OF		9.8	31	2	25	0.20	0.33	100	167
38			CB		10.7	28	2	22	0.20	0.33	99	164
31			OF		12.3	32	1	18	0.20	0.43	98	216
105			GS/OF		10.5	36	1	22	0.19	0.42	96	208
56			CB/GS/OF		17.8	22	1	10	0.19	0.43	95	215
122			OF		50.4	1	4	0	0.19	0.05	95	23
88			CB/OF		6.8	42	2	35	0.19	0.31	93	156
119			CB/OF		6.4	43	2	37	0.18	0.31	92	153
23			OF		18.3	21	1	9	0.18	0.41	92	206
29			OF		32.9	9	1	2	0.18	0.31	89	154
114			CB/GS		42.5	3	1	1	0.17	0.14	87	70
49			CB/GS/TT		5.6	61	2	56	0.23	0.37	114	186
68			OF		19.8	17	1	7	0.17	0.38	85	189
48			CB/GS/OF	5977-9010	15.6	24	1	12	0.18	0.41	92	207
118			CB/OF		5.9	50	1	36	0.16	0.33	82	163
39			OF/CB		5.5	44	2	38	0.16	0.27	81	135
41			CB/GS/OF		27.5	10	1	3	0.16	0.30	81	151
107			OF		9.1	35	1	21	0.16	0.35	81	175
108			OF		17.3	18	1	8	0.16	0.35	78	173
9			CB/OF		2.1	97	3	97	0.15	0.23	74	115
93			OF		11.4	26	1	13	0.14	0.32	71	160

St. Johnsbury - Subwatershed Prioritization and Recommendations (p1) cont.

Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	Landuse	IF Landuse is Residential: number of Raingardens needed to treat WQv	Raingarden Cost	IF Landuse is residential AND receiving water is small: number of raingardens needed to treat CPv	Raingarden Cost	IF Landuse is Commercial, Industrial, Residential, or Transportation: WQv retrofit cost (1)
11	1	EDP/CB/OF	Residential	1,808	$831,654			$1,102,571
1	2	SF-SS/CB	Commercial					$5,129,295
104	2	SF-SS/CB/GS/OF	Residential	468	$215,153			$3,708,138
7	1	CB	Commercial					To be determined
32		OF						
73		OF						
111		CB/GS/OF						
65	3	EDP//BFCB/GS	Commercial					$166,145
65	3	BR/BFCB/GS	Commercial					$125,321
63	3	CB/DW/OF	Commercial					To be determined
2	3	CB/GS/OF	Commercial					To be determined
60	3	CB/GS/OF/IP	Residential	341	$156,656			To be determined
83	2	CB/OF	Forest					
90	1	CB	Residential	160	$73,406			To be determined
109		CB						
58	3	CB/OF	Commercial					To be determined
44	1	EDP/BR/CB/GS/OF	Commercial					$161,048
70		CB/GS/OF						
10		CB/GS/OF						
120		OF						
35		CB/OF						
38		CB						
31		OF						
105		GS/OF						
56		CB/GS/OF						
122		OF						
88		CB/OF						
119		CB/OF						
23		OF						
29		OF						
114		CB/GS						
49		CB/GS/TT						
68		OF						
48		CB/GS/OF						
118		CB/OF						
39		OF/CB						
41		CB/GS/OF						
107		OF						
108		OF						
9		CB/OF						
93		OF						

St. Johnsbury - Subwatershed Prioritization and Recommendations (p2)

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	EIA Equation (RANK)	Percent Effective Impervious Area	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	# LID-Roof Raingardens to equal WQv	# LID-Roof Raingardens to equal CPv
69			CB/OF		4.4	48	2	41	0.14	0.23	69	115
30			CB/OF		20.0	13	1	5	0.14	0.28	68	141
43			GS/OF		8.0	32	1	18	0.13	0.28	64	140
57	1	Extended Detention Pond behind culvert	EDP/GS		8.4	30	1	17	0.13	0.28	63	140
121			OF		33.2	0	4	0	0.12	0.02	62	8
22			CB/GS/DP/OF		13.0	42	4	23	0.25	0.60	124	299
6			CB		1.9	90	3	90	0.12	0.18	60	91
61			CB		3.8	46	2	40	0.12	0.19	59	97
42			CB/GS/OF		10.5	22	1	10	0.11	0.25	56	126
26			CB/OF/GS	3286-9010	4.7	39	2	33	0.12	0.20	60	101
45	3	Treatment Tank (combine with 46)	TT/CB/RS/OF	3683-9010	10.8	20	1	9	0.11	0.24	54	121
113			OF	5407-9003	4.1	48	1	34	0.11	0.22	54	108
112			CB	5407-9003	2.2	70	2	66	0.11	0.17	53	85
110			OF		25.0	2	4	0	0.10	0.05	48	23
54			CB/GS/OF		11.4	16	1	6	0.09	0.20	46	100
115			CB/GS		5.2	26	2	20	0.09	0.15	45	74
52			GS/OF		2.7	56	1	42	0.09	0.16	43	82
14			CB/GS		5.4	23	2	18	0.08	0.14	42	69
67			CB		3.5	36	2	29	0.08	0.14	42	70
17			OF/GS	4482-9015	16.7	45	1	31	0.41	0.84	204	418
34			CB/GS/OF	4482-9015	22.5	35	1	21	0.40	0.87	202	437
87			OF		4.6	34	1	20	0.08	0.18	40	88
21			CB/OF/DP		10.8	33	4	15	0.15	0.39	75	194
15			IB/CB/GS	5895-9015 NOT BUILT	19.7	37	1	23	0.37	0.80	187	402
101			CB/GS/OF		7.6	19	1	9	0.07	0.16	36	81
59			CB/DP(2)		8.6	38	4	19	0.14	0.36	72	179
66			CB/OF		5.7	25	1	13	0.07	0.16	35	79
116			CB/GS		7.1	20	1	9	0.07	0.16	35	78
62			DI/OF		5.9	23	1	11	0.07	0.15	33	75
50			CB/GS/OF		1.7	65	1	53	0.07	0.12	33	60
95			CB/OF		4.7	28	1	15	0.07	0.15	33	73
97			CB/GS/OF		12.5	7	1	2	0.06	0.10	32	51
74			CB/GS/OF		5.6	22	1	11	0.06	0.14	30	68
117			CB/WP		15.7	18	4	5	0.11	0.30	57	152
106			OF		7.0	16	1	6	0.06	0.12	28	62
71			GS/OF		6.6	15	1	6	0.05	0.11	26	56
84			OF		9.5	8	1	2	0.05	0.09	26	44
51			CB		1.3	51	2	45	0.05	0.08	23	38
40			OF/CB		4.4	21	1	10	0.05	0.10	23	51
28			OF	3518-9010	4.4	24	1	11	0.05	0.11	25	57
16			OF		4.6	20	1	9	0.05	0.10	23	51
8			OF		0.9	76	1	67	0.04	0.07	21	37
78			CB/RS/OF	5340-9010	5.0	19	1	9	0.05	0.11	24	53

St. Johnsbury - Subwatershed Prioritization and Recommendations (p2) cont.

Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	Landuse	IF Landuse is Residential: number of Raingardens needed to treat WQv	Raingarden Cost	IF Landuse is residential AND receiving water is small: number of raingardens needed to treat CPv	Raingarden Cost	IF Landuse is Commercial, Industrial, Residential, or Transportation: WQv retrofit cost (1)
69		CB/OF						
30		CB/OF						
43		GS/OF						
57	1	EDP/GS	Commercial					$38,548
121		OF						
22		CB/GS/DP/OF						
6		CB						
61		CB						
42		CB/GS/OF						
26		CB/OF/GS						
45	3	TT/CB/RS/OF	Commercial					$128,703
113		OF						
112		CB						
110		OF						
54		CB/GS/OF						
115		CB/GS						
52		GS/OF						
14		CB/GS						
67		CB						
17		OF/GS						
34		CB/GS/OF						
87		OF						
21		CB/OF/DP						
15		IB/CB/GS						
101		CB/GS/OF						
59		CB/DP(2)						
66		CB/OF						
116		CB/GS						
62		DI/OF						
50		CB/GS/OF						
95		CB/OF						
97		CB/GS/OF						
74		CB/GS/OF						
117		CB/WP						
106		OF						
71		GS/OF						
84		OF						
51		CB						
40		OF/CB						
28		OF						
16		OF						
8		OF						
78		CB/RS/OF						

St. Johnsbury - Subwatershed Prioritization and Recommendations (p3)

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	EIA Equation (RANK)	Percent Effective Impervious Area	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	# LID-Roof Raingardens to equal WQv	# LID-Roof Raingardens to equal CPv
96			CB/OF		2.1	30	2	24	0.04	0.07	21	35
24			CB/OF		3.7	23	1	11	0.04	0.09	21	47
4			CB/RS	3518-9010	1.1	59	3	59	0.05	0.07	23	35
98			OF		4.7	17	1	7	0.04	0.09	20	45
94			CB/OF		3.4	24	1	12	0.04	0.09	20	46
75			CB/GS/OF	5340-9010	8.2	9	1	3	0.04	0.08	22	39
25			OF		4.5	18	1	8	0.04	0.09	20	45
47			OF	3185-9010	1.6	49	1	34	0.04	0.09	22	43
80			OF	5340-9010	6.2	13	1	5	0.04	0.09	21	43
33			OF		2.8	27	1	14	0.04	0.08	19	42
13			CB/GS	3092-9010	1.3	57	1	43	0.04	0.08	21	40
36			CB		0.7	67	3	67	0.04	0.06	18	28
82			CB/OF	5340-9010	3.6	23	1	11	0.04	0.09	20	45
27			CB/GS/OF	5616-INDS	3.3	75	2	71	0.17	0.27	85	136
12			CB/GS	3092-9010	0.7	72	3	72	0.04	0.06	19	28
91			CB/GS		0.6	80	1	72	0.03	0.05	16	27
79			OF	5340-9010	7.1	7	1	2	0.04	0.05	18	27
76			OF	5340-9010	4.1	17	1	7	0.03	0.07	17	37
89			OF		1.8	33	1	19	0.03	0.07	15	33
46	3	(combine with 45)	TT/CB/GS	3185-9010	0.7	75	1	65	0.03	0.06	16	29
102			CB/GS/OF		4.4	12	1	4	0.03	0.06	15	30
55			CB/GS/SF/DP	5304-9015.A1	10.0	38	5	15	0.14	0.42	68	210
81			CB/GS/OF	5340-9010	4.0	14	1	5	0.03	0.06	15	31
100			CB		1.0	39	2	33	0.03	0.04	13	21
19			CB/OF		1.4	34	1	20	0.02	0.05	12	27
85			OF		4.3	9	1	3	0.02	0.04	12	21
77			CB/RS/OF	5340-9010	1.6	32	1	18	0.03	0.06	13	29
103			OF		2.6	16	1	6	0.02	0.05	11	23
72			CB		0.6	55	2	49	0.02	0.03	10	17
53			CB/IG(3)	5099-9015	2.0	81	4	70	0.10	0.18	51	88
86			OF		1.3	29	1	16	0.02	0.04	10	22
20			DW		1.6	55	5	30	0.04	0.10	19	49
3			CB		0.6	46	3	46	0.02	0.03	10	14
99			CB/GS/OF		1.8	19	1	8	0.02	0.04	9	19
18			OF	3092-9010	1.2	25	1	13	0.02	0.03	8	17
5			CB		0.3	59	3	59	0.01	0.02	6	9
64			GS		0.4	42	1	27	0.01	0.02	5	10
92			CB		0.1	90	3	90	0.01	0.01	4	6
37			CB		0.1	69	3	69	0.00	0.01	2	3
3000			Drains to Sanitary		249.8	43	0	0	0.94	11.94	0	0
TOTALS					1944.3				24.74	53.37		

St. Johnsbury - Subwatershed Prioritization and Recommendations (p3) cont.

Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	Landuse	IF Landuse is Residential: number of Raingardens needed to treat WQv	Raingarden Cost	IF Landuse is residential AND receiving water is small: number of raingardens needed to treat CPv	Raingarden Cost	IF Landuse is Commercial, Industrial, Residential, or Transportation: WQv retrofit cost (1)
96		CB/OF						
24		CB/OF						
4		CB/RS						
98		OF						
94		CB/OF						
75		CB/GS/OF						
25		OF						
47		OF						
80		OF						
33		OF						
13		CB/GS						
36		CB						
82		CB/OF						
27		CB/GS/OF						
12		CB/GS						
91		CB/GS						
79		OF						
76		OF						
89		OF						
46	3	TT/CB/GS	Commercial					$128,703
102		CB/GS/OF						
55		CB/GS/SF/DP						
81		CB/GS/OF						
100		CB						
19		CB/OF						
85		OF						
77		CB/RS/OF						
103		OF						
72		CB						
53		CB/IG(3)						
86		OF						
20		DW						
3		CB						
99		CB/GS/OF						
18		OF						
5		CB						
64		GS						
92		CB						
37		CB						
3000		Drains to Sanitary						

Springfield - Subwatershed Prioritization and Recommendations (p1)

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	EIA Equation (RANK)	Percent Effective Impervious Area	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	# LID-Roof Raingardens to equal WQv	# LID-Roof Raingardens to equal CPv
66	2	Upper 1/2 - EDP, Lower 1/2 - SS-SF	EDP/SS-SF/CB		38.6	35	3	35	1.05	1.48	525	738
34	3	SS-SF @ 97 Park St	SS-SF/CB		28.4	49	3	49	1.05	1.53	523	766
97	1	Extended Detention Pond, Swirl Separator-Filter (Combine with 92,93,96-102)	(1st option) EDP/ CB/GS		44.6	31	2	24	0.90	1.51	452	756
97	1	Extended Detention Pond, Swirl Separator-Filter (Combine with 92,93,96-102)	(2nd option) SS-SF/ CB/GS		44.6	31	2	24	0.90	1.51	452	756
104	2	Rooftop raingardens or bioretention area	BR/CB		44.8	30	2	24	0.89	1.49	446	746
71	1	Extended Detention Pond	EDP/CB/GS/DW		46.4	27	2	21	0.84	1.40	421	701
52	3	Lower 1/2 SS-SF @ 23 South St	SS-SF/CB		26.1	30	3	30	0.62	0.85	309	423
107	2	(SS - SF @ parking lot)	SS-SF/CB		12.0	60	3	60	0.53	0.80	267	398
18	3	EDP	EDP/CB/GS		15.0	49	2	43	0.49	0.82	247	408
68			CB/GS		55.0	17	1	7	0.47	1.02	233	512
103	3	Rooftop raingardens/ bioretention	BR/CB/GS		42.1	22	1	10	0.44	1.00	222	500
81			CB	4886-9003, 4746-9003	31.7	17	3	17	0.48	0.58	238	291
9			CB		12.0	49	2	42	0.39	0.64	193	320
125			CB		20.6	28	2	22	0.38	0.64	192	320
121			CB		15.7	36	2	29	0.37	0.62	184	308
131			OF		27.0	24	1	12	0.31	0.71	156	354
16			CB		4.7	92	3	92	0.31	0.47	154	236
74	3	Rooftop raingardens/ bioretention (or SS-SF behind 48 Stanley Rd)	BR/CB/GS/OF	3253-9010	41.7	30	1	16	0.61	1.37	307	683
36			CB		8.9	44	3	44	0.30	0.43	150	217
116			CB		10.0	45	2	38	0.29	0.49	147	244
100	1	Combine with 92,93,96-102	EDP/SS-SF/CB		8.7	49	2	42	0.28	0.46	140	231
69			CB/GS		29.7	19	1	8	0.27	0.61	137	307
37			CB		4.6	93	3	93	0.30	0.47	152	234
60			CB		15.6	25	2	19	0.26	0.44	131	218
57			CB		6.2	53	3	53	0.24	0.36	122	180
84			CB		5.2	63	3	63	0.24	0.36	119	178
67			CB		21.9	22	1	10	0.24	0.53	118	267
111			CB/OF		18.4	18	2	13	0.23	0.37	116	186
140			OF		26.5	17	1	7	0.23	0.50	113	249
2			CB/GS		7.7	43	2	37	0.22	0.36	109	182
133			CB/OF		9.0	45	1	30	0.22	0.45	109	223
14			OF/RD		4.7	73	1	62	0.22	0.38	108	190
15			OF		4.5	74	1	64	0.21	0.37	106	185
42			CB/GS		14.4	30	1	16	0.21	0.47	105	235

Springfield - Subwatershed Prioritization and Recommendations (p1) cont.

Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	Landuse	IF Landuse is Residential: number of Raingardens needed to treat WQv	Raingarden Cost	IF Landuse is residential AND receiving water is small: number of raingardens needed to treat CPv	Raingarden Cost	IF Landuse is Commercial, Industrial, Residential, or Transportation: WQv retrofit cost (1)
66	2	EDP/SS-SF/CB	Residential	525	$241,507			$2,241,259
34	3	SS-SF/CB	Residential	523	$240,755			$4,149,380
97	1	(1st option) EDP/ CB/GS	Residential	452	$207,860			$487,128
97	1	(2nd option) SS-SF/ CB/GS	Residential	452	$207,860			$6,332,668
104	2	BR/CB	Residential	446	$205,245			$205,245
71	1	EDP/CB/GS/DW	Commercial					$256,695
52	3	SS-SF/CB	Residential	309	$141,980			$1,223,504
107	2	SS-SF/CB	Commercial					$2,115,271
18	3	EDP/CB/GS	Commercial					$141,788
68		CB/GS						
103	3	BR/CB/GS	Residential	222	$101,977			
81		CB						
9		CB						
125		CB						
121		CB						
131		OF						
16		CB						
74	3	BR/CB/GS/OF	Residential	307	$141,272			
36		CB						
116		CB						
100	1	EDP/SS-SF/CB	Residential	140	$64,292	231	$106,471	
69		CB/GS						
37		CB						
60		CB						
57		CB						
84		CB						
67		CB						
111		CB/OF						
140		OF						
2		CB/GS						
133		CB/OF						
14		OF/RD						
15		OF						
42		CB/GS						

Springfield - Subwatershed Prioritization and Recommendations (p2)

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	EIA Equation (RANK)	Percent Effective Impervious Area	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	# LID-Roof Raingardens to equal WQv	# LID-Roof Raingardens to equal CPv
137			GS/OF		26.7	14	1	5	0.20	0.42	99	209
56			CB		3.5	75	3	75	0.19	0.29	95	145
82			CB	4886-9003, 4746-9003	3.1	94	3	94	0.21	0.32	104	161
1			CB		5.3	50	2	43	0.17	0.29	87	144
129			CB/OF		24.8	15	4	4	0.16	0.41	79	203
90			CB/GS		15.3	21	1	9	0.15	0.35	77	173
91			CB/GS		12.7	24	1	12	0.15	0.34	74	168
135			CB		15.3	12	2	8	0.14	0.20	68	99
44			CB/GS		9.7	28	1	15	0.14	0.30	68	151
138			CB		14.2	19	1	8	0.13	0.30	67	151
38			CB		4.5	45	2	39	0.13	0.22	67	112
30			CB/GS		5.4	46	1	31	0.13	0.27	66	135
101	1	Combine with 92,93,96-102	EDP/SS-SF/CB/OF		20.7	15	4	4	0.13	0.34	66	169
76			CB		12.4	21	1	10	0.13	0.29	65	146
110			CB		5.9	33	2	26	0.13	0.21	64	107
120			CB/GS		7.7	33	1	19	0.13	0.28	64	140
54			CB		2.3	76	3	76	0.13	0.19	63	96
4			CB		5.2	45	1	30	0.12	0.25	62	127
83			CB	4886-9003, 4746-9003	2.4	79	3	79	0.14	0.21	68	104
35			OF		10.8	23	1	11	0.12	0.27	60	136
118			CB		4.9	45	1	30	0.12	0.24	59	121
92	1	Combine with 92,93,96-102	EDP/SS-SF/CB/GS		17.0	16	4	4	0.11	0.29	56	145
28			CB/GS		6.4	34	1	20	0.11	0.24	55	120
77			CB		3.8	51	1	36	0.11	0.21	54	107
134			CB/GS		17.1	11	1	4	0.11	0.21	54	105
75			CB/GS		11.2	20	1	9	0.11	0.24	54	120
70			CB/GS		12.8	17	1	7	0.11	0.24	54	118
139			OF		4.9	40	1	25	0.10	0.21	51	107
114			OF		11.8	17	1	7	0.10	0.22	51	112
72	3	EDP	EDP/CB		4.2	45	1	30	0.10	0.21	50	104
46			CB		5.2	29	2	23	0.10	0.17	50	84
130			OF		8.8	27	4	11	0.10	0.26	49	131
50			CB/OF		3.8	39	2	32	0.10	0.16	48	81
41			CB/DP	3233-9010	13.6	39	5	15	0.19	0.58	94	290
78			CB/GS/DP	3249-9010	15.0	30	4	13	0.19	0.50	94	248
128			OF		9.6	20	1	9	0.09	0.21	46	104
85			CB		1.6	79	3	79	0.09	0.14	46	70
108			OF		9.9	22	4	8	0.09	0.24	44	119
106			GS/OF		2.5	60	1	47	0.09	0.16	44	82
22			CB/GS		2.2	59	2	53	0.09	0.14	43	70
86			CB		1.7	71	2	66	0.08	0.13	41	65
89			CB/GS		6.9	24	1	11	0.08	0.18	39	89
33			CB		3.7	30	2	24	0.07	0.12	37	62
109			OF		3.5	41	1	26	0.07	0.16	37	78

Springfield - Subwatershed Prioritization and Recommendations (p2) cont.

Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	Landuse	IF Landuse is Residential: number of Raingardens needed to treat WQv	Raingarden Cost	IF Landuse is residential AND receiving water is small: number of raingardens needed to treat CPv	Raingarden Cost	IF Landuse is Commercial, Industrial, Residential, or Transportation: WQv retrofit cost (1)
137		GS/OF						
56		CB						
82		CB						
1		CB						
129		CB/OF						
90		CB/GS						
91		CB/GS						
135		CB						
44		CB/GS						
138		CB						
38		CB						
30		CB/GS						
101	1	EDP/SS-SF/CB/OF	Forest					
76		CB						
110		CB						
120		CB/GS						
54		CB						
4		CB						
83		CB						
35		OF						
118		CB						
92	1	EDP/SS-SF/CB/GS	Forest					
28		CB/GS						
77		CB						
134		CB/GS						
75		CB/GS						
70		CB/GS						
139		OF						
114		OF						
72	3	EDP/CB	Residential	50	$23,222	104	$47,767	$30,787
46		CB						
130		OF						
50		CB/OF						
41		CB/DP						
78		CB/GS/DP						
128		OF						
85		CB						
108		OF						
106		GS/OF						
22		CB/GS						
86		CB						
89		CB/GS						
33		CB						
109		OF						

Springfield - Subwatershed Prioritization and Recommendations (p3)

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	EIA Equation (RANK)	Percent Effective Impervious Area	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	# LID-Roof Raingardens to equal WQv	# LID-Roof Raingardens to equal CPv
94			CB		4.7	30	1	16	0.07	0.15	34	76
29			CB/GS		4.8	28	1	15	0.07	0.15	34	76
43			CB		1.9	52	2	46	0.07	0.11	34	55
45			OF		6.5	20	1	9	0.06	0.14	32	72
31			CB/GS		3.5	34	1	20	0.06	0.13	30	66
80			CB		1.6	61	1	48	0.06	0.11	29	54
3			CB/GS/DP		5.6	40	1	25	0.12	0.24	58	122
115			OF		11.7	7	1	2	0.06	0.09	29	44
49			CB		3.0	28	2	22	0.05	0.09	27	45
51			CB		1.3	53	3	53	0.05	0.08	26	39
17			CB		1.1	62	3	62	0.05	0.08	26	39
39			CB/GS/IG/OGF	5476-INDS	14.9	39	4	20	0.26	0.64	130	319
73			CB		2.3	43	1	28	0.05	0.11	26	54
11			CB		2.0	38	2	31	0.05	0.08	25	42
8			CB		3.5	29	1	16	0.05	0.11	25	55
40			CB/RS	5476-INDS	17.9	28	1	15	0.25	0.55	123	275
48			OF		4.3	23	1	11	0.05	0.11	24	55
93	1	Combine with 92,93,96-102	EDP/SS-SF/CB		1.4	51	2	45	0.05	0.08	24	40
132			OF		8.4	10	1	3	0.05	0.09	24	44
117			CB		1.2	53	2	47	0.04	0.07	22	36
136			CB/GS		8.6	7	1	2	0.04	0.06	21	32
119			CB		1.8	43	1	28	0.04	0.09	21	43
5			CB/GS		6.3	12	1	4	0.04	0.08	21	42
32			OF		5.3	15	1	6	0.04	0.09	21	44
58			OF		1.2	59	1	45	0.04	0.08	21	39
23			CB		1.1	55	2	49	0.04	0.07	20	33
127			CB/GS		7.0	12	4	3	0.04	0.09	20	46
113			CB		2.0	38	1	23	0.04	0.08	19	41
79			OF		2.0	37	1	23	0.04	0.08	19	41
63			CB		0.6	91	1	87	0.04	0.06	18	29
62			CB		0.6	83	1	76	0.04	0.06	18	30
112			OF		2.0	35	1	21	0.04	0.08	18	38
96	1	Combine with 92,93,96-102	EDP/SS-SF/CB		3.7	19	1	8	0.03	0.08	17	39
126			CB/GS		6.8	9	4	2	0.03	0.07	16	33
20			CB		0.5	88	3	88	0.03	0.05	15	23
99	1	Combine with 92,93,96-102	EDP/SS-SF/CB		2.0	30	1	16	0.03	0.07	15	34
122			CB		1.5	38	1	23	0.03	0.06	15	31
105			CB		0.4	99	3	99	0.03	0.04	14	22
98	1	Combine with 92,93,96-102	EDP/SS-SF/CB		0.7	69	1	57	0.03	0.05	14	25
55			CB		0.5	72	3	72	0.03	0.04	14	21
102	1	Combine with 92,93,96-102	EDP/SS-SF/CB		1.8	30	1	17	0.03	0.06	14	30
95			CB		0.6	77	1	67	0.03	0.05	13	23
24			GS		0.6	74	1	64	0.03	0.05	13	23
27			CB/GS/DP	3837-9015.1	5.8	47	4	28	0.13	0.30	65	149
13			CB		0.4	89	3	89	0.03	0.04	13	20
61			CB		0.7	52	2	46	0.03	0.04	13	21

Springfield - Subwatershed Prioritization and Recommendations (p3) cont.

Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	Landuse	IF Landuse is Residential: number of Raingardens needed to treat WQv	Raingarden Cost	IF Landuse is residential AND receiving water is small: number of raingardens needed to treat CPv	Raingarden Cost	IF Landuse is Commercial, Industrial, Residential, or Transportation: WQv retrofit cost (1)
94		CB						
29		CB/GS						
43		CB						
45		OF						
31		CB/GS						
80		CB						
3		CB/GS/DP						
115		OF						
49		CB						
51		CB						
17		CB						
39		CB/GS/IG/OGF						
73		CB						
11		CB						
8		CB						
40		CB/RS						
48		OF						
93	1	EDP/SS-SF/CB	Residential	24	$11,261	40	$18,585	
132		OF						
117		CB						
136		CB/GS						
119		CB						
5		CB/GS						
32		OF						
58		OF						
23		CB						
127		CB/GS						
113		CB						
79		OF						
63		CB						
62		CB						
112		OF						
96	1	EDP/SS-SF/CB	Residential	17	$7,983	39	$17,878	
126		CB/GS						
20		CB						
99	1	EDP/SS-SF/CB	Commercial					
122		CB						
105		CB						
98	1	EDP/SS-SF/CB	Residential	14	$6,510	25	$11,667	
55		CB						
102	1	EDP/SS-SF/CB	Residential	14	$6,273	30	$13,935	
95		CB						
24		GS						
27		CB/GS/DP						
13		CB						
61		CB						

Springfield - Subwatershed Prioritization and Recommendations (p4)

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	EIA Equation (RANK)	Percent Effective Impervious Area	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	# LID-Roof Raingardens to equal WQv	# LID-Roof Raingardens to equal CPv
19			OF		3.6	13	1	5	0.03	0.05	13	26
65			CB		0.5	75	2	72	0.02	0.04	12	20
12			CB		0.4	75	3	75	0.02	0.04	12	19
10			CB/GS		0.6	68	1	57	0.02	0.04	12	21
123			CB/DG/DP/OGF	5487-INDS	11.5	30	5	9	0.11	0.38	56	188
59			CB		0.7	45	2	38	0.02	0.03	10	17
26			CB/GS	3837-9015.1	5.8	36	4	18	0.09	0.23	45	115
21			CB		0.3	82	3	82	0.02	0.03	9	14
53			CB		0.3	89	3	89	0.02	0.03	9	14
88			CB		2.2	16	1	6	0.02	0.04	9	19
25			CB/GS	3837-9015.1	4.0	41	4	22	0.08	0.18	38	91
124			GS		1.6	14	1	5	0.01	0.02	6	12
6			CB		0.7	34	1	20	0.01	0.02	6	12
7			CB		0.5	40	1	26	0.01	0.02	5	12
47			CB		0.8	27	1	14	0.01	0.02	5	12
64			CB		0.2	84	2	82	0.01	0.02	5	8
87			CB		0.2	66	2	61	0.01	0.01	3	6
3000			Drains to Sanitary		38.4	48	0	0	0.14	2.04	72	1018
TOTALS					1,375.6				23.63	45.07		

Springfield - Subwatershed Prioritization and Recommendations (p4) cont.

Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	Landuse	IF Landuse is Residential: number of Raingardens needed to treat WQv	Raingarden Cost	IF Landuse is residential AND receiving water is small: number of raingardens needed to treat CPv	Raingarden Cost	IF Landuse is Commercial, Industrial, Residential, or Transportation: WQv retrofit cost (1)
19		OF						
65		CB						
12		CB						
10		CB/GS						
123		CB/DG/DP/OGF						
59		CB						
26		CB/GS						
21		CB						
53		CB						
88		CB						
25		CB/GS						
124		GS						
6		CB						
7		CB						
47		CB						
64		CB						
87		CB						
3000		Drains to Sanitary						

Brattleboro - Subwatershed Prioritization and Recommendations (p1)

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	EIA Equation (RANK)	Percent Effective Impervious Area	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	# LID-Roof Raingardens to equal WQv	# LID-Roof Raingardens to equal CPv
67	1	CB Cleaning	CB		61.8	61	2	56	2.55	4.15	1275	2074
177	1	EDP	EDP/CB/SW/GS/SB	3987-9010 5116-9003 3415-9010 3693-9010 6339-9003 4859-9003	119.6	54	1	39	3.62	7.06	1811	3530
82	1	Shallow extended detention in I-91 median	EDP/CB/OF		110.3	28	2	21	2.01	3.36	1007	1678
6	1	Maintenance of Kettle Pond for stormwater management	CB/GS/OF/Kettle Pond	5954-9010	135.5	38	5	15	1.84	5.69	922	2847
9	3	Swirl Separator/Sand Filter	SS-SF/CB/DS/IP	3423-9010.A	104.1	45	2	38	3.09	5.14	1546	2572
152	1	EDP	EDP/CB/DW	3255-9010 3022-9010 3022-9003 3291-9010	29.0	73	3	73	1.54	2.33	768	1163
5	3	Swirl Separator/Sand Filter	SS-SF/CB		41.6	43	3	43	1.37	1.98	685	990
4	1	EDP	EDP/CB		40.5	40	2	33	1.07	1.78	534	892
68	1	EDP	EDP/CB/OF		57.4	27	2	21	1.03	1.72	516	860
84	3	Swirl Separator/Sand Filter	SS-SF/CB		57.5	26	2	20	1.01	1.68	504	838
175	3	Swirl Separator/Sand Filter	SS-SF/CB	5604-9003	16.6	82	3	82	0.98	1.50	491	750
36	1	CB Cleaning	CB/OF	4560-9003	26.1	47	2	41	0.82	1.35	408	677
21	3	SWPPP-mostly roof runoff	SWPPP/DI/OF		10.1	94	3	94	0.68	1.05	340	524
173	1	Swirl Separator/Sand Filter / reroute to Conn River	SS-SF/CB	5130-9003	18.1	59	2	53	0.72	1.17	359	586
30	1	CB Cleaning	CB		16.2	59	2	53	0.64	1.05	322	525
14	2	Swirl Separator/Sand Filter	SS-SF/CB/SB	3423-9010.A	59.5	32	2	25	1.24	2.08	622	1042
22	2	SWPPP	SWPPP/CB/OF/WL (natural)		22.3	54	4	35	0.61	1.32	307	661
155	2	Retrofit infiltration system at time of redevelopment	IB/CB		11.4	76	2	72	0.59	0.95	297	473
176	3	Enhanced SWPPP-mostly roof runoff	SWPPP/CB	4432-9003	10.0	90	3	90	0.65	0.99	324	497
57			CB		15.2	57	2	51	0.58	0.95	291	476
209			CB/GS		34.5	32	1	18	0.55	1.21	275	606
69			CB		36.5	22	2	16	0.54	0.89	271	444
178			CB/SB	3987-9010 4845-9003	20.4	76	5	58	0.87	1.70	435	852
88			CB		14.5	44	3	44	0.49	0.70	243	352
196			CB		67.5	8	2	5	0.49	0.62	243	309
184			GS/OF		12.9	62	1	48	0.47	0.87	235	437
171			OF/CB		12.8	52	2	46	0.44	0.73	222	366
153			CB		8.0	79	2	76	0.44	0.70	222	351
24			CB/GS/OF/DS		34.9	28	4	11	0.40	1.07	200	533
61			CB/OF		16.4	37	2	30	0.40	0.66	198	331
190			CB/OF		21.1	22	3	22	0.39	0.50	193	251

Brattleboro - Subwatershed Prioritization and Recommendations (p1) cont.

Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	Landuse	IF Landuse is Residential: number of Raingardens needed to treat WQv	Raingarden Cost	IF Landuse is residential AND receiving water is small: number of raingardens needed to treat CPv	Raingarden Cost	IF Landuse is Commercial, Industrial, Residential, or Transportation: WQv retrofit cost (1)	IF Landuse is Commercial, Industrial, Residential, or Transportation AND receiving water is small: CPv retrofit cost (2)
67	1	CB	Residential	1275	$586,286			To be determined	
177	1	EDP/CB/SW/GS/SB	Industrial					$1,104,448	
82	1	EDP/CB/OF	Trans					$614,196	
6	1	CB/GS/OF/Kettle Pond	Commercial					To be determined	
9	3	SS-SF/CB/DS/IP	Residential	1546	$711,346			$6,129,973	
152	1	EDP/CB/DW	Commercial					$468,509	
5	3	SS-SF/CB	Residential	685	$315,219	990	$455,247	$5,432,746	$7,846,110
4	1	EDP/CB	Commercial					$325,425	
68	1	EDP/CB/OF	Residential	516	$237,496	860	$395,481	$314,863	$524,312
84	3	SS-SF/CB	Residential	504	$231,724			$1,996,862	
175	3	SS-SF/CB	Industrial					$3,895,897	
36	1	CB/OF	Residential	408	$187,817			To be determined	
21	3	SWPPP/DI/OF	Industrial					$2,500	
173	1	SS-SF/CB	Industrial					$2,847,814	
30	1	CB	Residential	322	$147,912				
14	2	SS-SF/CB/SB	Residential	622	$286,265			$2,466,863	
22	2	SWPPP/CB/OF/WL (natural)	Industrial					$2,500	
155	2	IB/CB	Commercial					$102,465	
176	3	SWPPP/CB	Industrial					$2,500	
57		CB							
209		CB/GS							
69		CB							
178		CB/SB							
88		CB							
196		CB							
184		GS/OF							
171		OF/CB							
153		CB							
24		CB/GS/OF/DS							
61		CB/OF							
190		CB/OF							

Brattleboro - Subwatershed Prioritization and Recommendations (p2)

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	EIA Equation (RANK)	Percent Effective Impervious Area	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	# LID-Roof Raingardens to equal WQv	# LID-Roof Raingardens to equal CPv
186			SB/CB/OF	4859-9003	76.3	26	1	13	0.96	2.17	482	1085
29			CB		7.3	69	3	69	0.37	0.56	185	279
72			OF		23.2	32	1	18	0.37	0.81	183	404
19			OF/WP/WL(natural	4387-9003	15.1	78	4	65	0.72	1.29	362	645
164			OF		7.0	79	1	71	0.36	0.61	181	307
106			CB/GS		13.1	48	1	33	0.34	0.69	170	344
81			OF		22.7	30	1	17	0.34	0.76	170	378
132	2	Bioretention	BR/CB/GS		12.7	49	1	34	0.34	0.68	169	340
143			DW/IG/CB	3027-9010	16.6	74	5	55	0.68	1.35	338	676
96			CB		6.3	73	3	73	0.34	0.51	169	255
104			CB		7.0	68	2	63	0.32	0.52	162	262
111			CB/OF		15.3	31	2	24	0.31	0.52	155	259
198			CB		22.9	20	2	14	0.31	0.49	153	247
39	1	Extended Detention Basin/Combine with 40, 37	EDP/CB		8.0	51	3	51	0.30	0.44	151	222
194			CB		29.4	14	2	9	0.30	0.45	150	227
204			OF/GS/WP	3304-9010	114.7	8	5	1	0.48	1.06	242	531
110			CB/OF		13.7	32	2	26	0.29	0.49	145	243
189			OF		13.3	41	1	26	0.29	0.60	144	302
97			CB		4.4	88	3	88	0.28	0.43	139	213
128			CB/OF		6.2	64	2	59	0.27	0.44	135	219
101			CB		5.9	66	2	61	0.27	0.43	133	214
141			CB	3293-9010	12.7	61	2	56	0.52	0.85	261	425
125			CB/OF		24.1	21	1	10	0.25	0.57	125	283
91			CB		5.0	66	3	66	0.24	0.36	121	181
119			CB/GS/OF		14.4	24	2	19	0.23	0.39	117	193
151			DW/SB/OF	3957-9010.1	26.2	45	5	21	0.46	1.31	231	654
134			CB/OF		3.9	85	2	82	0.23	0.36	115	181
23			CB/OF/WL(natural)		5.0	75	4	62	0.23	0.42	114	208
99			CB/OF		5.6	67	1	55	0.23	0.41	114	206
83			OF		42.9	8	1	2	0.22	0.36	111	179
26			OF		8.3	48	1	33	0.22	0.44	110	221
156			CB		5.8	55	2	49	0.22	0.35	108	177
37	1	Extended Detention Basin/Combine with 39, 37	EDP/CB/OF	4560-9003	4.8	70	2	65	0.23	0.37	116	186
121			CB/OF		39.4	8	1	2	0.20	0.33	102	167
192			CB/SS		7.2	77	4	65	0.34	0.61	170	304
43			CB		3.1	88	3	88	0.20	0.31	100	153
166			CB		9.2	33	2	26	0.20	0.33	99	166
207			CB/GS		22.3	18	1	8	0.20	0.44	99	220
185			CB/SB		35.7	19	1	8	0.33	0.74	165	368
16			CB		11.8	33	1	19	0.20	0.43	98	215
27			CB		4.9	57	2	51	0.19	0.31	94	154
75			OF		15.9	21	1	10	0.16	0.37	82	185
7			CB		3.4	70	2	66	0.16	0.26	81	131
202			CB/GS		14.5	23	1	11	0.16	0.37	81	184

Brattleboro - Subwatershed Prioritization and Recommendations (p2) cont.

Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	Landuse	IF Landuse is Residential: number of Raingardens needed to treat WQv	Raingarden Cost	IF Landuse is residential AND receiving water is small: number of raingardens needed to treat CPv	Raingarden Cost	IF Landuse is Commercial, Industrial, Residential, or Transportation: WQv retrofit cost (1)	IF Landuse is Commercial, Industrial, Residential, or Transportation AND receiving water is small: CPv retrofit cost (2)
186		SB/CB/OF							
29		CB							
72		OF							
19		OF/WP/WL(natural)							
164		OF							
106		CB/GS							
81		OF							
132	2	BR/CB/GS	Commercial					$77,904	
143		DW/IG/CB							
96		CB							
104		CB							
111		CB/OF							
198		CB							
39	1	EDP/CB	Commercial					$179,023	
194		CB							
204		OF/GS/WP							
110		CB/OF							
189		OF							
97		CB							
128		CB/OF							
101		CB							
141		CB							
125		CB/OF							
91		CB							
119		CB/GS/OF							
151		DW/SB/OF							
134		CB/OF							
23		CB/OF/WL(natural)							
99		CB/OF							
83		OF							
26		OF							
156		CB							
37	1	EDP/CB/OF							
121		CB/OF							
192		CB/SS							
43		CB							
166		CB							
207		CB/GS							
185		CB/SB							
16		CB							
27		CB							
75		OF							
7		CB							
202		CB/GS							

Brattleboro - Subwatershed Prioritization and Recommendations (p3)

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	EIA Equation (RANK)	Percent Effective Impervious Area	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	# LID-Roof Raingardens to equal WQv	# LID-Roof Raingardens to equal CPv
2			CB/GS/OF/IB	5954-9010	10.3	58	4	40	0.32	0.66	159	331
47			OF	4384-9003	2.5	100	3	100	0.18	0.27	88	136
38			CB		7.0	33	2	27	0.15	0.26	76	128
46			OF	4384-9003	2.4	98	3	98	0.17	0.26	84	129
31			CB		5.8	40	2	33	0.15	0.25	75	126
78			CB/GS		11.3	27	1	14	0.15	0.34	75	168
17			CB/WL(natural)		8.2	40	4	22	0.15	0.36	75	181
59			CB		4.4	48	2	42	0.14	0.23	70	116
18			CB/WS/OF	6182-9010	9.0	39	4	20	0.16	0.38	78	192
208			OF/GS		31.4	5	1	1	0.14	0.16	70	81
80	1	RS erosion	RS/CB		4.7	44	2	38	0.14	0.23	69	115
154			OF		11.6	24	1	12	0.14	0.31	69	156
188			OF/GS		8.8	31	1	17	0.13	0.30	67	149
34			CB/GS		7.4	35	1	21	0.13	0.29	66	143
115			OF		11.4	23	1	11	0.13	0.29	64	144
180			CB/WP	4299-9010	8.3	63	5	40	0.25	0.57	126	286
20			OF/GS/WL(natural)		3.1	70	4	54	0.12	0.24	62	118
35			CB		4.4	43	2	36	0.12	0.21	62	103
73			CB		5.6	33	2	26	0.12	0.20	60	100
120			CB/GS/IP/SB/DP		42.6	16	5	3	0.24	0.77	119	385
44			CB		2.5	63	3	63	0.11	0.17	57	86
191			IG/CB		3.1	86	2	83	0.19	0.29	94	147
50			CB		1.7	90	3	90	0.11	0.17	55	84
116			OF		9.9	22	1	11	0.11	0.24	54	122
205			GS/OF	3244-9010	8.3	51	5	26	0.18	0.47	89	234
51			CB		1.5	99	3	99	0.11	0.16	53	81
107			CB/OF		7.7	28	1	15	0.11	0.24	53	118
15			CB/SB	3423-9010.A	6.3	65	5	42	0.20	0.45	102	225
41			CB		2.4	62	2	56	0.10	0.16	51	82
206			GS/WP	3244-9010 6044-9003 3742-9010 3303-9003 3303-9010 3801-9010	58.8	27	5	7	0.50	1.73	252	865
163			CB		2.1	67	2	62	0.10	0.15	48	77
49			OF	4384-9003	1.6	94	2	93	0.10	0.16	52	81
52			OF		2.6	61	1	48	0.09	0.17	46	87
203			CB		7.5	25	1	13	0.09	0.21	46	105
126			OF		2.2	58	3	58	0.09	0.14	46	68
13			CB/DS/IG	3423-9010.A	3.7	80	5	63	0.17	0.32	86	162
137			OF		13.3	12	1	4	0.09	0.17	43	85
129			OF		5.1	33	1	19	0.09	0.19	43	94
146			DW/OF		2.9	91	5	82	0.17	0.29	85	143
12			RD/DW/IP		2.5	98	5	96	0.17	0.27	85	133
138			OF		4.6	35	1	21	0.08	0.18	41	89

Brattleboro - Subwatershed Prioritization and Recommendations (p3) cont.

Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	Landuse	IF Landuse is Residential: number of Raingardens needed to treat WQv	Raingarden Cost	IF Landuse is residential AND receiving water is small: number of raingardens needed to treat CPv	Raingarden Cost	IF Landuse is Commercial, Industrial, Residential, or Transportation: WQv retrofit cost (1)	IF Landuse is Commercial, Industrial, Residential, or Transportation AND receiving water is small: CPv retrofit cost (2)
2		CB/GS/OF/IB							
47		OF							
38		CB							
46		OF							
31		CB							
78		CB/GS							
17		CB/WL(natural)							
59		CB							
18		CB/WS/OF							
208		OF/GS							
80	1	RS/CB	Residential	69	$31,801			$5,000	
154		OF							
188		OF/GS							
34		CB/GS							
115		OF							
180		CB/WP							
20		OF/GS/WL(natural)							
35		CB							
73		CB							
120		CB/GS/IP/SB/DP							
44		CB							
191		IG/CB							
50		CB							
116		OF							
205		GS/OF							
51		CB							
107		CB/OF							
15		CB/SB							
41		CB							
206		GS/WP							
163		CB							
49		OF							
52		OF							
203		CB							
126		OF							
13		CB/DS/IG							
137		OF							
129		OF							
146		DW/OF							
12		RD/DW/IP							
138		OF							

Brattleboro - Subwatershed Prioritization and Recommendations (p4)

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	EIA Equation (RANK)	Percent Effective Impervious Area	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	# LID-Roof Raingardens to equal WQv	# LID-Roof Raingardens to equal CPv
8			OF/GS		1.6	79	1	70	0.08	0.14	40	69
1			GS/DS/CB/DP/DG	5953-9010	12.7	36	5	13	0.16	0.50	79	251
183			OF		2.6	52	1	38	0.08	0.15	38	75
109			OF		5.0	31	1	17	0.08	0.17	38	84
25			CB		3.0	38	2	31	0.07	0.13	37	63
92			CB/GS		6.7	23	1	11	0.07	0.17	37	84
157			DW/SB/OF		4.9	62	5	39	0.15	0.34	74	169
79			OF		3.8	36	1	21	0.07	0.15	35	75
182			CB		1.1	87	3	87	0.07	0.11	35	53
187			OF		2.9	43	1	28	0.07	0.14	33	69
95			OF		2.2	51	1	36	0.06	0.12	31	61
90			CB		1.7	55	2	49	0.06	0.10	31	50
172			OF		8.9	13	1	5	0.06	0.13	30	63
140			CB/OF		9.5	10	1	3	0.06	0.11	29	55
127			CB/OF		1.1	72	3	72	0.06	0.09	29	43
168			OF		1.2	76	1	67	0.06	0.10	28	49
66			OF		5.1	22	1	11	0.06	0.13	28	63
169			OF		4.6	24	1	12	0.05	0.12	27	61
114			OF		3.7	26	1	13	0.05	0.11	23	53
133			DW/OF		2.0	78	5	61	0.09	0.17	46	87
65			CB		1.5	45	2	39	0.04	0.07	22	37
135	2	Extended Detention Basin	EDP/CB/SB		4.1	52	5	27	0.09	0.23	44	116
105			OF		3.2	28	1	15	0.04	0.10	22	49
148			DW/CB/SB	3257-9010	1.7	85	5	72	0.09	0.16	44	79
131			OF		8.4	7	1	2	0.04	0.06	21	31
150			OF/SB	3816-9010	4.4	47	5	22	0.08	0.23	41	114
42			OF		3.5	23	1	11	0.04	0.09	20	45
102			DW		1.5	85	5	73	0.08	0.14	40	71
117	3	Modify existing permitted basin to extended detention	EDP/CB/GS/OF/RS/DP	3375-9010	8.6	28	5	8	0.08	0.27	39	133
98			OF		0.6	92	3	92	0.04	0.06	19	30
89			OF		2.7	29	1	16	0.04	0.08	19	42
195			CB		4.8	10	2	6	0.04	0.05	19	26
32			CB/GS		1.1	50	2	44	0.04	0.06	19	31
112			CB		0.7	71	3	71	0.04	0.06	18	28
70			CB/GS/OF/RS	4040-9010	1.7	62	2	57	0.07	0.11	35	57
77			GS		5.2	12	1	4	0.03	0.07	17	35
113			CB		0.6	77	3	77	0.03	0.05	17	26
199			IG/PP/GS	3596-9015	41.8	6	5	0	0.17	0.28	84	139
71			CB		0.8	63	2	58	0.03	0.05	17	27
48			OF	4384-9003	0.6	82	2	79	0.04	0.06	18	28
118			CB		0.7	72	2	68	0.03	0.05	16	26
130			DW		1.8	68	5	47	0.06	0.13	31	67
174			DW/IB		4.0	73	5	53	0.16	0.32	78	159
103			DW		1.1	88	5	77	0.06	0.11	31	54
94			CB/GS	5108-9015	4.8	55	1	41	0.15	0.29	75	145

Brattleboro - Subwatershed Prioritization and Recommendations (p4) cont.

Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	Landuse	IF Landuse is Residential: number of Raingardens needed to treat WQv	Raingarden Cost	IF Landuse is residential AND receiving water is small: number of raingardens needed to treat CPv	Raingarden Cost	IF Landuse is Commercial, Industrial, Residential, or Transportation: WQv retrofit cost (1)	IF Landuse is Commercial, Industrial, Residential, or Transportation AND receiving water is small: CPv retrofit cost (2)
8		OF/GS							
1		GS/DS/CB/DP/DG							
183		OF							
109		OF							
25		CB							
92		CB/GS							
157		DW/SB/OF							
79		OF							
182		CB							
187		OF							
95		OF							
90		CB							
172		OF							
140		CB/OF							
127		CB/OF							
168		OF							
66		OF							
169		OF							
114		OF							
133		DW/OF							
65		CB							
135	2	EDP/CB/SB	Commercial					$27,132	
105		OF							
148		DW/CB/SB							
131		OF							
150		OF/SB							
42		OF							
102		DW							
117	3	EDP/CB/GS/OF/RS/DP	Residential	39	$17,935	133	$61,072	$13,452	$45,804
98		OF							
89		OF							
195		CB							
32		CB/GS							
112		CB							
70		CB/GS/OF/RS							
77		GS							
113		CB							
199		IG/PP/GS							
71		CB							
48		OF							
118		CB							
130		DW							
174		DW/IB							
103		DW							
94		CB/GS							

Brattleboro - Subwatershed Prioritization and Recommendations (p5)

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	EIA Equation (RANK)	Percent Effective Impervious Area	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	# LID-Roof Raingardens to equal WQv	# LID-Roof Raingardens to equal CPv
33			GS/OF		3.0	20	1	9	0.03	0.07	15	33
181			CB/IG		3.0	81	5	66	0.15	0.27	73	134
60			OF		1.7	33	1	19	0.03	0.06	14	31
197			CB		6.4	5	1	1	0.03	0.03	14	17
167			OF/SD		0.7	63	2	58	0.03	0.05	14	23
64			CB		0.8	49	2	43	0.03	0.05	14	23
45			CB		0.4	88	3	88	0.03	0.04	14	21
201			IG/PP/GS	3596-9015 5768-9015	30.0	11	5	1	0.14	0.35	68	175
40	1	Combine with 39, 37	EDP/OF/CB/WP		3.1	38	4	20	0.05	0.13	26	66
136			DW		2.4	51	5	26	0.05	0.14	26	68
62			CB		0.5	75	3	75	0.03	0.04	13	19
139			CB/SB		1.6	64	5	41	0.05	0.11	25	56
162			SB/DW		1.3	72	5	52	0.05	0.10	25	50
142			DW		1.9	56	5	32	0.05	0.12	23	58
53			OF		0.9	47	1	33	0.02	0.05	11	23
122			DW		1.8	56	5	31	0.04	0.11	22	55
149			OF/SB	3816-9010	4.3	31	5	9	0.04	0.14	22	72
11			CB/DW/IB		1.9	53	5	29	0.04	0.11	21	55
108			DW		2.3	46	5	22	0.04	0.12	21	58
58			OF		0.5	65	1	53	0.02	0.04	10	19
147			DW	3291-9010	0.6	96	5	92	0.04	0.06	20	32
165			CB/IG	4021-9015	2.7	69	5	48	0.10	0.20	48	101
193			OF/SD		0.8	43	1	28	0.02	0.04	9	19
145			DW/CB		0.6	91	5	83	0.04	0.06	18	30
161			CB/IG		1.0	67	5	45	0.04	0.08	18	38
123			DW		0.5	103	5	105	0.03	0.05	17	26
76			OF		1.6	22	1	10	0.02	0.04	8	19
158			DW		1.8	47	5	22	0.03	0.09	17	46
159			DW		0.7	82	5	68	0.03	0.06	17	30
179			DW		0.8	74	5	54	0.03	0.06	16	32
74			CB		0.7	34	2	28	0.02	0.03	8	13
200			IG/PP/GS	3596-9015	13.6	16	5	3	0.08	0.25	38	123
54			CB/BR	6233-9015 NOT BUILT	1.1	92	2	91	0.07	0.11	35	55
93			CB/GS/DP/IB	5108-9015	9.6	22	5	5	0.07	0.24	34	119
144			EDP/DW/CB	3946-9010 3946-9015	2.2	59	5	35	0.06	0.14	30	72
160			DW/SB/OF		1.9	36	5	13	0.02	0.07	12	37
56			CB/BR	6233-9015 NOT BUILT	0.7	91	3	91	0.05	0.07	24	37
10			CB/DW		0.5	71	5	50	0.02	0.04	9	19
63			CB/DW		0.9	50	5	25	0.02	0.05	9	24
28			CB/DW		1.0	46	5	21	0.02	0.05	9	25
86			OF/WP		1.8	30	5	9	0.02	0.06	9	29
87			DW		1.4	34	5	12	0.02	0.05	8	27

Brattleboro - Subwatershed Prioritization and Recommendations (p5) cont.

Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	Landuse	IF Landuse is Residential: number of Raingardens needed to treat WQv	Raingarden Cost	IF Landuse is residential AND receiving water is small: number of raingardens needed to treat CPv	Raingarden Cost	IF Landuse is Commercial, Industrial, Residential, or Transportation: WQv retrofit cost (1)	IF Landuse is Commercial, Industrial, Residential, or Transportation AND receiving water is small: CPv retrofit cost (2)
33		GS/OF							
181		CB/IG							
60		OF							
197		CB							
167		OF/SD							
64		CB							
45		CB							
201		IG/PP/GS							
40	1	EDP/OF/CB/WP	Forest						
136		DW							
62		CB							
139		CB/SB							
162		SB/DW							
142		DW							
53		OF							
122		DW							
149		OF/SB							
11		CB/DW/IB							
108		DW							
58		OF							
147		DW							
165		CB/IG							
193		OF/SD							
145		DW/CB							
161		CB/IG							
123		DW							
76		OF							
158		DW							
159		DW							
179		DW							
74		CB							
200		IG/PP/GS							
54		CB/BR							
93		CB/GS/DP/IB							
144		EDP/DW/CB							
160		DW/SB/OF							
56		CB/BR							
10		CB/DW							
63		CB/DW							
28		CB/DW							
86		OF/WP							
87		DW							

Brattleboro - Subwatershed Prioritization and Recommendations (p6)

Watershed Number	Action List #	Proposed Action	Proposed or Existing Stormwater Treatment Practice	Permit Number	Watershed Area (Acres)	Percent Mapped Impervious Area (MIA)	EIA Equation (RANK)	Percent Effective Impervious Area	Water Quality Volume (Acre-Feet)	Channel Protection (Acre-Feet)	# LID-Roof Raingardens to equal WQv	# LID-Roof Raingardens to equal CPv
170			OF		0.9	16	1	6	0.01	0.02	4	8
85			DW		0.3	77	5	59	0.01	0.02	6	11
3			CB/GS/OF/IB	5954-9010	1.3	26	5	7	0.01	0.04	5	18
55			OF/BR	6233-9015 NOT BUILT	0.5	65	3	65	0.02	0.03	11	16
100			DW		0.1	79	5	63	0.01	0.01	3	6
124			DW		0.1	38	5	15	0.00	0.00	1	2
3000					3.4	76	0		0.00	0.29	0	144
TOTALS					2,675.3				57.11	106.63		

Brattleboro - Subwatershed Prioritization and Recommendations (p6) cont.

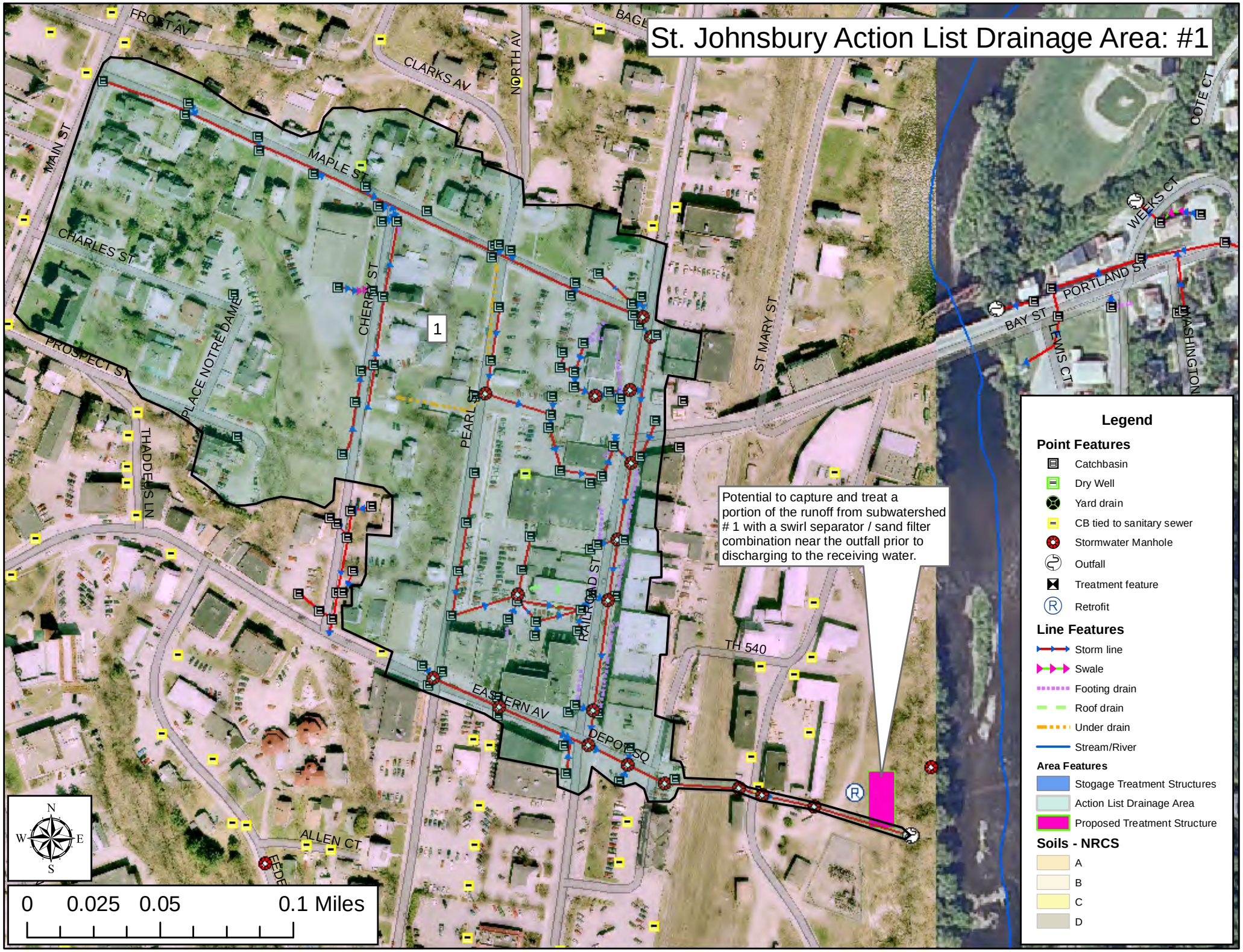
Watershed Number	Action List #	Proposed or Existing Stormwater Treatment Practice	Landuse	IF Landuse is Residential: number of Raingardens needed to treat WQv	Raingarden Cost	IF Landuse is residential AND receiving water is small: number of raingardens needed to treat CPv	Raingarden Cost	IF Landuse is Commercial, Industrial, Residential, or Transportation: WQv retrofit cost (1)	IF Landuse is Commercial, Industrial, Residential, or Transportation AND receiving water is small: CPv retrofit cost (2)
170		OF							
85		DW							
3		CB/GS/OF/IB							
55		OF/BR							
100		DW							
124		DW							
3000									

Target Maps

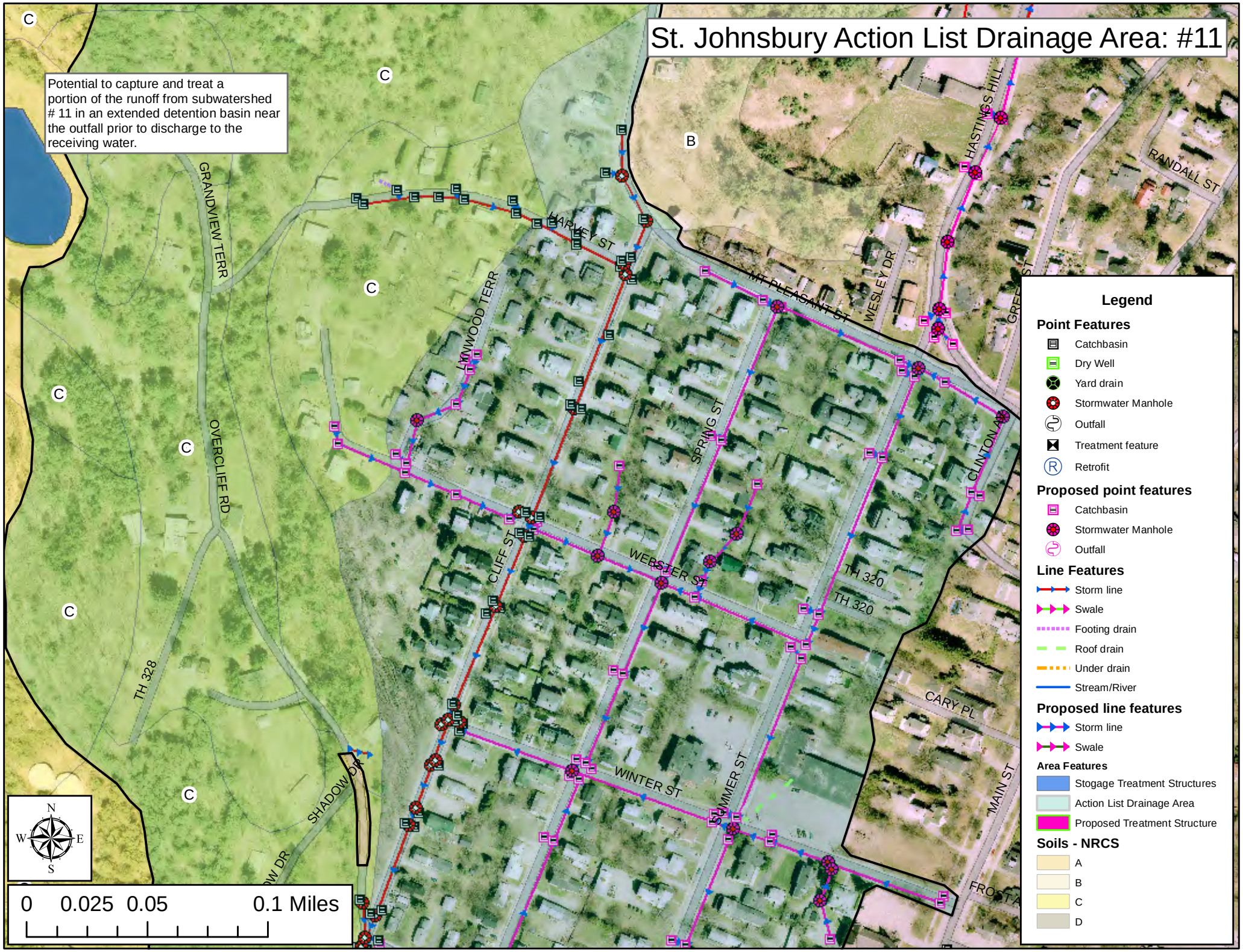
Showing Priority Action List Drainage Areas

And Potential Retrofit Locations

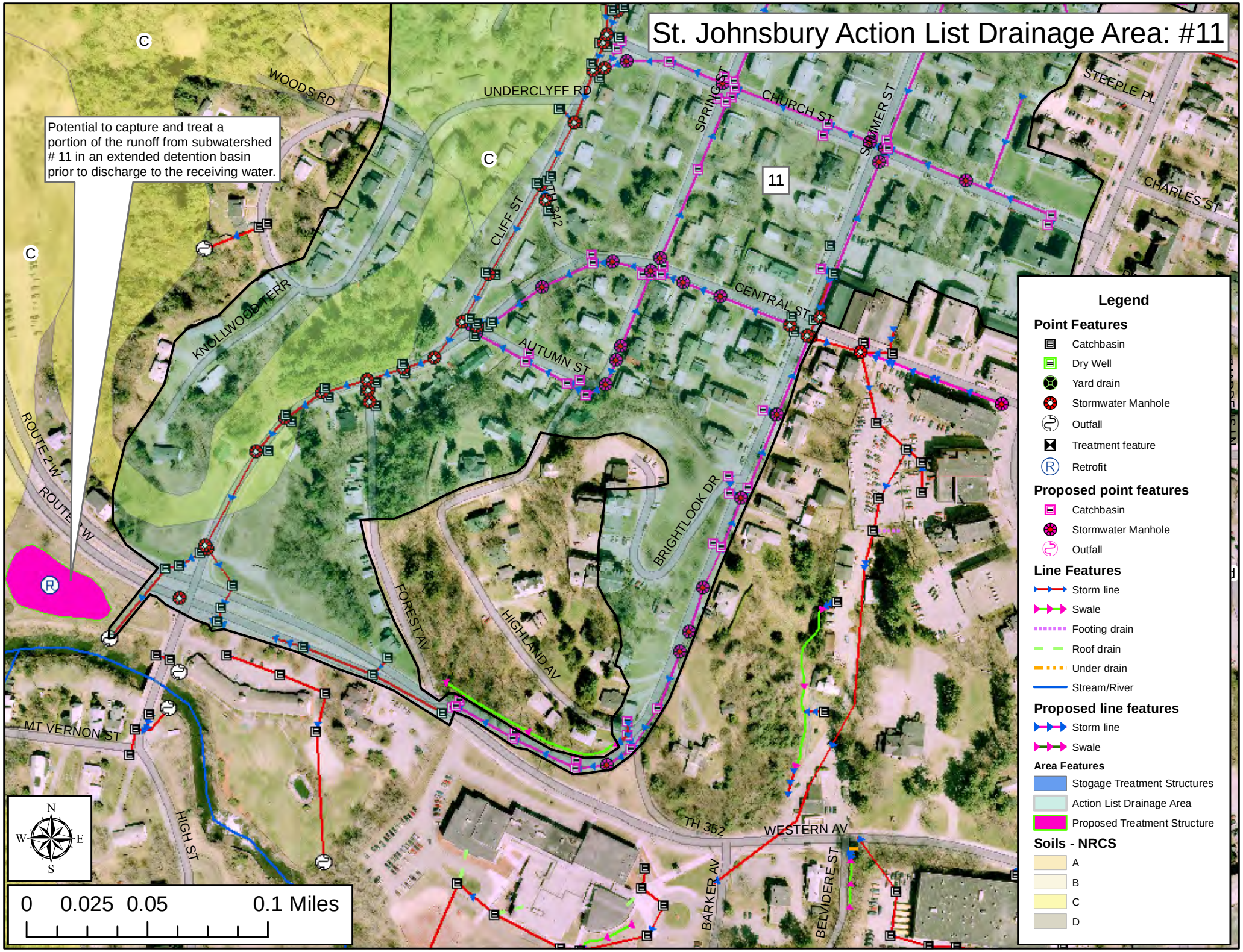
St. Johnsbury Action List Drainage Area: #1

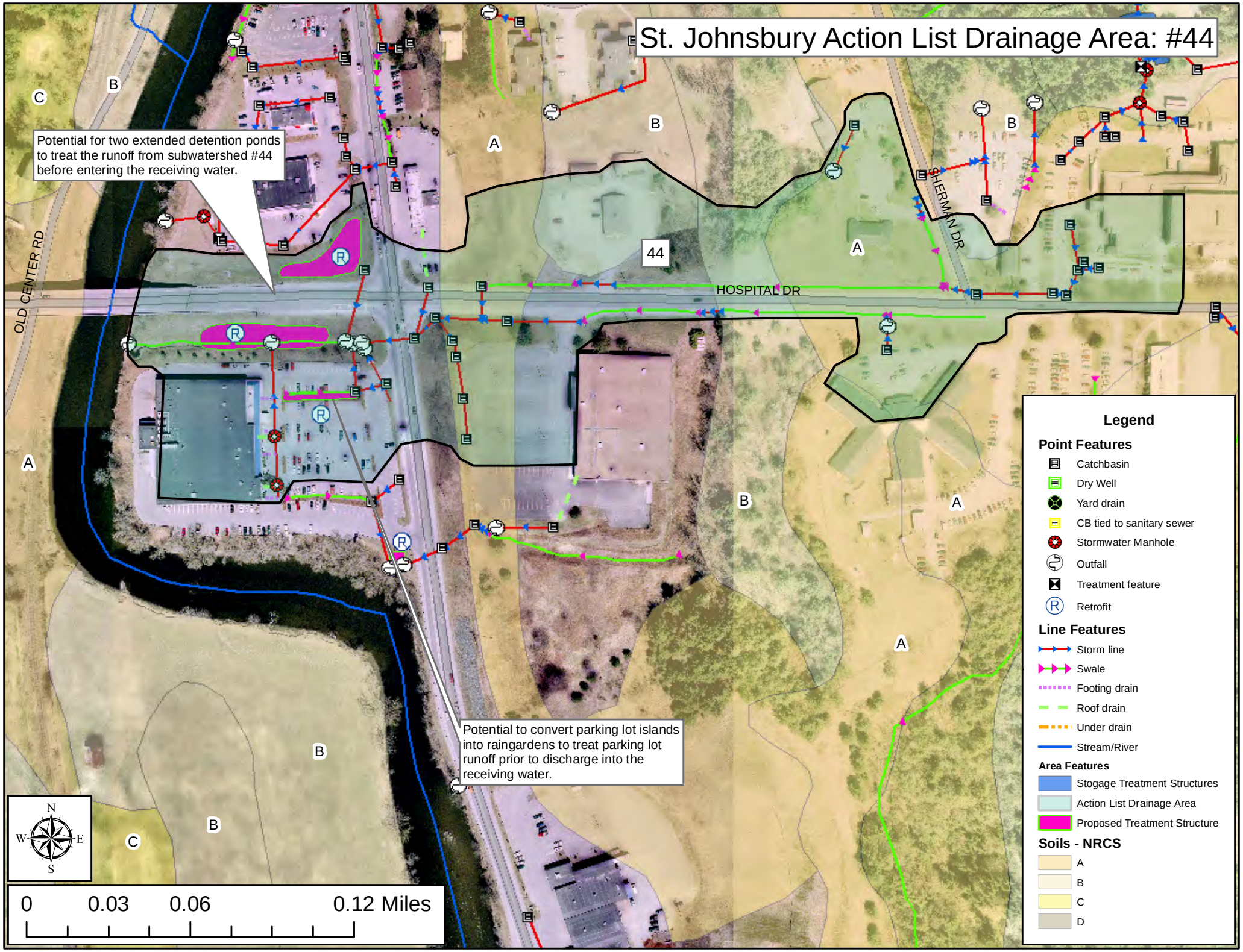


St. Johnsbury Action List Drainage Area: #11

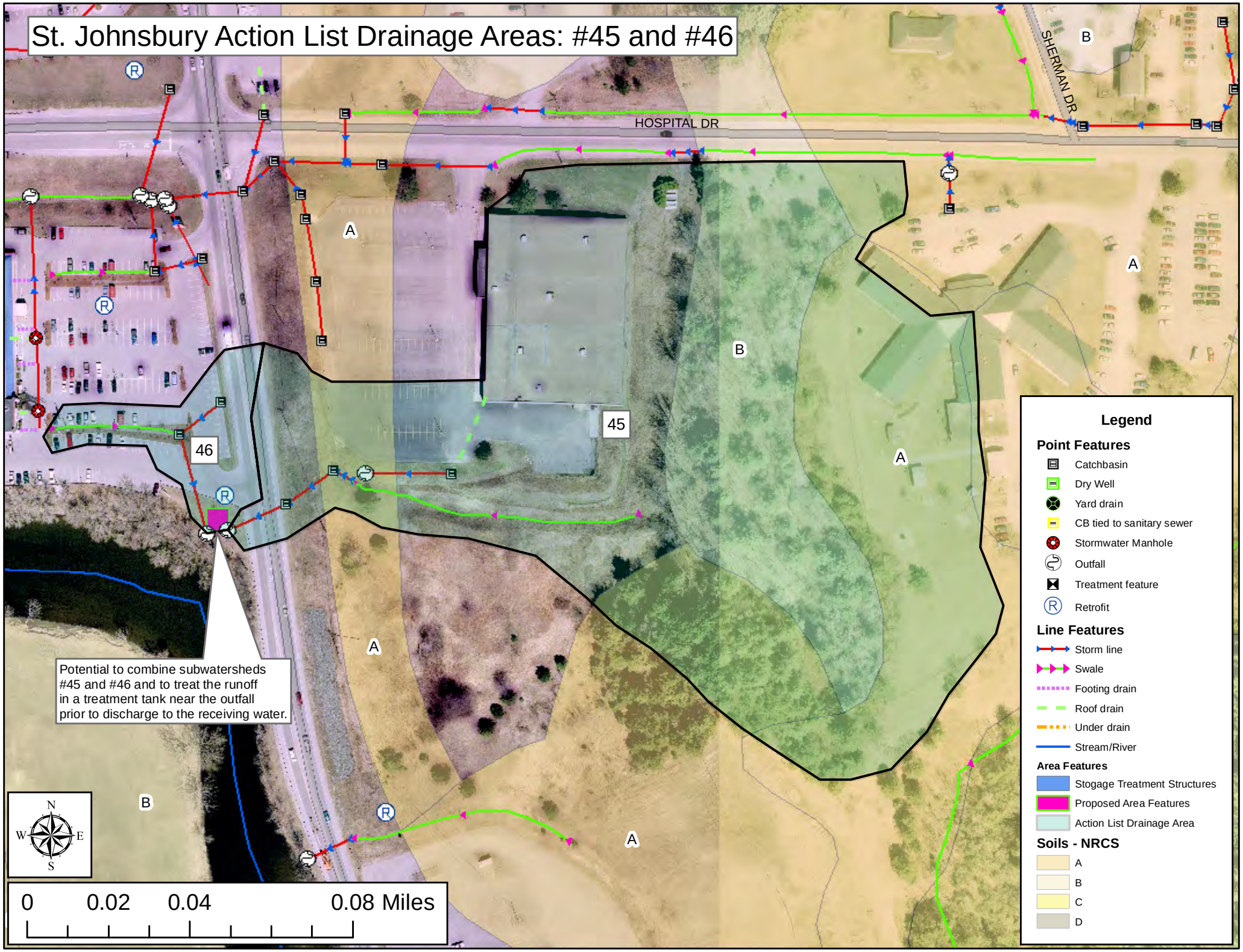


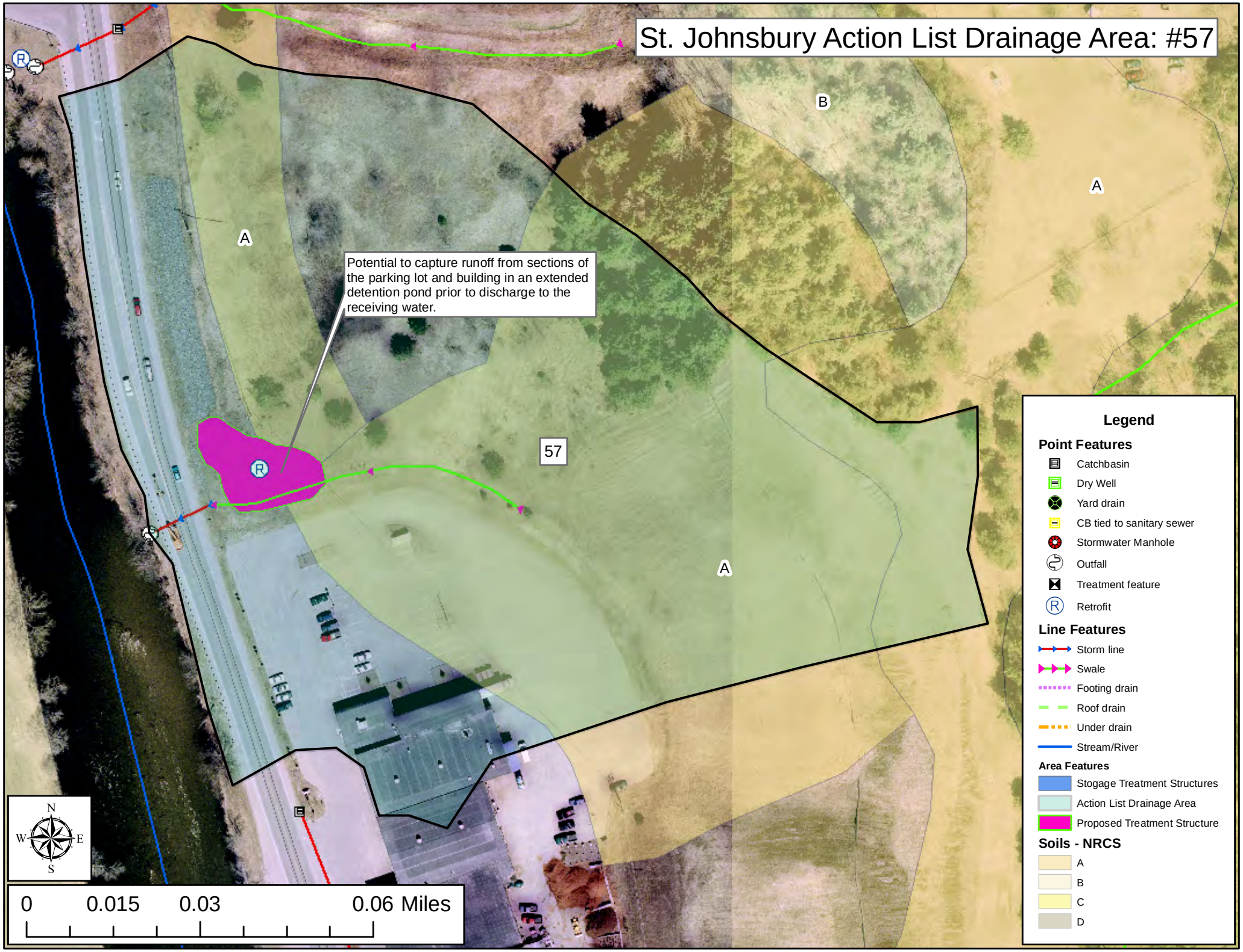
St. Johnsbury Action List Drainage Area: #11



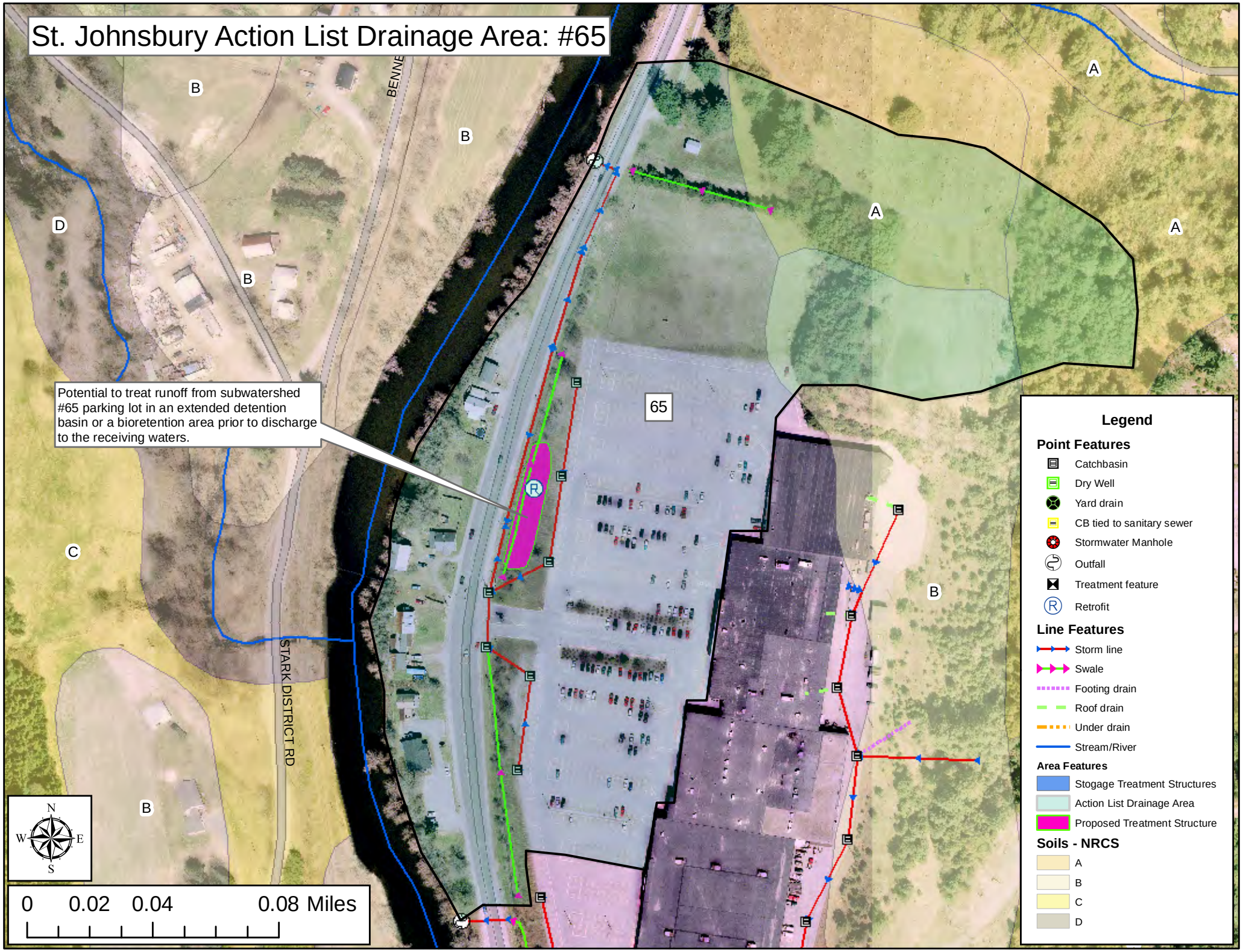

St. Johnsbury Action List Drainage Area: #44
Potential for two extended detention ponds to treat the runoff from subwatershed #44 before entering the receiving water.
Potential to convert parking lot islands into raingardens to treat parking lot runoff prior to discharge into the receiving water.
OLD CENTER RD
HOSPITAL DR
SHERMAN DR
44
A
B
C
Legend
Point Features
Catchbasin
Dry Well
Yard drain
CB tied to sanitary sewer
Stormwater Manhole
Outfall
Treatment feature
Retrofit
Line Features
Storm line
Swale
Footing drain
Roof drain
Under drain
Stream/River
Area Features
Stogage Treatment Structures
Action List Drainage Area
Proposed Treatment Structure
Soils - NRCS
A
B
C
D
N
S
E
W
0
0.03
0.06
0.12 Miles

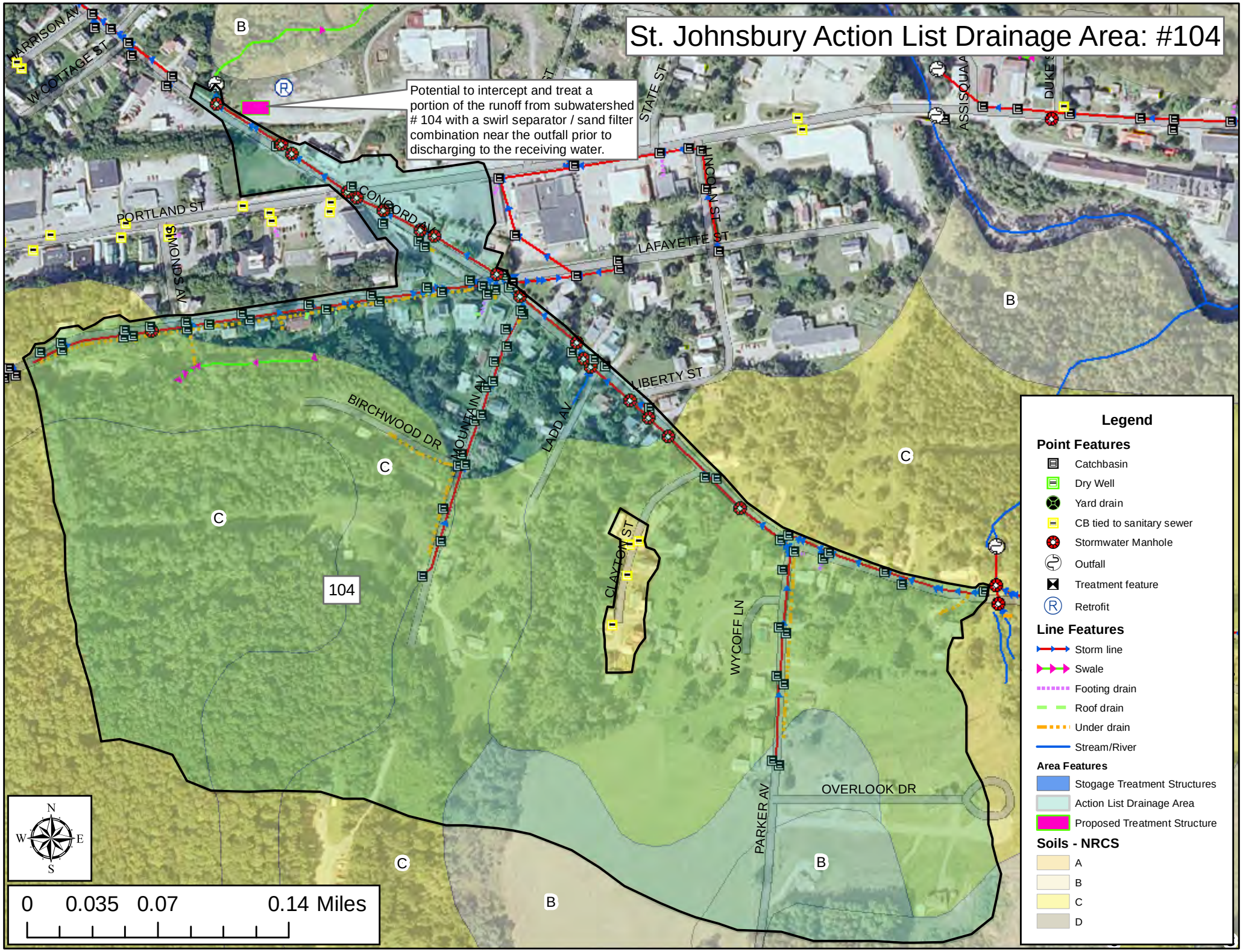
St. Johnsbury Action List Drainage Areas: #45 and #46



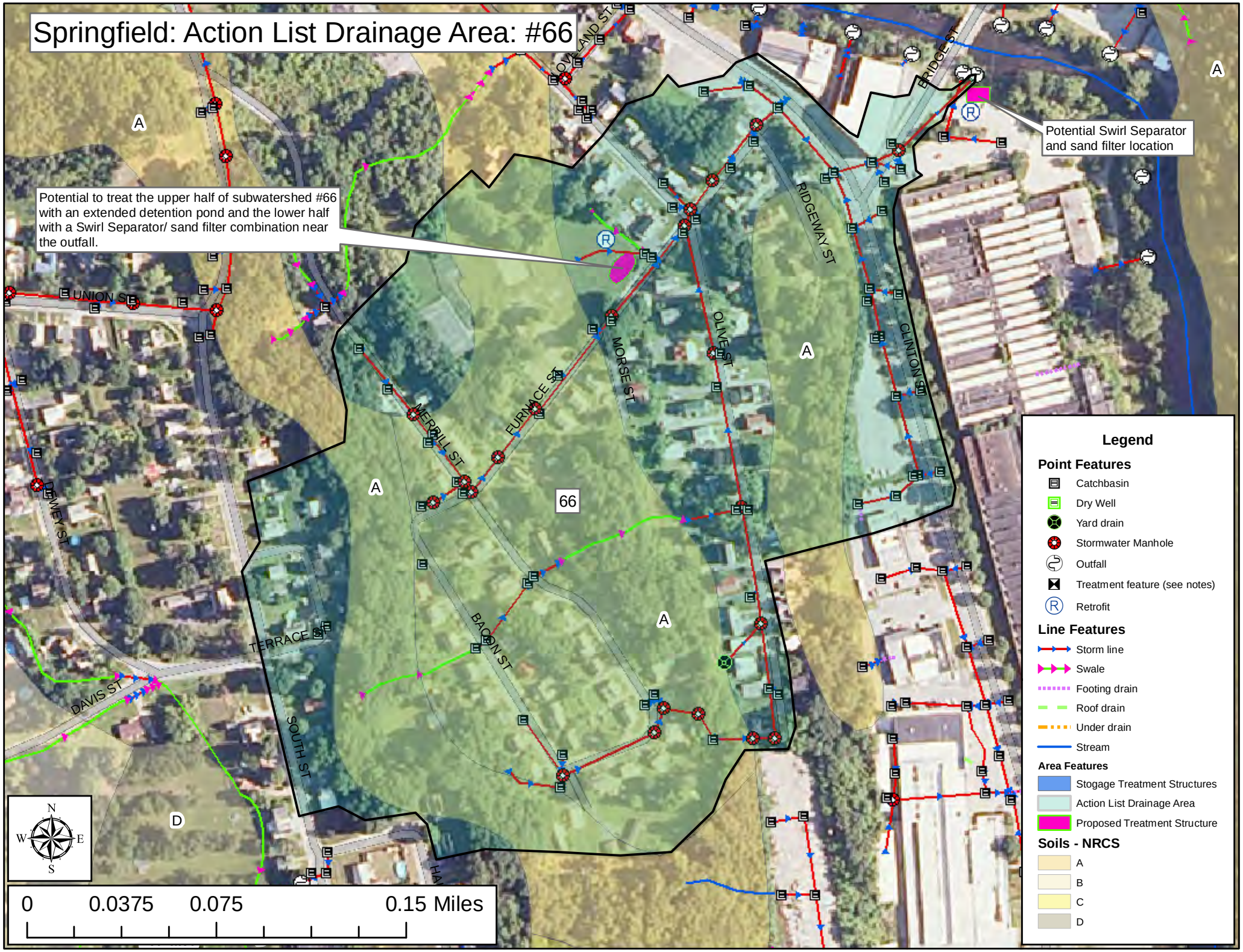

St. Johnsbury Action List Drainage Area: #57
Potential to capture runoff from sections of the parking lot and building in an extended detention pond prior to discharge to the receiving water.
57
A
B
A
A
Legend
Point Features
Catchbasin
Dry Well
Yard drain
CB tied to sanitary sewer
Stormwater Manhole
Outfall
Treatment feature
Retrofit
Line Features
Storm line
Swale
Footing drain
Roof drain
Under drain
Stream/River
Area Features
Stogage Treatment Structures
Action List Drainage Area
Proposed Treatment Structure
Soils - NRCS
A
B
C
D
N
W
E
S
0
0.015
0.03
0.06 Miles

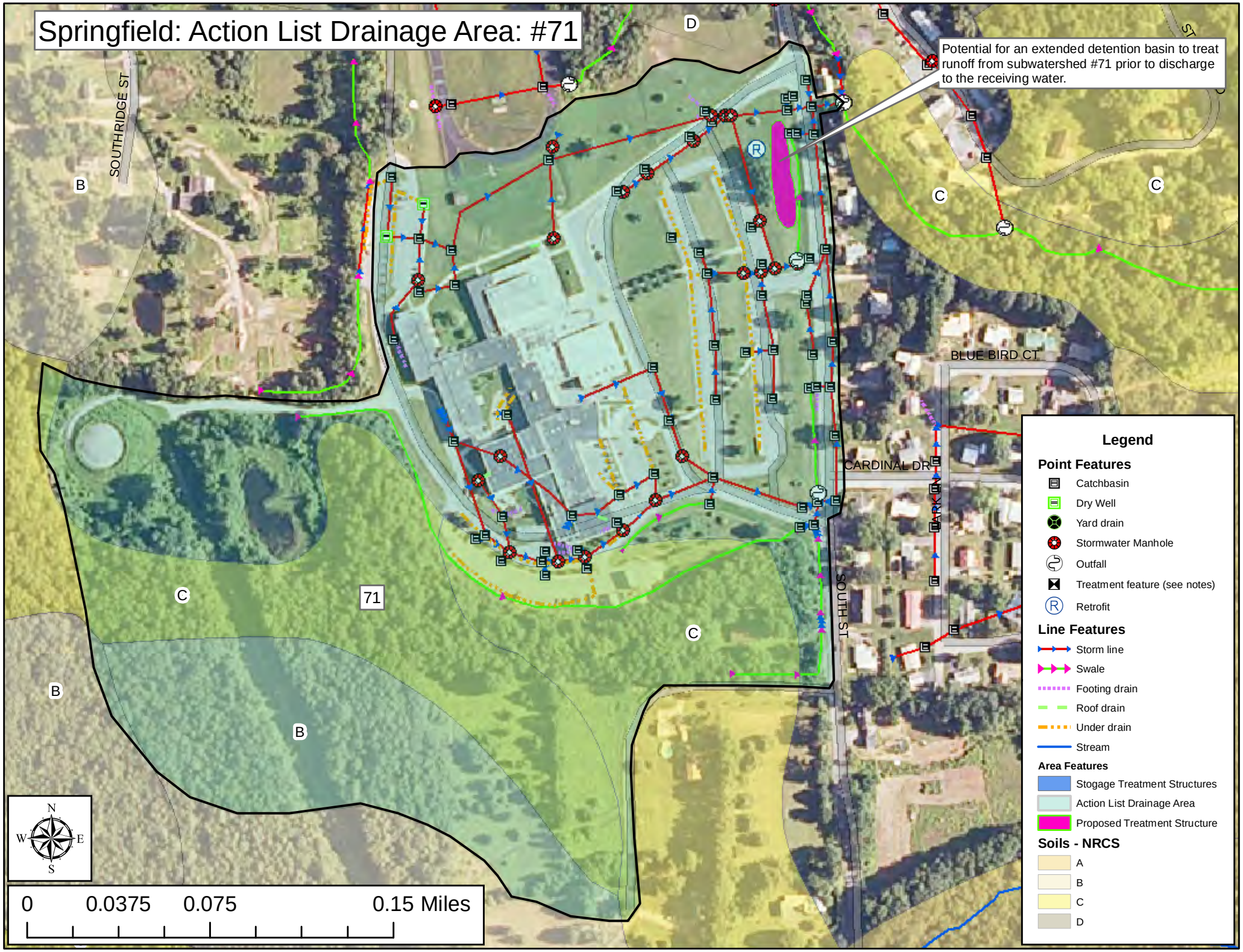
St. Johnsbury Action List Drainage Area: #65

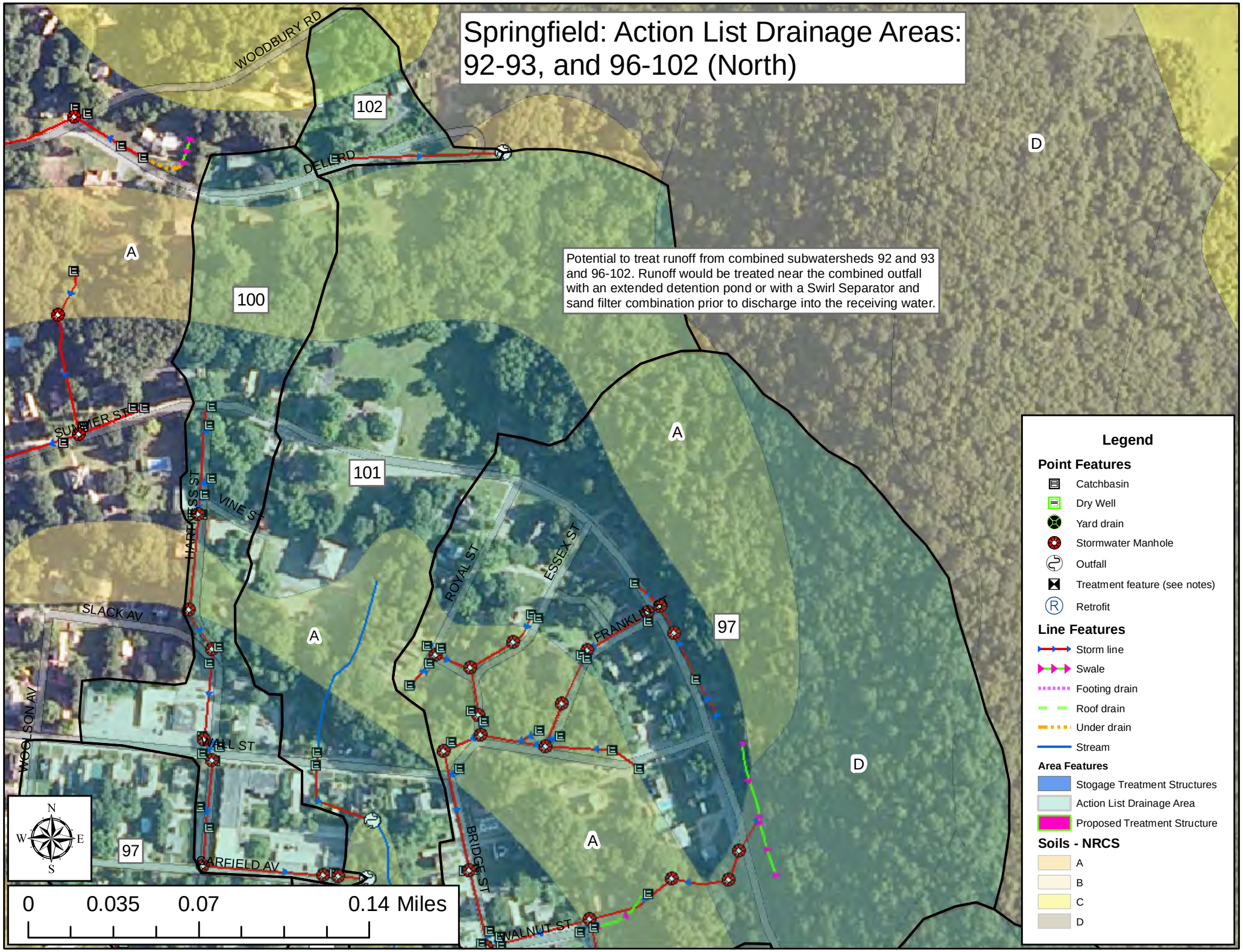



St. Johnsbury Action List Drainage Area: #104
Potential to intercept and treat a portion of the runoff from subwatershed # 104 with a swirl separator / sand filter combination near the outfall prior to discharging to the receiving water.
HARRISON AV
W COTTAGE ST
PORTLAND ST
SIMONDS AV
CONCORD AV
STATE ST
LINCOLN ST
LAFAYETTE ST
ASSISQUA
DUKE
LIBERTY ST
BIRCHWOOD DR
MOUNTAIN AV
LADD AV
CLAYTON ST
WYCOFF LN
PARKER AV
OVERLOOK DR
104
B
C
Legend
Point Features
Catchbasin
Dry Well
Yard drain
CB tied to sanitary sewer
Stormwater Manhole
Outfall
Treatment feature
Retrofit
Line Features
Storm line
Swale
Footing drain
Roof drain
Under drain
Stream/River
Area Features
Stogage Treatment Structures
Action List Drainage Area
Proposed Treatment Structure
Soils - NRCS
A
B
C
D
N
W
E
S
0 0.035 0.07 0.14 Miles

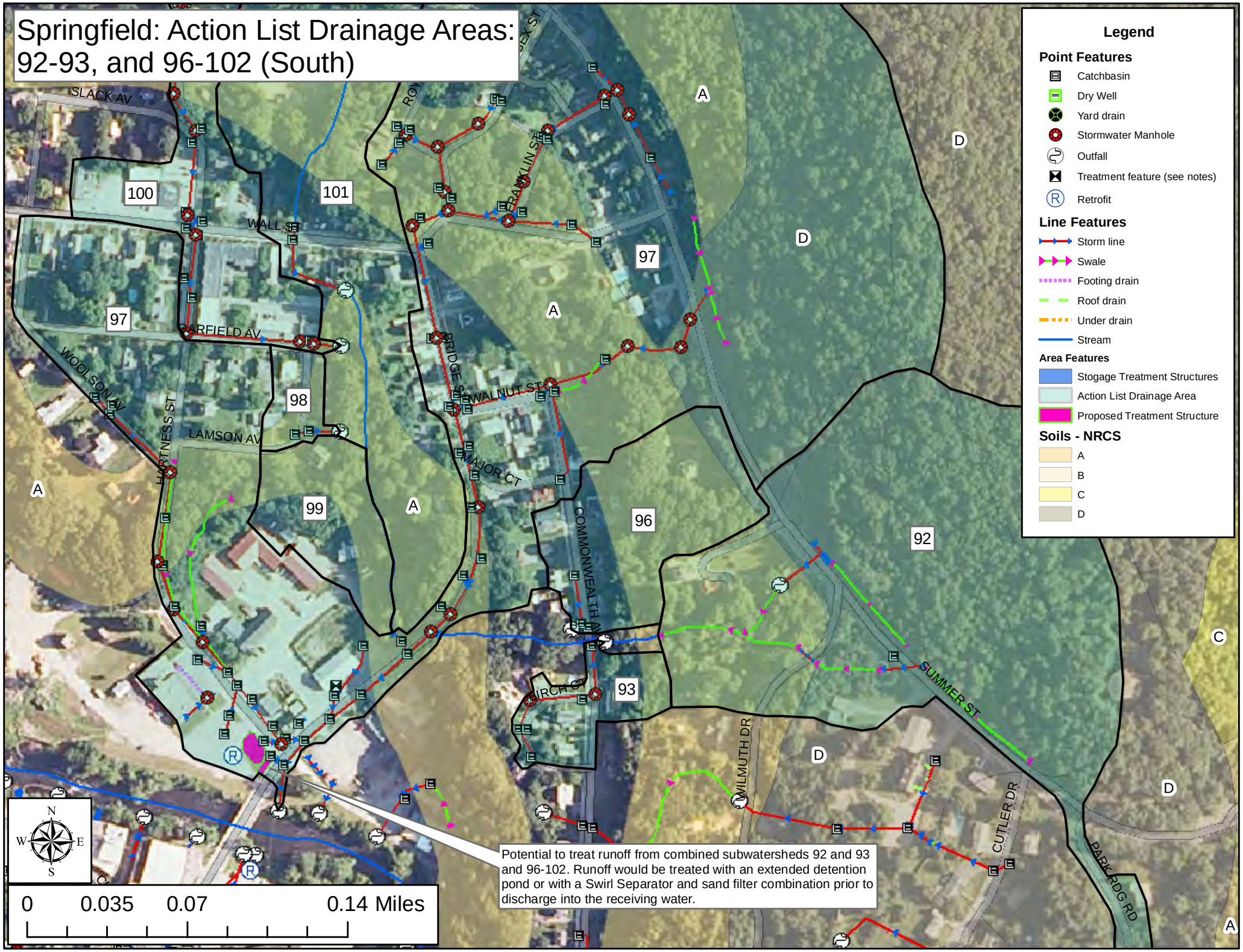
Springfield: Action List Drainage Area: #66



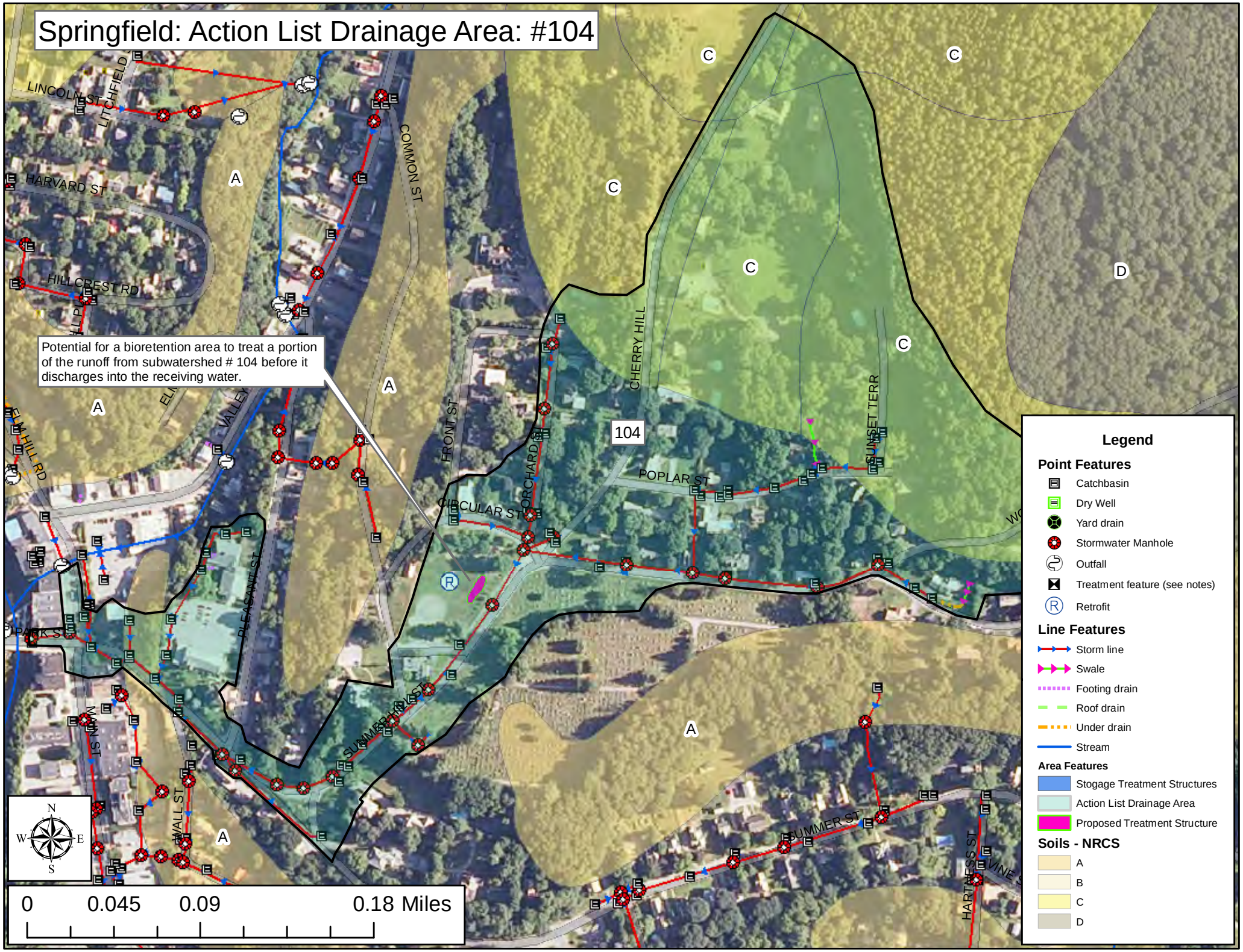

Springfield: Action List Drainage Area: #71
Potential for an extended detention basin to treat runoff from subwatershed #71 prior to discharge to the receiving water.
SOUTHRIDGE ST
BLUE BIRD CT
CARDINAL DR
SOUTH ST
71
B
C
D
Legend
Point Features
Catchbasin
Dry Well
Yard drain
Stormwater Manhole
Outfall
Treatment feature (see notes)
Retrofit
Line Features
Storm line
Swale
Footing drain
Roof drain
Under drain
Stream
Area Features
Stogage Treatment Structures
Action List Drainage Area
Proposed Treatment Structure
Soils - NRCS
A
B
C
D
N
S
E
W
0
0.0375
0.075
0.15 Miles

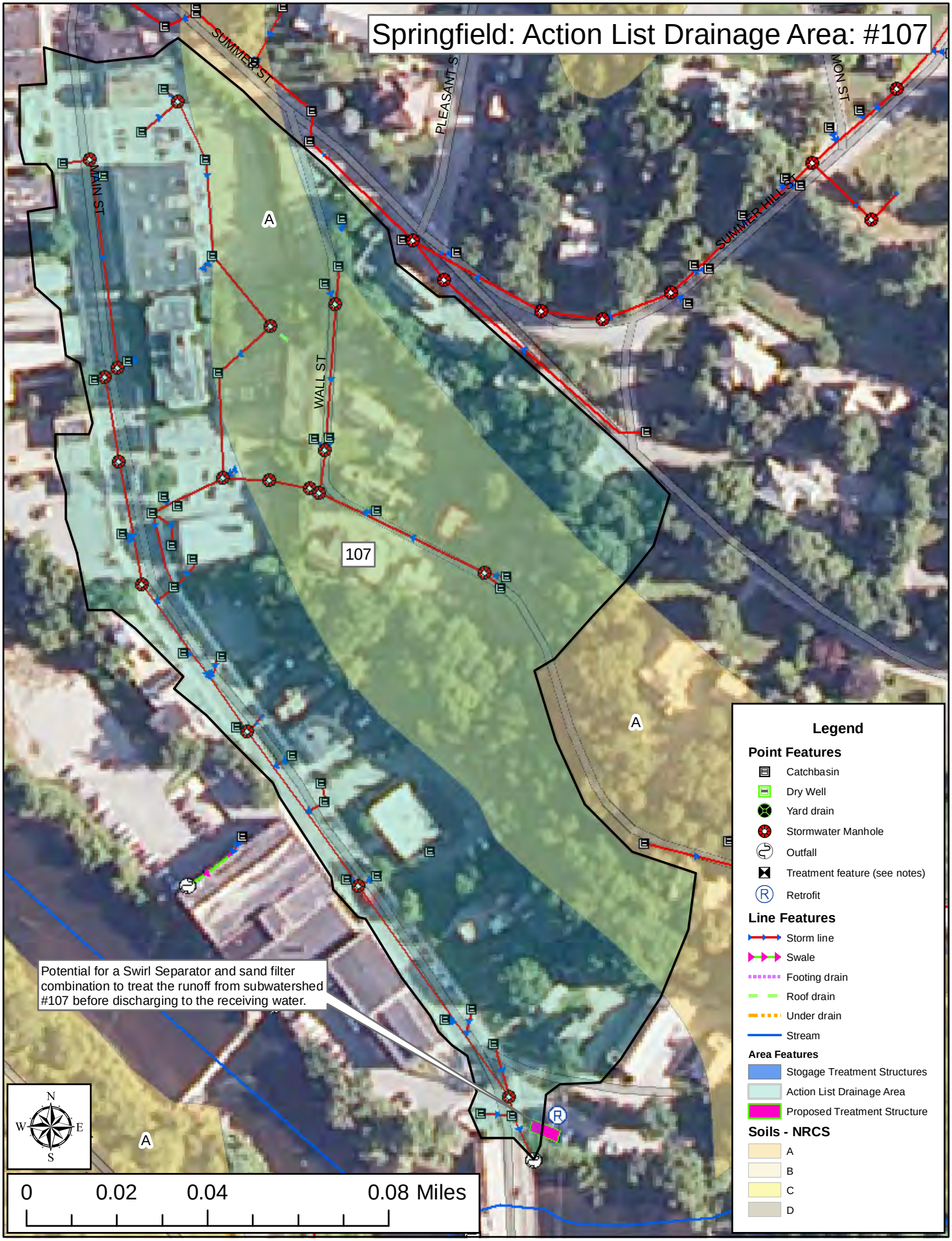

Springfield: Action List Drainage Areas: 92-93, and 96-102 (North)
Potential to treat runoff from combined subwatersheds 92 and 93 and 96-102. Runoff would be treated near the combined outfall with an extended detention pond or with a Swirl Separator and sand filter combination prior to discharge into the receiving water.
WOODBURY RD
DELLERD
SUMMER ST
HARTNESS ST
VINE ST
SLACK AV
WOOLSON AV
HILL ST
GARFIELD AV
ROYAL ST
ESSEX ST
FRANKLIN ST
BRIDGE ST
WALNUT ST
102
100
101
97
A
D
Legend
Point Features
Catchbasin
Dry Well
Yard drain
Stormwater Manhole
Outfall
Treatment feature (see notes)
Retrofit
Line Features
Storm line
Swale
Footing drain
Roof drain
Under drain
Stream
Area Features
Stogage Treatment Structures
Action List Drainage Area
Proposed Treatment Structure
Soils - NRCS
A
B
C
D
N
W
E
S
0
0.035
0.07
0.14 Miles

Springfield: Action List Drainage Areas: 92-93, and 96-102 (South)

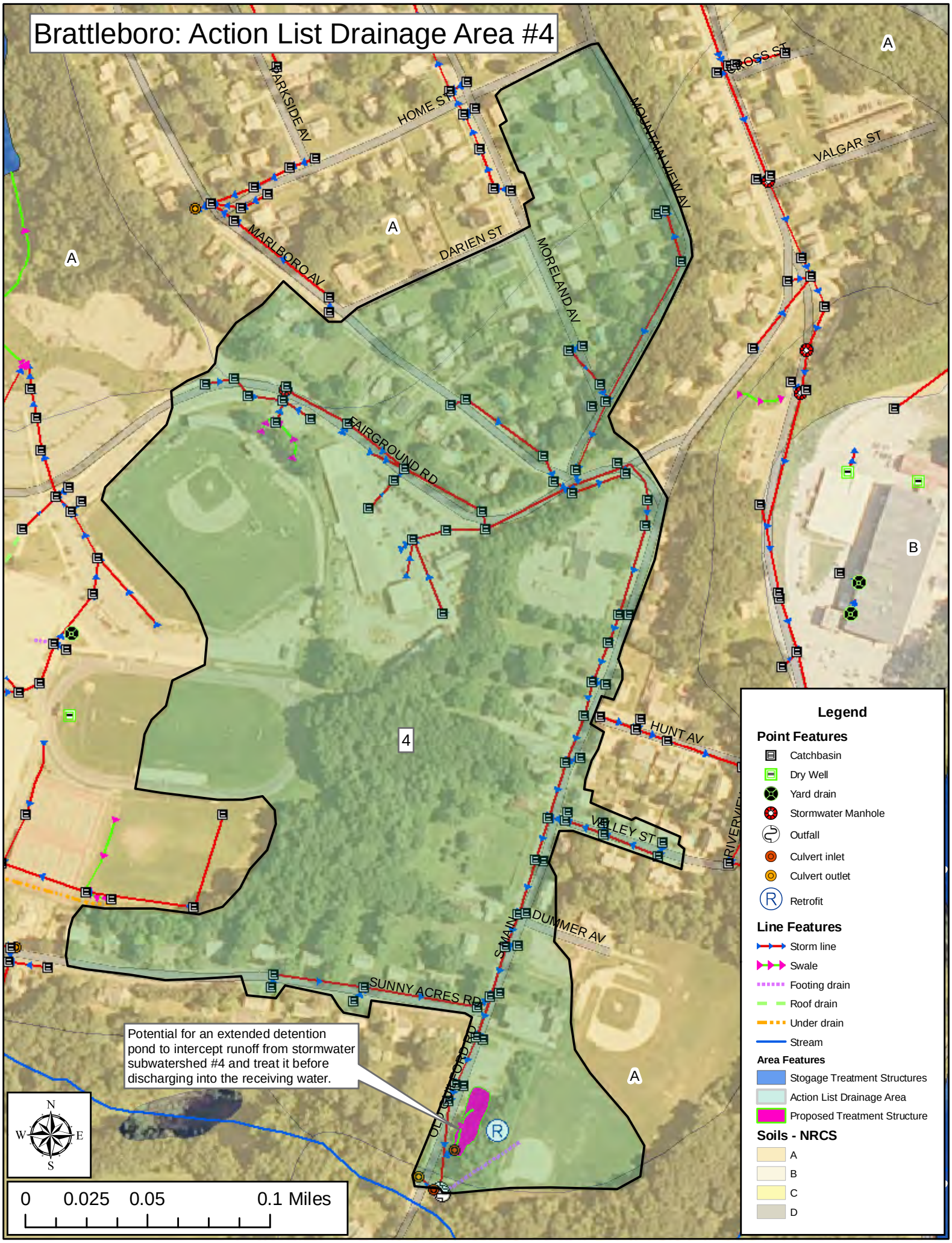


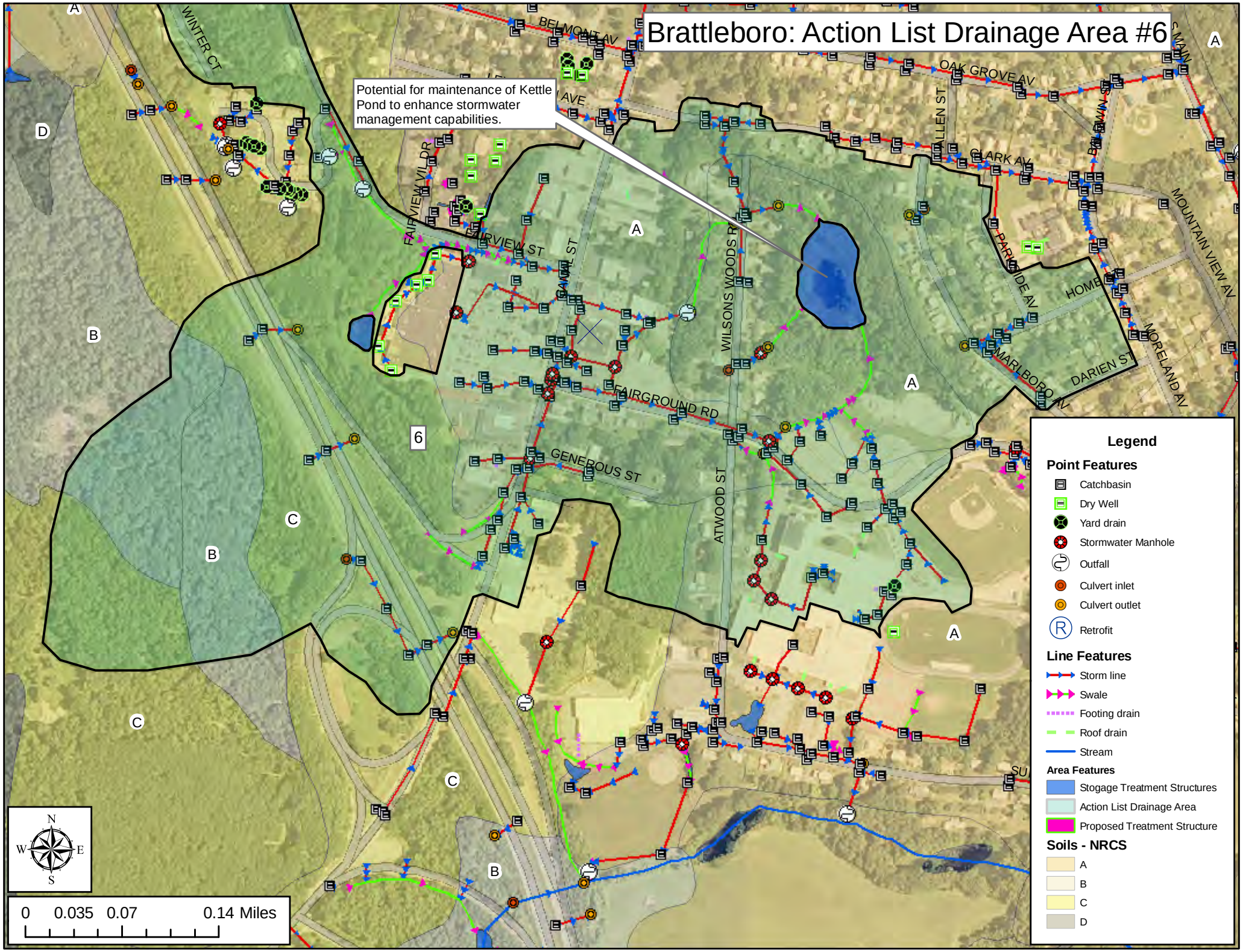
Springfield: Action List Drainage Area: #104



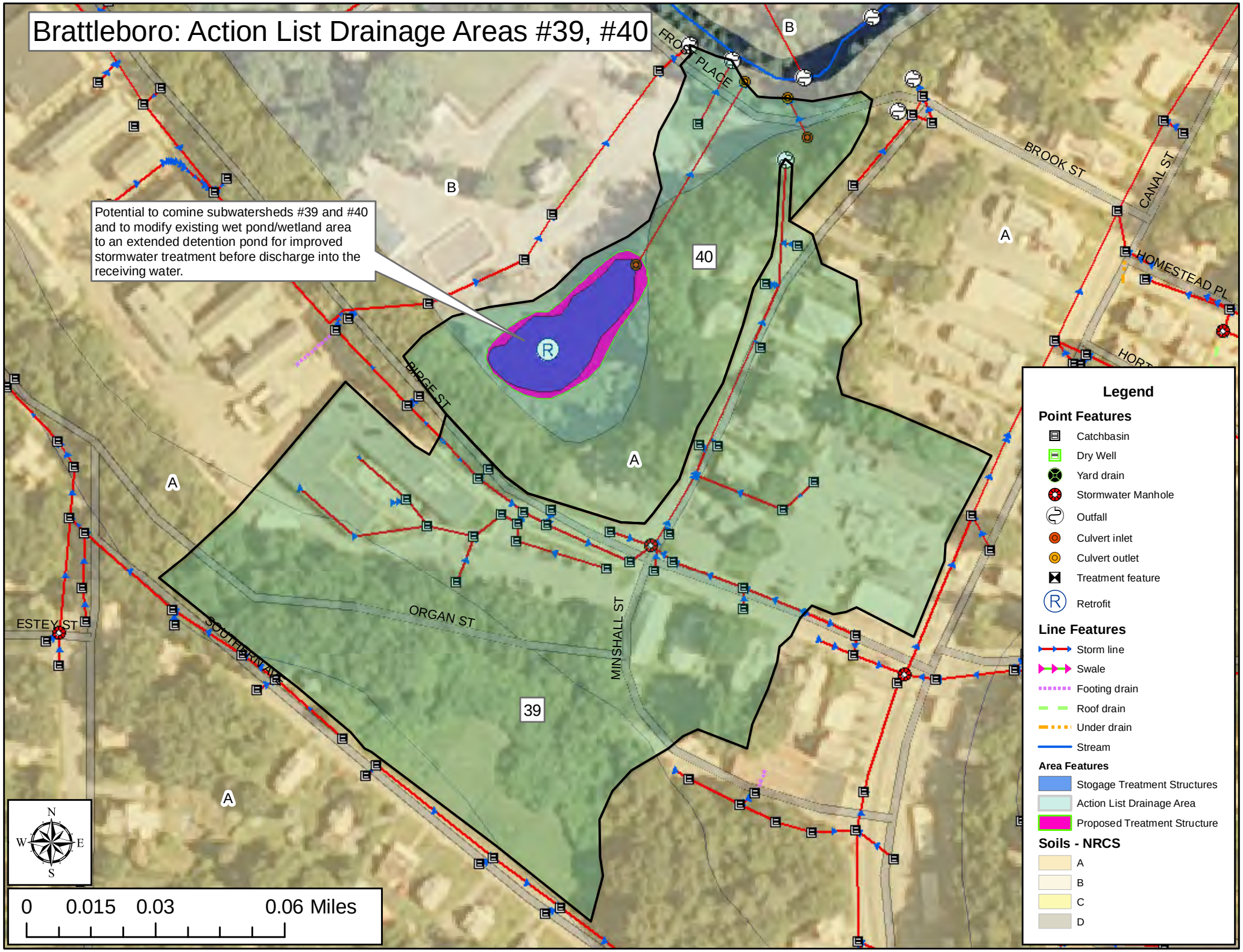

Springfield: Action List Drainage Area: #107
SUMMER ST
PLEASANT ST
MON ST
SUMMER HILL ST
MAIN ST
WALL ST
A
107
Potential for a Swirl Separator and sand filter combination to treat the runoff from subwatershed #107 before discharging to the receiving water.
N
W
E
S
0
0.02
0.04
0.08 Miles
Legend
Point Features
Catchbasin
Dry Well
Yard drain
Stormwater Manhole
Outfall
Treatment feature (see notes)
Retrofit
Line Features
Storm line
Swale
Footing drain
Roof drain
Under drain
Stream
Area Features
Stogage Treatment Structures
Action List Drainage Area
Proposed Treatment Structure
Soils - NRCS
A
B
C
D

Brattleboro: Action List Drainage Area #4

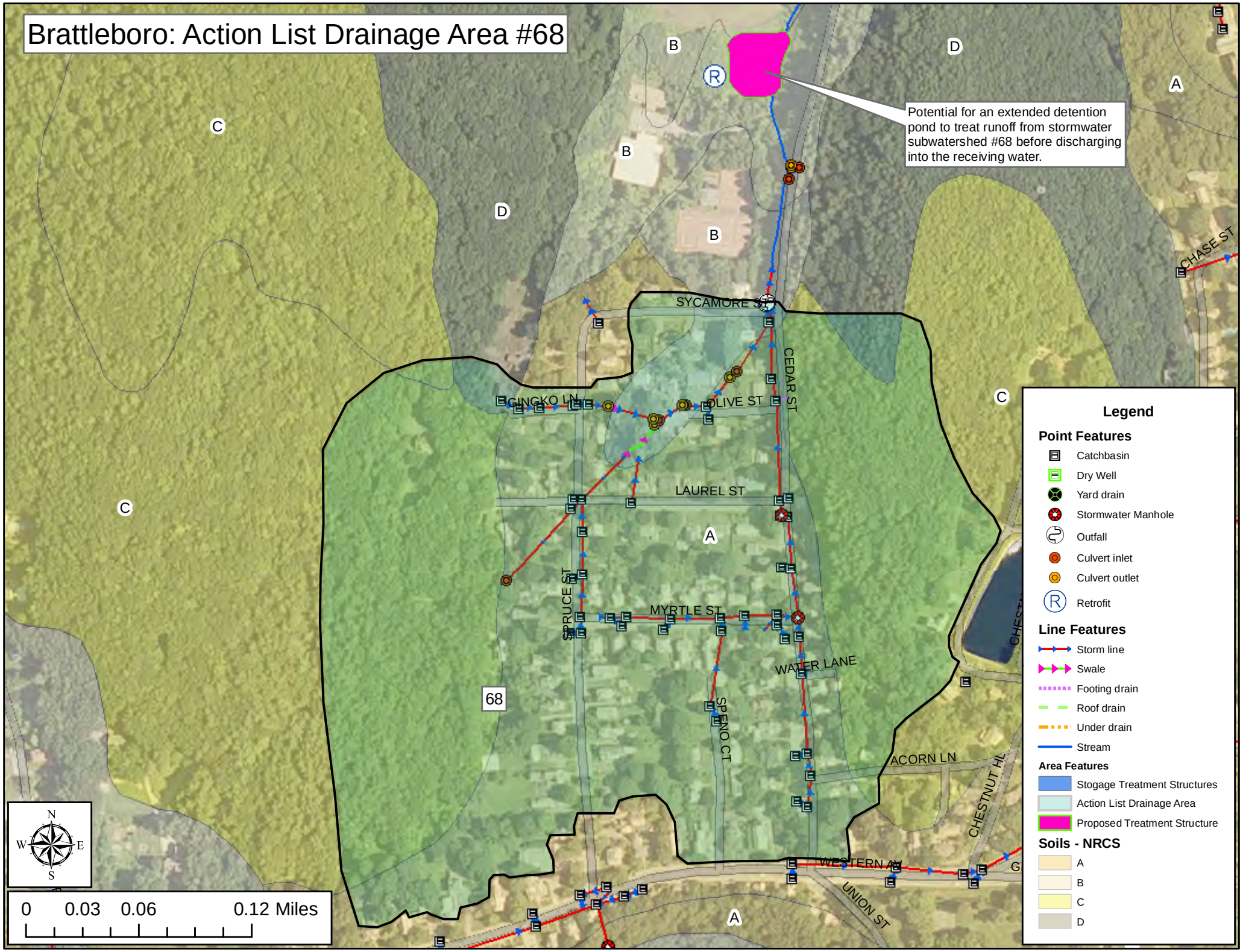


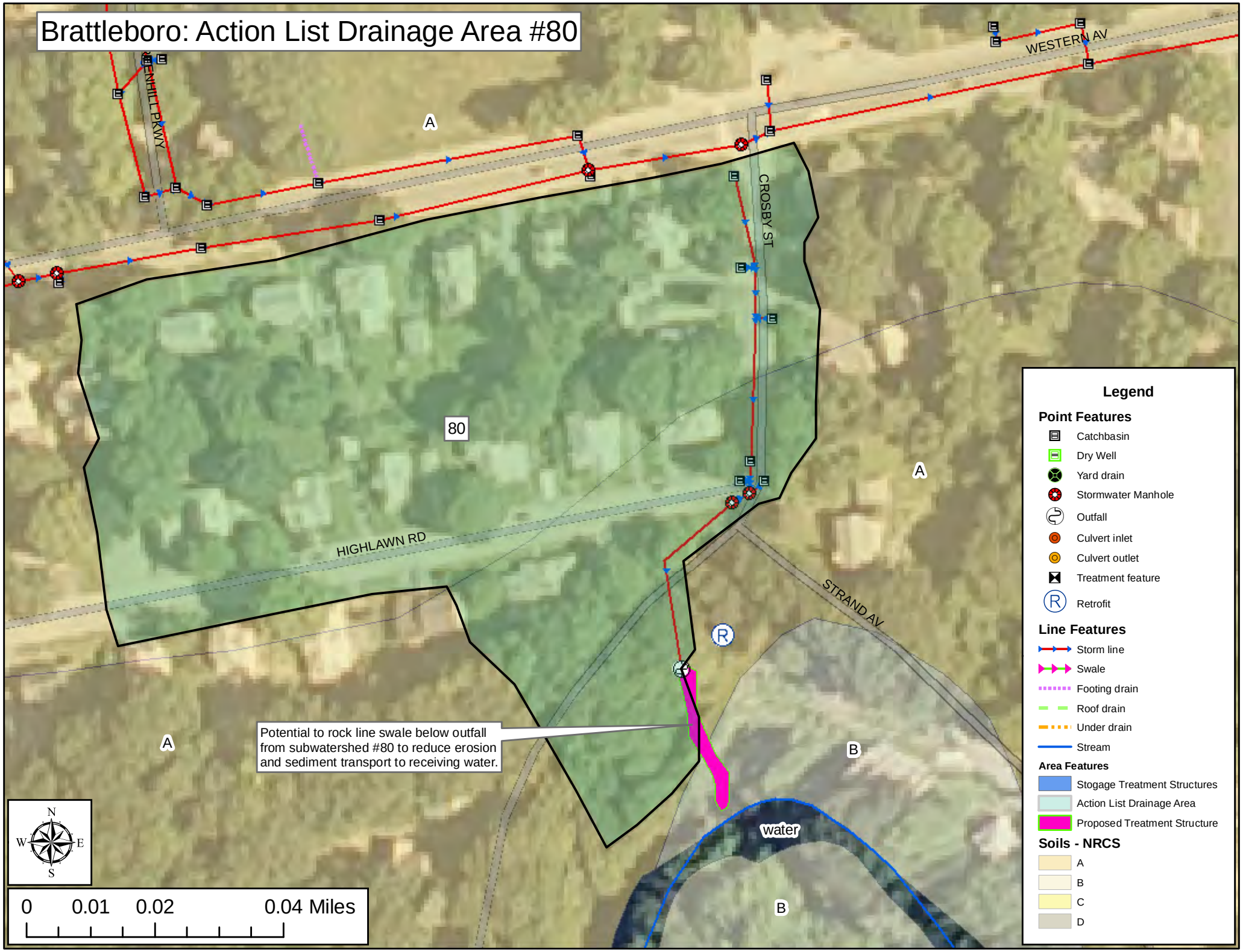

Brattleboro: Action List Drainage Area #6
Potential for maintenance of Kettle Pond to enhance stormwater management capabilities.
WINTER CT
BELMONT AV
OAK GROVE AV
ALLEN ST
CLARK AV
MOUNTAIN VIEW AV
FAIRVIEW VIL DR
FAIRVIEW ST
CANAL ST
WILSONS WOODS RD
PARKSIDE AV
HOME
MARLBORO AV
DARIEN ST
MORELAND AV
FAIRGROUND RD
GENEROUS ST
ATWOOD ST
6
A
B
C
D
Legend
Point Features
Catchbasin
Dry Well
Yard drain
Stormwater Manhole
Outfall
Culvert inlet
Culvert outlet
Retrofit
Line Features
Storm line
Swale
Footing drain
Roof drain
Stream
Area Features
Stogage Treatment Structures
Action List Drainage Area
Proposed Treatment Structure
Soils - NRCS
A
B
C
D
N
W
E
S
0 0.035 0.07 0.14 Miles

Brattleboro: Action List Drainage Areas #39, #40

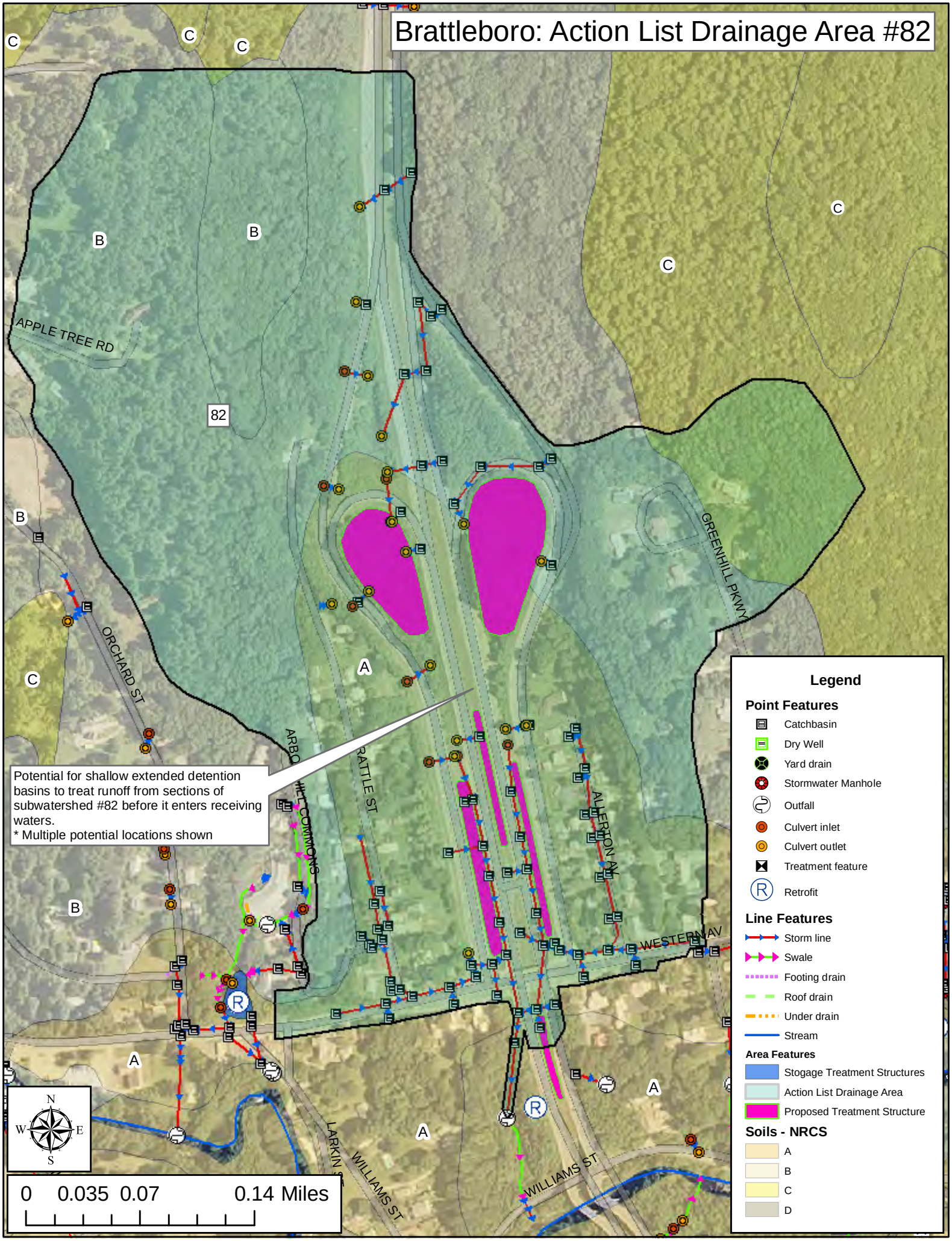


Brattleboro: Action List Drainage Area #68

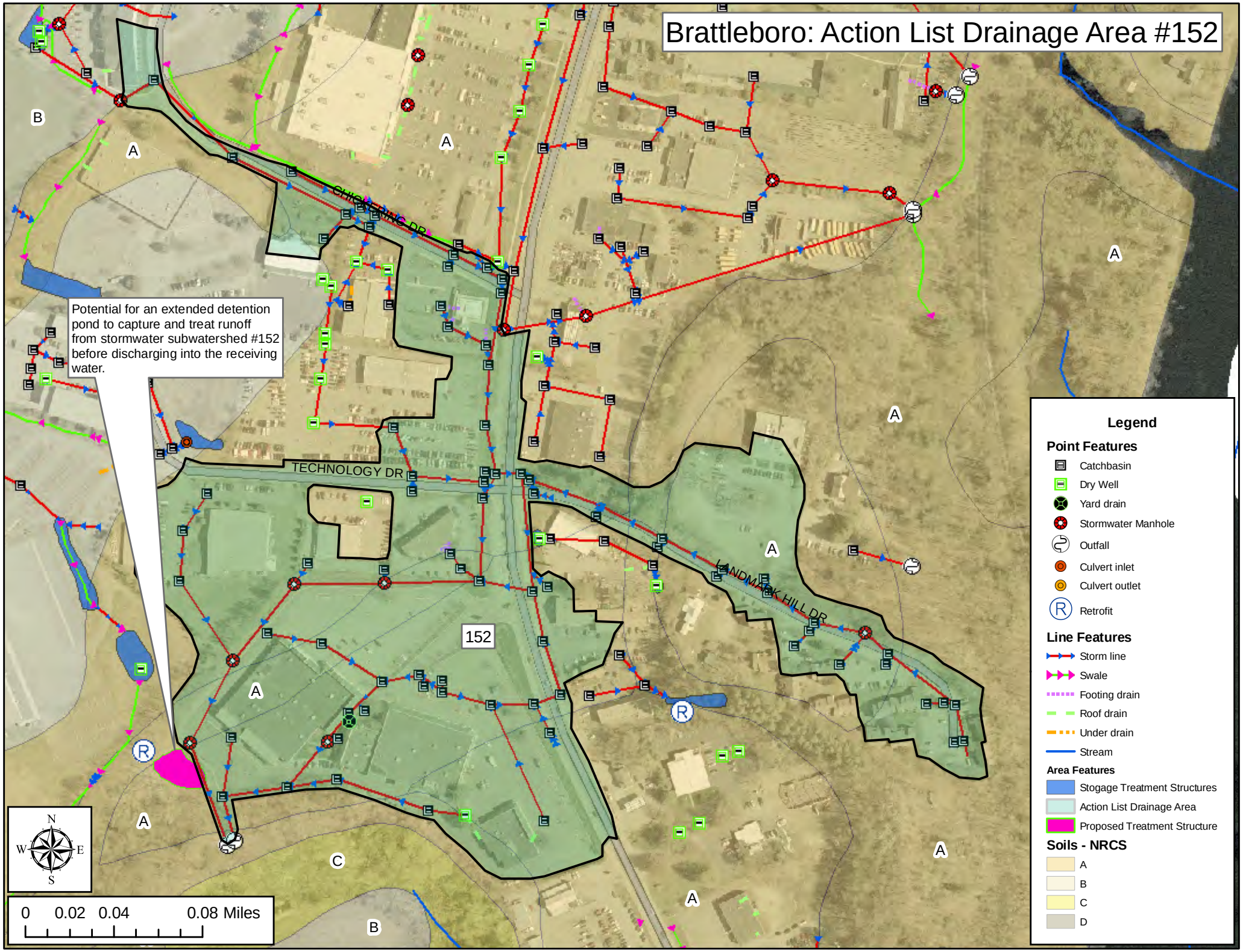



Brattleboro: Action List Drainage Area #80
WESTERN AV
ENHILL PKWY
CROSBY ST
HIGHLAWN RD
STRAND AV
80
A
A
A
B
B
water
Potential to rock line swale below outfall from subwatershed #80 to reduce erosion and sediment transport to receiving water.
N
W
E
S
0
0.01
0.02
0.04 Miles
Legend
Point Features
Catchbasin
Dry Well
Yard drain
Stormwater Manhole
Outfall
Culvert inlet
Culvert outlet
Treatment feature
Retrofit
Line Features
Storm line
Swale
Footing drain
Roof drain
Under drain
Stream
Area Features
Stogage Treatment Structures
Action List Drainage Area
Proposed Treatment Structure
Soils - NRCS
A
B
C
D

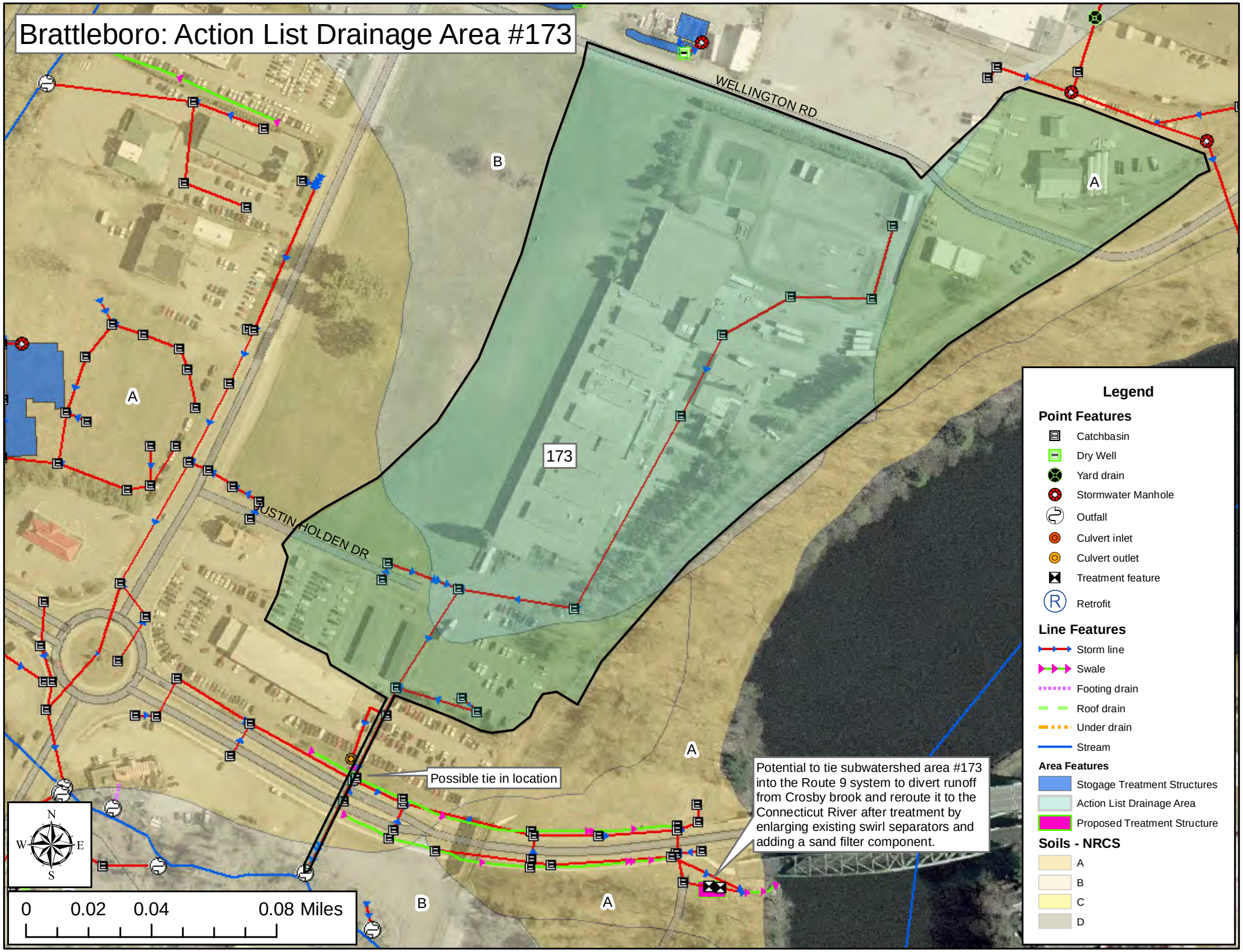
Brattleboro: Action List Drainage Area #82



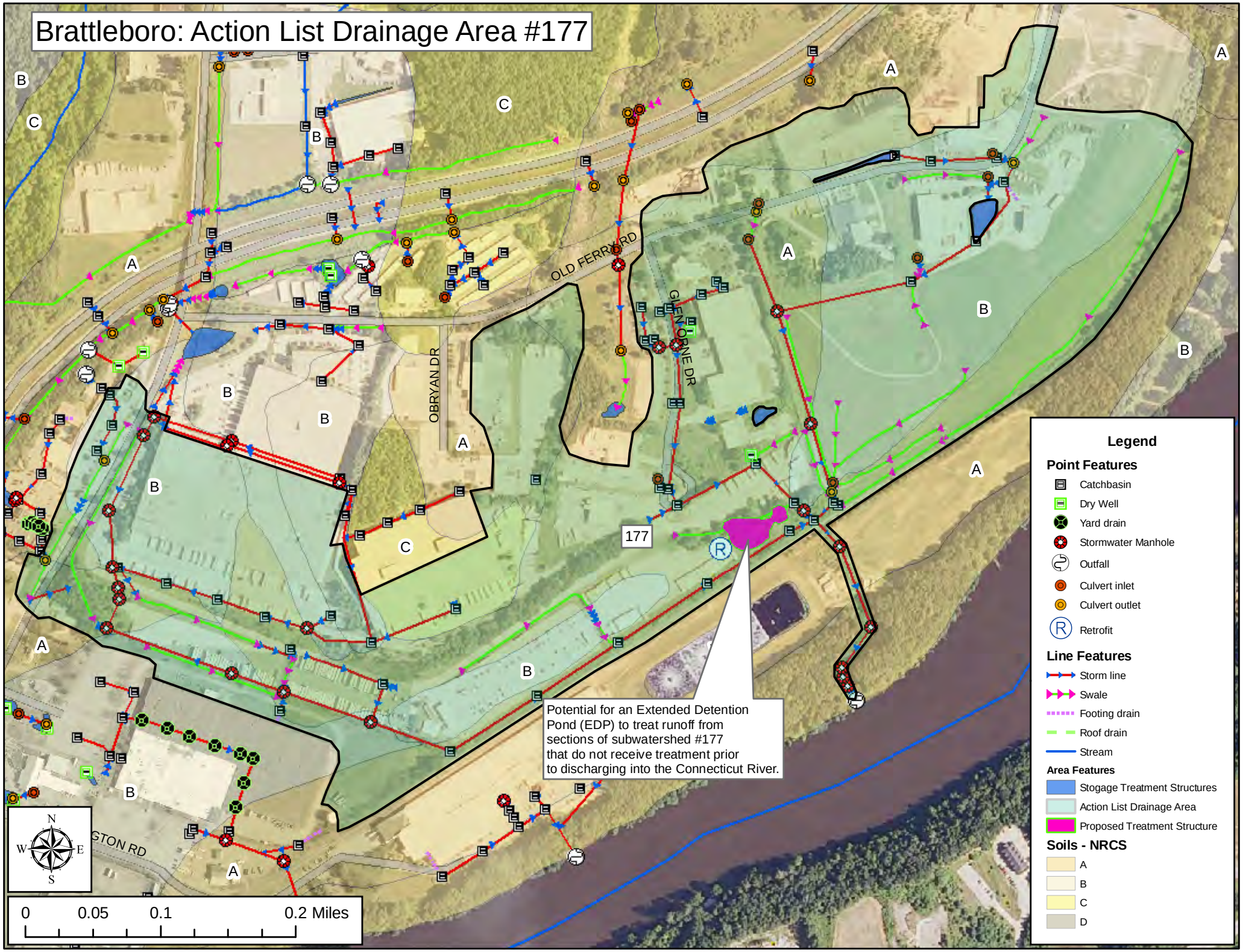
Brattleboro: Action List Drainage Area #152



Brattleboro: Action List Drainage Area #173



Brattleboro: Action List Drainage Area #177



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:

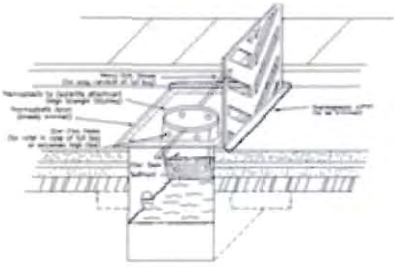
— Proper notification when a spill occurs;
— Site responsibility with respect to addressing the cleanup of a spill;
— Stopping the source of a spill;
— Cleaning up a spill;
— Proper disposal of materials contaminated by the spill;
— Location of spill response equipment programs; and
— Training for designated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

(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. § 8**005 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.