

# CENTENNIAL BROOK FLOW RESTORATION PLAN

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## 1. Executive Summary

This Flow Restoration Plan (FRP) for the Centennial Brook watershed was developed in accordance with requirements in the Municipal Separate Storm Sewer System (MS4) General Permit #3-9014 (2012). Once approved by the Vermont Department of Environmental Conservation (VTDEC) this FRP will become part of the Stormwater Management Plans (SWMP) prepared by the MS4 permittees in the Centennial Brook watershed. This includes the City of South Burlington, the Vermont Agency of Transportation (VTrans), the City of Burlington, Burlington International Airport (BTV), and the University of Vermont (UVM). The Centennial Brook FRP will act as a guidance document for the MS4 entities as they implement the stormwater Best Management Practices (BMPs) necessary to attain the flow restoration targets established by the Centennial Brook Total Maximum Daily Load (TMDL). The Centennial Brook TMDL was approved by the U.S. Environmental Protection Agency (EPA) on September 28, 2007. The TMDL suggests a 23.2% increase in stream flow during low flow conditions, and requires a 63.4% reduction in stream flow during high flow conditions (established as the 1-year storm event).

Development of the Centennial Brook FRP was an iterative process that utilized the Vermont Best Management Practice Decision Support System (BMPDSS) model maintained by VTDEC. This model was created by VTDEC and its partners as part of the initial TMDL development. The BMPDSS model allows the user to add, remove, or modify information related to the existing and proposed stormwater BMPs in the watershed. The BMPDSS then predicts the impacts that these changes will have on stream flow. In 2002, VTDEC provided a “base” condition BMPDSS model for Centennial Brook. This version of the BMPDSS model included all stormwater BMPs that existed in the watershed prior to 2002 and provided an estimated stream flow during the 1-year storm event. The goal of the FRP is to reduce stream flow by 63.4% during this target storm event.

The first step in FRP development was to inspect all existing BMPs included in the “base” condition model (Pre-2002). Based on the results of these field inspections, revisions were made to the BMPDSS model. Once this work was complete, the BMPDSS model was updated to include all BMPs that were constructed in the watershed after 2002. This version of the model became known as the “existing” conditions, or Post-2002, model run.

Following updates to the BMPDSS for the Pre-2002 and Post-2002 model scenarios, existing Pre-2002 BMPs were evaluated to determine if they could be retrofit to provide improved treatment and detention of stormwater runoff. After an initial list of retrofit sites were identified, a preliminary field assessment was completed at each site to document any potential constructability issues and review the drainage areas for each proposed BMP. These new BMPs were then incorporated into the BMPDSS model. New BMPs were added to the BMPDSS model until the required stream flow reduction target was achieved.

In addition to the identification of stormwater controls, the Total Maximum Daily Load (TMDL) flow targets and future growth assumption developed by VTDEC was reviewed in the context of the FRP development. In July 2013, at the request of the City of South Burlington, the Chittenden County Regional Planning Commission (CCRPC)<sup>1</sup> completed a study to estimate the expected non-jurisdictional impervious area growth in the Centennial Brook watershed over the next 20 years. The original TMDL arbitrarily assumed a non-jurisdictional impervious growth of 40 acres, whereas the CCRPC study estimated 5 acres

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<sup>1</sup> Chittenden County Regional Planning Commission (CCRPC). 2013. Impervious Surface Analysis for the Centennial Brook Watershed.

based on the actual non-jurisdictional growth rate from 2003 to 2010. The revised future growth reduced the high-flow target (Q0.3%) from 63.4% to 51.6%<sup>2</sup>.

The final proposed BMPDSS model run that ultimately achieved a 51.6% reduction in stream flow during the 1-year storm event includes a total of 27 sites; seven (7) retrofits to existing BMPs, three (3) new detention systems, nineteen (19) new infiltration systems, and one (1) new bioretention system. The total cost for implementation of these BMPs is estimated at approximately \$10,000,000 (final cost utilizes 2014 construction cost estimates).

Once the final list of required BMPs was determined, these projects were then ranked using a comprehensive ranking matrix and scheduled for construction over a 17-year period. The MS4 permit requires that the BMPs identified in the FRP be constructed within 20 years of the effective date of the MS4 permit, which results in a December 5, 2032 deadline. Therefore, 17 years remain for project implementation prior to the construction deadline. Many factors were considered when developing the BMP implementation schedule. A number of the BMPs are currently covered by expired State of Vermont stormwater permits. These BMPs were included at the front of the schedule so that the associated properties could complete the required stormwater improvements and achieve permit compliance. Other BMPs involve properties containing more than 3 acres of impervious area. VTDEC is currently drafting a "3 Acre Permit" that would require stormwater retrofit of these sites. Therefore, BMPs in this situation were also placed towards the front of the implementation schedule. Other BMPs are located on land owned or controlled by the MS4 entities. These BMPs were given priority over those that were located on private property. The remaining projects were scheduled based on their ability to contribute to stream flow reductions, cost effectiveness, and constructability.

The final step in FRP development was to develop a financial plan that would allow for the construction of the BMPs included in the BMPDSS model. The MS4s involved in the Centennial Brook FRP worked together to develop an implementation schedule for Centennial Brook. Some MS4s have responsibility for BMP implementation as part of FRPs in multiple watersheds. For example, the City of South Burlington has the responsibility to implement BMPs as part of FRPs in five stormwater impaired watersheds: Bartlett, Englesby, Centennial, Munroe, and Potash Brook. All five FRPs were considered when developing a comprehensive and realistic D&C schedule for the City.

Initial project cost estimates were arrived at using 2014 cost estimates. The City of South Burlington intends to finance the required stormwater BMPs by utilizing funds raised by stormwater utility fees, State and Federal grants, as well as low interest loan programs. Once projects were scheduled over the 17-year implementation schedule an annual 3% inflation rate was applied based on historic trends in the construction cost index. The City of South Burlington was then able to take these annual costs and insert them into their existing stormwater utility rate model. Three different scenarios were evaluated in the rate model. The first scenario assumed that grant funding would not be available and that the City would not utilize low interest loans to assist with project implementation. This scenario resulted in a stormwater billing rate of \$11.25 per Equivalent Residential Unit (ERU) in FY2032. The second scenario also assumed that grant funding would not be available, but that the City would utilize low interest loans to help pay for implementation of the projects. This scenario resulted in a stormwater billing rate of \$10.44 per ERU in FY2032. The third funding scenario assumed that grant funding of approximately \$250,000 per year would be available starting in 2018 and that this amount would increase to \$500,000 in 2030. This resulted in a stormwater billing rate of \$8.79 per ERU in FY2032.

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<sup>2</sup> See Table 1: The Modified target was calculated as:  $-(49.9\%) + (63.4 - 49.9\%)*(5 \text{ ac}/40 \text{ ac}) = -51.6\%$

## 2. Background

### 2.1. General

Centennial Brook and its watershed are located in Chittenden County, principally in the City of South Burlington, and encompass an area of approximately 1.4 square miles. Centennial Brook is a small second order tributary to the Winooski River, with its confluence located about one half mile above the Winooski Dam at an elevation of approximately 225 ft. Centennial Brook is 0.8 miles in length. At river mile (RM) 0.8 it divides into two branches. The southern branch is 0.8 miles in length and includes within its drainage the I-89 interchange and Route 2 east of the interchange in South Burlington. The east branch is 1.3 miles in length and drains dense residential areas from the upper portion of the watershed. The entire stream and its tributaries are Class B waters designated as cold water fish habitat pursuant to the Vermont Water Quality Standards.

Centennial Brook has been identified as not attaining water quality standards in accordance with Section 303(d) of the Federal Clean Water Act. In 2007, the EPA approved the Centennial Brook Stormwater TMDL<sup>3</sup>. The Centennial Brook TMDL study established targets for flow modification in the stream. The flow targets are the basis for this FRP, which was developed in accordance with the MS4 General Permit Subpart IV.C.1 as a required part of the MS4s SWMPs.

The City of South Burlington, as well as the City of Burlington, VTrans and UVM, are regulated MS4 Operators who own and control impervious surface in the Centennial Brook Watershed. The final MS4 general permit dated December 2012 requires that the impacted MS4s develop and submit a comprehensive FRP for the Centennial Brook Watershed. The purpose of this Centennial Brook FRP is to identify the necessary stormwater Best Management Practices (BMPs) that will be used to achieve the flow restoration targets prescribed in the Centennial Brook TMDL.

### 2.2. Permitting History

All State issued stormwater permits within the Centennial Brook watershed were reviewed as part of the FRP development effort. A full list of VTDEC permits discharging to the Centennial Brook is included in Table 1. Several of the expired permits obtained new permit coverage under a Residual Designation Authority (RDA) permit from VTDEC. Many of the properties that were issued RDA permits have applied for a renewal of their permit, but VTDEC has yet to act on these renewal requests.

**Table 1. Expired Permits Within The Centennial Brook Watershed**

PERMIT NUMBER	Project Name	PERMIT BUSINESS	EXPDATE
2-0126		Larkin Realty	7/1/1985
1-0871	Summer Woods	CGPM Inc.	6/30/1994

<sup>3</sup> The EPA approval of the Centennial Brook TMDL can be viewed at the following links:

[https://ofmpub.epa.gov/waters10/attains\\_impaired\\_waters.show\\_tmdl\\_document?p\\_tmdl\\_doc\\_blobs\\_id=72381](https://ofmpub.epa.gov/waters10/attains_impaired_waters.show_tmdl_document?p_tmdl_doc_blobs_id=72381)

1-0946	Queensbury Rd and Bluff Court	O'Brien Brothers Agency, Inc.	6/30/1995
1-1257	Quarry Ridge (Centennial Heights)	Quarry Ridge Homeowners Association (So Burlington Realty)	6/30/2001
4330-INDS		South Burlington School District	9/19/2011
4524-INDS	Benson Development	Benson Development LP	3/26/2012
5932-INDS	Precourt Properties	Precourt Investment Co., LLC	12/30/2013

### 2.3. Centennial Brook Total Maximum Daily Load (TMDL)

#### 2.3.1. Stormwater TMDL History

In response to Centennial Brook not meeting the water quality standards set forth in Section 303(d) of the Federal Clean Water Act, the VTDEC developed TMDLs for impaired watersheds using flow as a surrogate for pollutant loading. The basis for the TMDL development was the comparison of modeled Flow Duration Curves (FDCs) between impaired and attainment watersheds. The Program for Predicting Polluting Particles Passage through Pits, Puddles, and Ponds, Urban Catchment Model (P8) was used to model gauged and ungauged watersheds in Vermont and develop Flow Duration Curves (FDCs) from which a normalized high flow and low flow per drainage area in square miles (cfs/sq.mi.) were extracted.

As described in the Horsley Witten memorandum "Centennial Brook Watershed Flow Restoration Plan Development: Phase I Findings" (February, 2013), the P8 model was initially calibrated to two nearby New York watersheds with long-term flow records where there were some issues with groundwater predictions, and later to six UVM-monitored watersheds with shorter flow records. The model prediction of storm flow was tested on the UVM watersheds and produced satisfactory results, but it should be noted that none of the UVM watersheds had more than 16% impervious cover. For application of the P8 model in ungauged watersheds, such as Centennial Brook, several input parameters had to be estimated or set as a constant, which can introduce potential error.

An FDC is a graph that displays the percentage of time during a given period where flow exceeds a certain value. For the purposes of the Centennial Brook Stormwater TMDL, VTDEC determined that the "low" flow target would be represented by the 95th percentile (Q95%) of the curve and the "high" flow target would be represented by the 5th percentile (Q0.3%). The high and low flow values from the FDCs were then compared between "impaired" watersheds and comparable "attainment" watersheds to determine a percent change (i.e. reduction of high flow, increase of low flow). The percent change was reported in the EPA approved TMDL for each impaired watershed. The high-flow (Q0.3%) was determined to be relatively equivalent to the 1-year design storm flow (2.1 inches of rain over a 24-hour period in Chittenden County). Therefore, stormwater BMPs designed to meet the VTDEC Stormwater Management Manual's Channel Protection volume (CPv) storage standard were used to address the required high-flow reduction target.

### 2.3.2. TMDL Flow Targets

Centennial Brook is an 887-acre highly-developed tributary to the Winooski River that flows northward from the intersection of Route 2 and I-89. The brook is designated as a Class B water supporting a cold water fishery. Prior assessments for fish were fair to good and the macro invertebrate assessments were poor. Most watershed reaches are rated as poor for sediment content. The TMDL uses high flow as a surrogate for “pollutant of concern” with the assumption that restoration of the high and low flow is assumed to restore the physical, biological, and chemical regime. The low flow target suggested a total 23.2% increase in watershed base stream flows during low flow conditions, and the high flow target required a total 63.4% reduction in watershed flow allocation during the 1-year storm event. UVM and DEC have discussed the exclusion of flows derived from agricultural/open space lands, which would reduce the 63.4% TMDL reduction target to 63.0%.

### 2.3.3. Future Growth Modified Target

The TMDL flow targets and future growth assumptions used by VTDEC in development of TMDL targets were reviewed as part of the FRP development. In July 2013, at the request of the City of South Burlington, the CCRPC completed a study to estimate the additional non-jurisdictional impervious growth expected in the Centennial Brook over the next 20 years (Appendix B) . Non-jurisdictional growth is by definition impervious area that does not require a stormwater permit, and is therefore important to account for within the 20 year management plan.

The study estimated a future growth of 5 acres, accounting for the maximum new impervious surfaces allowed by the zoning lot coverage for each available parcel of land within the City of Burlington and City of South Burlington. Modified TMDL flow targets were determined by multiplying the portion of the TMDL target associated with future growth (FG) by a correction factor as follows:

$$\text{Modified Flow Target} = (\text{Target \% with no FG}) + (\text{Target \% from FG}) * \left( \frac{\text{Revised FG acres}}{\text{Original FG acres}} \right)$$

The approved original TMDL flow targets and modified flow targets with a revised future growth for Centennial Brook are as follows:

**Table 2. Modified TMDL Flow Targets with revised non-jurisdictional future impervious growth estimate**

Flow Target	Target High Flow Q 0.3(± %) Reduction	Target Low Flow <sup>2</sup> Q 95 (± %) Increase
TMDL Target from current Urban/Developed areas	-49.9%	23.2%
TMDL Targets with <b>40 acres</b> of Non-Jurisdictional Future Growth	-63.4%	23.2%
TMDL <i>Modified</i> Targets with <b>5 acres</b> of Non-Jurisdictional Future Growth <sup>1</sup>	-51.6%	23.2%
<sup>1</sup> Modified target was calculated as: $-(49.9\%) + (63.4\% - 49.9\%)*(5 \text{ ac}/40 \text{ ac}) = -15.6\%$ <sup>2</sup> The low flow target is not actionable under the TMDL, but is included because improving base flow in the watershed is still a water quality goal.		

## **2.4 MS4 Permit Background and Requirements**

A MS4 is a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, or man-made channels) that are designed or used for the collection or conveyance of stormwater discharged to waters of the State or waters of the United States. MS4 systems do not include combined sewer systems that are part of publicly owned wastewater treatment facilities.

On December 5, 2012, Vermont's revised MS4 Permit was issued. This MS4 permit was the second MS4 General Permit issued by the VTDEC. The first MS4 permit was issued in 2003 and amended in 2004. Both the 2004 and 2012 permits authorize stormwater discharges within the urbanized areas of small MS4s. Small MS4s included cities, towns, counties, airports, highway departments, and universities. The City of South Burlington, City of Burlington, University of Vermont, Burlington International Airport and Vermont Agency of Transportation were designated as regulated small MS4s, as were Colchester, Essex, Essex Junction, Milton, Shelburne, Williston, and Winooski.

Included in the 2012 MS4 permit issuance were new requirements for municipalities to develop FRPs to implement the stormwater TMDLs. The FRPs must be developed for each impaired watershed within three (3) years of the date of issuance of the authorization to discharge to the permittee under the general permit, by October 1, 2016, and must include the following elements:

- 1) An identification of the required controls
- 2) A design and construction schedule
- 3) A financial plan
- 4) A regulatory analysis
- 5) The identification of regulatory assistance, and
- 6) Identification of any third party implementation.

The schedule shall provide for implementation of the required BMPs as soon as possible, but no later than 20 years from the effective date of the permit; before December 5, 2032.

## **3. Best Management Practice Decision Support System Model Assessment**

### **3.1 Background**

In an effort to implement the Vermont Stormwater TMDLs, the VTDEC worked with an external consultant (TetraTech) to develop the computer-based VT BMPDSS, a VT-specific hydrologic BMP assessment model. This modeling tool was developed by TetraTech, Inc., with considerable investment from EPA Region 3 and Prince George's County, Maryland, and was adapted for use in Vermont using funding from the Vermont Agency of Natural Resources (ANR). The purpose of the modeling tool was to predict progress toward the TMDL flow targets based on proposed BMP implementation scenarios to help MS4 communities identify different BMP options and associated costs.

### **3.1.1 Model Calibration for Centennial Brook**

During development of the Centennial Brook FRP, the VT BMPDSS was also reviewed for any values or factors utilized in the stream flow model that could impact accuracy and results. One value used by the BMPDSS is the Hydraulic Weighting Factor (HWF). The HWF is a measure of lag time within a watershed. VTDEC collected rainfall and stream flow data from 2006 to 2008 and calibrated the original model to this data using the HWF. After working closely with VTDEC, it was determined that adjustment of the HWF used in the original BMPDSS model would provide model results that more closely replicated the observed rainfall and streamflow data. Therefore, with VTDEC concurrence, the final BMPDSS model runs utilized a modified HWF.

In order to complete a flow target assessment, VTDEC developed three model scenarios for each impaired watershed, including a “Base” (Pre-2002), “Existing” conditions (Post-2002), and an optimized credit scenario (meeting the flow restoration target). The base scenario (Pre-2002 model) included all stormwater BMPs installed prior to issuance of the VT Stormwater Design Standards in 2002. The land use data used in this scenario was derived from 2002 Quickbird satellite imagery. An existing scenario (Post-2002 model) was then developed with all existing BMPs designed to the 2002 VT Stormwater Design Standards, providing credit toward the flow target on a percent change basis compared to the base scenario. The optimized credit run was used by VTDEC to gage the estimated cost and level of effort to reach the flow targets in each impaired watershed. During the optimized credit run, a theoretical full build-out of BMPs were placed in each subwatershed by the model with a goal of minimizing cost and maximizing flow benefit. Results from the BMPDSS model output were provided as unadjusted cubic feet per second (cfs) and normalized flow (flow per drainage area, cfs/sq. mi). The unadjusted flow was used in the determination of progress towards the TMDL targets to eliminate the effect of watershed area in the percent change comparison.

### **3.2 Objective**

Assessment of the VT BMPDSS model involved a thorough verification of model input variables, assumptions, and results of the baseline (Pre-2002) and existing conditions (Post-2002) BMPDSS models. Creation of the “Credit” scenarios involved developing a list of potential retrofit sites for review by the MS4s in the watershed. As part of this process, site inspections were conducted in order to help assess the feasibility of conceptual projects (see Stormwater BMP Site Inspection Field Sheets provided in Appendix A). Once a preliminary list was created, concepts were refined, and sizing and drainage area delineations were developed for input into the BMPDSS model. The most important inputs to the model for this study were the GIS layers of land use, impervious cover, and soil, as well as the locations, configuration, and hydraulic connections of the BMPs themselves.

### **3.3 Review of Base and Existing Conditions BMPDSS Model**

Prior to conducting site inspections, expired VTDEC stormwater permit files for existing BMPs were reviewed so that the information could be compared to what was included in the Pre-2002 BMPDSS model. Input variables such as drainage areas, impervious cover, soils, and stormwater facility design information were reviewed against GIS data and evaluation of design calculations and site plans was carried out for each of the stormwater practices. This review determined the following:

- Soils, watershed boundary, and 2002 land use data were consistently applied to both the Pre-2002 and Post-2002 condition model runs. The Post-2002 condition model used slightly different impervious area and BMP drainage areas to reflect Post-2002 conditions.
- The Hydrologic Response Unit (HRU) parameters of soils, land use, slope, and impervious cover were in line with the GIS data. Many of the small discrepancies found between GIS area calculations and model inputs were attributed to the HRU grid system used by the model (where individual grids cannot be split and are assigned either inside or outside of a boundary).
- Impervious cover estimates differed slightly between the Pre-2002 and Post-2002 model, with the latter being more accurate. Recently updated impervious cover mapping provided by South Burlington shows a net increase in 1.3 acres over the Post-2002 version and a net decrease in 4.5 acres of VTrans impervious cover, which appears to reflect more accurate mapping rather than an actual change in land cover.
- Updated impervious cover from Burlington was received on 11/30/12, which included revised UVM coverage, and separate calculations from UVM were received on 12/17/12. Review of the data shows an increase in 0.75 acres for the City and a decrease of 11.8 UVM acres from the Post-2002 conditions. Minor changes in drainage boundaries are also reflected in the UVM numbers. Table 3 summarizes changes in total acres and impervious area for each MS4 for the Pre-2002 and Post-2002 models compared to the more recently updated data.

**Table 3. Cross-check of MS4 Area and Impervious Acres by Model Runs\***

MS4	Total Acres			Impervious Acres		
	Base Model (Pre-2002)	Existing Conditions Model (Post-2002)	Updated Data	Base Model (Pre-2002)	Existing Conditions Model (Post-2002)	Updated Data
UVM	301.3	301.3	300.0	90.0	89.1	77.3
VTrans	59.6	59.6	59.6	18.3	18.3	13.8
Burlington	101.8	101.8	101.9	43.8	45.1	45.9
South Burlington	423.3	423.3	423.4	126.5	126.5	127.8
<b>Total Watershed</b>	<b>886.0</b>	<b>886.0</b>	<b>884.9</b>	<b>278.6</b>	<b>279.1</b>	<b>264.8</b>

\*Areas are derived from GIS data; updated impervious cover based on data provided by S. Burlington and Burlington

- MS4 boundaries were developed using a parcel-based delineation for VTrans, a property boundary provided by UVM, and a boundary for Burlington and South Burlington based on the Vermont Center for Geographic Information (VCGI) municipal boundary shapefile.

- BMP drainage area information was cross-checked between the HRU and BMP model input tables, GIS information, and BMP design information. Table 4 shows discrepancies between GIS and HRU inputs in the VTMPDSS and updated impervious estimates. The discrepancies found were a  $\geq 6.5$  acre difference between the model inputs and updated estimates for the North Campus pond and the VTDEC’s HydroCAD run, as well as UVM’s sizing calculations which utilized an impervious cover that was 10 acres less than the input used in the VTBMPDSS. The differences seen for the North Campus pond may have been due to outdated mapping and/or the exclusion of non-UVM impervious cover from the sizing calculations. Updated drainage boundaries were provided by UVM.

**Table 4. Cross-check of Impervious Acres Draining to each BMP**

BMP	IMPERVIOUS ACRES IN BMP DRAINAGE AREA				
	Base Model (Pre-2002)		Existing Conditions Model (Post-2002)		Updated Data
	<i>HRU model input</i>	<i>GIS</i>	<i>HRU model input</i>	<i>GIS</i>	
M1 East Campus Pond (and retrofit)	53.2	52.7	52.5	52.4	47.7
M2/9 Quarry Ridge Pond	5.1	4.6	5.1	4.6	4.2
M3 Queensbury Pond	1.8	1.7	1.8	1.7	1.5
M4 Sheraton (and retrofit)	5.8	6.2	6.7	7.1	6.8
M5 Main St. Pond	11.6	11.8	11.6	11.8	9.0
M6/7 North Campus Pond	50.9	48.1	50.0	47.6	43.5
M8 Burlington Co Housing Pond/Infil.	-	0.0	1.6	1.3	1.6
<b>TOTAL</b>	<b>128.3</b>	<b>125.0</b>	<b>129.2</b>	<b>126.4</b>	<b>114.3</b>

- DEC modeled stormwater facilities using HydroCAD to generate the BMP information needed to input into the VTBMPDSS. Both the HydroCAD and the VTBMPDSS inputs were reviewed for each BMP, as well as the design plans and any calculations obtained. Specifically checked were pond storage volumes, drainage areas, outlet elevations, and orifice sizes. Three discrepancies were found: storage volumes for M9 Quarry Ridge (Post-2002); drainage areas for M4 Sheraton (Pre-2002); and volume and outlet assumptions for M5 Main St Pond (Pre-2002). The BMP input for M9 Quarry Ridge was revised and the Post-2002 model was re-run to assess the magnitude of the change to the overall results—the high flow reduction at the watershed outlet changed by 0.1%. This resulted in an overall increase from 16.0% to 16.1% in the Q0.3% reduction for the watershed. Table 5 summarizes the findings from this BMP evaluation.

**Table 5. Summary of BMP Information Review**

BMP ID*	Name	Comments
M1 (Pre)	UVM - East Campus Pre-2002	<b>Acceptable.</b> Small discrepancy in volume between DSS and HydroCAD model, but it appears to correspond to permanent pool storage. HydroCAD matches existing conditions plan. Consider revising dual outlet pipe routing.
M1 (Post)	UVM - East Campus Post-2002	<b>Acceptable.</b> Volumes match between models, but no plan set was available to confirm. Inconsistencies in number of outlets; OK based on calculations provided by engineer.
M2 (Pre)	Quarry Ridge Pond Pre-2002	<b>Acceptable.</b> All volumes match with plans. As-built plans have an outlet adjustment from 240.0' to 240.3' which is not reflected in the model.
M9 (Post)	Quarry Ridge Pond Post-2002	<b>Model to be revised.</b> Impervious area in HydroCAD is slightly lower than in model input. Storage volumes and outflows incorrectly modeled in relation to M2.
M3 (Pre)	Queensbury Road Pre & Post-2002	<b>Acceptable.</b> Plans are difficult to read. Pond volumes all appear to check. Cannot verify hole size/count on perforated standpipe outlet structure. The modeled overflow diameter may be slightly understated according the plans. Plans appear to show a 15" dia. orifice, model says 12" diameter. This does not affect the 1-yr storm.
M4 (Pre)	Sheraton Hotel Pre-2002	<b>Additional review.</b> All volumes and outlets check, however, the total drainage area (DA) and impervious acres (IA) are twice as large in the HydroCAD model as in the model input (i.e., 11.3 IA /16 DA acres in HydroCAD compared to ~6 IA/8.2 DA acres in VTBMPS and GIS).
M4 (Post)	Sheraton Hotel Post-2002	<b>Acceptable.</b> All volumes and outlets check. Should model 24" PVC outlet culvert from outlet structure.
M5 (Pre)	Main Street Pond Pre & Post-2002	<b>Review.</b> Volumes cannot be verified because page scaling is not included on plan set. Primary outlet elevations inconsistent, may be assuming more flow being released.
M6 (Pre)	UVM - North Campus Pre-2002	<b>Acceptable.</b> Volumes checked, but inconsistency in model for upper orifices; these do not affect 1-yr storm release. Impervious cover in the DA is off ~10 acres.
M7 (Post)	UVM - North Campus Post-2002	<b>Acceptable.</b> Adjust the HydroCAD routing input parameters if this BMP is to be remodeled under retrofit scenario.
M8 (Post)	Burlington Co- Housing Post-2002	<b>Acceptable.</b> Make minor adjustments to outlets to more accurately reflect design.

\* Pre- and Post-2002 stormwater design standards

Verification of BMP drainage areas and the design of the existing BMPs was also completed during site visits. Documentation of these observations has been included on field sheets (see Stormwater BMP Site Inspection Field Sheets provided in Appendix A). BMP outlet structures were noted on the field sheet to confirm the general configuration. The HydroCAD models used by VTDEC to enter the BMPs into the BMPDSS were also reviewed against existing site conditions. Comparison of measured field observations versus what VTDEC used for model inputs yielded a number of discrepancies. The watershed boundary was changed in a few locations based on MS4 input and field verification. For example, the area north of University Avenue and west of the baseball diamond was removed because it is now connected to the combined sewer system.

In coordination with VTDEC, a Revised Baseline Scenario was created to address an issue discovered during subsequent modeling runs involving the application of BMPs with small drainage areas. Each time one of these on-site BMPs was added, the model creates a new routing connection that increases downstream flow and reduces times of concentration in the drainage area. This phenomenon can cause the VTBMPPDSS model to underestimate the reduction potential of smaller green infrastructure (GI) practices and negates some of the potential benefits of BMP treatment trains. To accurately account for this effect, the “Base” model was revised to incorporate virtual outlets (VOs) and drainage areas with “dummy” connections in the same manner as in the subsequently modeled credit scenario. This adjustment did not alter flow paths in the “Base” model, but did slightly increase Q03 base flows. Thus, slight increases in percent reductions over baseline conditions were achieved in the restoration scenarios.

### 3.4 Revised Base and Existing Conditions Model Results:

Results of the Centennial VTBMPPDSS are summarized in Table 6, based on the results generated by VTDEC. From the flows modeled under the existing Post-2002 scenario at the watershed outlet, there has been a 16.1% reduction in high flows and a 0.03% increase in low flows over the base Pre-2002 “Base” conditions. This result leaves an additional 35.5% reduction and 23.2% increase to meet the overall high and low flow restoration targets, respectively.

**Table 6. Summary of Centennial Brook Flows Modeled at the Watershed Outlet \***

Model Run	High Flow (Q 0.3%)	Low Flow (Q 95%)
Revised TMDL Target	51.6% reduction	23.2% increase
Pre-2002 Model (cfs/mi2)	20.1	0.17
Post-2002 Model (cfs/mi2)	16.9	0.17
% Change	16.1%	-0.03%
% Remaining	35.5	23.2%

Based on DEC Credit Model run, with revisions to BMP M9 model input.

## 4. Identification of Stormwater Best Management Practices

The process of BMP identification involved an initial assessment of the existing BMPs with expired permits that did not already meet the CPv standards in the 2002 Vermont Stormwater Management Manual (VSMM) to determine if they could be retrofitted to meet the VSMM design standards. Upon review of the existing BMPs, it was determined that additional new BMPs would be required to meet the high-flow and low-flow targets. An initial desktop assessment of the watershed was completed to identify open spaces ideal for BMP implementation. A focus of this effort was to first evaluate property owned by the MS4s where projects could be implemented more readily than on private property. In addition, the location of proposed BMPs across the watershed was taken into consideration to provide storage throughout the watershed. The effort also focused on areas with a high-percentage of impervious coverage where flows were expected to be highest and where infiltration may be possible, as indicated by mapped Natural Resource Conservation Service Hydrologic Soil Group A<sup>4</sup> or B<sup>5</sup> soils.

After an initial list of retrofit sites were identified, a preliminary field assessment was completed at each location to document potential constructability issues and review mapped drainage areas for the proposed BMPs. The BMPs were then modeled using HydroCAD to meet the CPv storage criteria for cold water fish habitat (12-hour detention standard), and incorporated into the BMPDSS model. A number of credit scenarios were modeled to compare various implementation options using 27 stormwater BMPs. In these scenarios, primary BMPs are defined as having an outlet directly to a stream while secondary BMPs drain to a downstream BMP. More details of the BMP concept summaries, based on GIS and field data, can be found in the revised “Centennial Brook Watershed: Retrofit Field Findings Summary Memorandum” (dated October, 2013).

### 4.1 BMPDSS Model Assessment Results

The credit model runs included 27 BMPs and accounted for an initial 44.2% decrease towards the revised high flow (Q0.3) reduction target of 51.6%.

After completing these initial credit model runs, the MS4 partners discussed the Hydraulic Weighting Factor (HWF) with VTDEC. It was determined that adjustment of the HWF used in the original BMPDSS model would provide results that more closely replicated the observed rainfall and streamflow data. Therefore, with VTDEC concurrence, the final BMPDSS model run utilized a modified HWF, as described previously in section 3.1.1.

These modifications resulted in a revised 51.8% flow reduction of the unadjusted high flow (Q0.3) between the base scenario and proposed credit model runs, meeting the revised high target flow reduction of the TMDL. A summary of the base (Pre-2002), existing conditions (Post-2002), and final credit scenarios discussed above are presented in Table 7. Table C-1 in, Appendix C, provides an accounting of some of the key input parameters of each proposed BMP used in the proposed credit scenario.

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<sup>4</sup> Group A is sand, loamy sand or sandy loam types of soils. It has low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission.

<sup>5</sup> Group B is silt loam or loam. It has a moderate infiltration rate when thoroughly wetted and consists chiefly or moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures.

**Table 7. Summary of Modeling Scenarios**

Model Scenario			Purpose	Q03 High Flow		Conclusion
				(cfs)	% Red.	
Pre-TMDL	ANR Base (Pre-2002)	Six Pre-2002 BMPs, 2002 land use and IA GIS layers.	What were the flows at the time the TMDL was established? These flows are the baseline from which restoration/treatment is measured.	27.2	--	We were able to successfully replicate ANR's model.
	Revised Base (Pre-2002)	ANR Base + virtual outlets, DAs, and network.	Add "dummy" BMP connections to allow for more accurate comparison with credit scenarios.	27.9	--	This is the new baseline to measure achieved flow reductions.
Current	ANR Existing (Post-2002)	ANR Base + upgrades to some existing BMPs.	What is the change in baseline flow with the retrofit of 4 of 6 existing BMPs to 2002 standards?	23.1	15.2%	We were able to replicate ANR's model.
	Revised Existing (Post-2002)	ANR Post-2002 + BMP revisions & additions.	Revise current conditions by correcting model inputs on East Campus Pond (M1) and adding the Patchen Woods development.	23.2	14.8%	Corrections result in a slight decrease from ANR's prediction of the current reductions.
<b>Final Credit Scenario w/Initial TMDL Reduction Target</b>		All primary and secondary retrofits (see Table 3)	What is the max. flow reduction achievable if all feasible retrofits are implemented with UVM-designed retrofits of the Main St. (M5A3) and North Campus (M7A3) ponds and the Colchester Ave. expansion.	15.6	44.2%	Does not meet the revised 51.6% TMDL reduction target, and benefit of secondary practices probably not worth the additional cost.
<b>Final Credit Scenario w/ Revised TMDL Reduction Target</b>		All primary and secondary retrofits (see Table 3)	What is the max. flow reduction achievable if all feasible retrofits are implemented with UVM-designed retrofits of the Main St. (M5A3) and North Campus (M7A3) ponds and the Colchester Ave. expansion.	15.6	51.8%	Meets the revised 51.6% TMDL reduction target.

The BMPDSS model did not predict a significant increase in the stream base flow despite the preferential selection of infiltration-based BMPs when possible given site constraints such as soil type. It has been noted by the VTDEC and other BMPDSS model users that the model tends to under represent infiltration-based BMPs and is not sensitive enough to accurately predict base flow increases as a result of smaller infiltration-based BMPs. It is expected that actual base flow increases will be higher than predicted by the BMPDSS.

## **5. Proposed BMP Implementation Plan**

The final proposed BMP implementation plan includes a total of 27 sites; seven (7) retrofits to existing BMPs, three (3) new detention systems, nineteen (19) new infiltration systems, and one (1) new bioretention system. The proposed BMPs are summarized in Appendix C, Table C-1, including the impervious cover treated, drainage area, WQv managed, CPv storage, or infiltration volume managed as estimated by the HydroCAD design model. A map of the proposed BMP locations is included in Appendix C.

### **5.1 Proposed BMPs**

Twenty seven (27) BMP sites are proposed for implementation in the Centennial Brook watershed. Proposed BMPs include a mixture of retrofits to existing BMPs and new BMPs. The proposed BMPs for implementation are summarized in Table C-1 in Appendix C. Summary sheets describing each proposed BMP in detail for the Centennial Brook FRP were prepared and are included in Appendix C.

### **5.2 Considerations During BMP Design**

Proposed BMPs are currently conceptual in nature. These BMPs will need to be advanced to final design prior to construction. A variety of site specific factors will need to be further considered during the design phase. These considerations include, but are not limited to, the following:

- Relocation of utilities
- Wetland impacts
- Archeological resource impacts
- Soil characterization
- Depth to groundwater
- Depth to bedrock
- "Hotspot" land use
- Access considerations
- Land purchase/easements
- Future land use plans
- Potential need for site improvements such as; underground storage, retaining walls, etc.

## **6. Implementation Schedule**

A Design and Construction (D&C) schedule is a required element of the final FRP. The MS4 permit indicates that the implementation schedule for the BMPs included in the FRP must be over a timeframe that is less than 20 years from the effective date of the permit. The MS4s involved in the Centennial Brook FRP worked together to develop an implementation schedule for Centennial Brook. Some MS4s have responsibility for BMP implementation as part of FRPs in multiple watersheds. For example, the City of

South Burlington has the responsibility to implement BMPs as part of FRPs in five stormwater impaired watersheds: Bartlett, Englesby, Centennial, Munroe, and Potash Brook. All five FRPs were considered when developing a comprehensive and realistic D&C schedule for the City. The time schedule also accounts for acquisition of necessary permits and/or regulatory approvals, as well as limitations of MS4 resources on an annual basis.

### 6.1 Project Ranking

All proposed BMPs identified as part of FRP development in the five stormwater impaired watersheds of Potash, Bartlett, Englesby, Centennial, and Munroe Brook were ranked and a project prioritization was created. Considerations that factored into the ranking of BMP projects include the estimated benefit of a BMP towards the FRP’s flow restoration targets, and the amount of impervious area treated. The comprehensive ranking matrix ranked the proposed BMP projects based on the following criteria, which were grouped into four general categories as shown in Table 8.

**Table 8: Project Ranking Matrix**

Category	ID	Criteria
Cost/Operations	A	Project Cost per Impervious Acre
Project Design Metrics	B	Impervious Acres Managed (ac)
	C	Channel Protection Volume (CPv) Mitigated, (ie. 1-year Storm)
	D	Volume Infiltrated (ac-ft)
Project Implementation	E	Permits
	F	Land Availability
Other Project Benefits/Constraints	G	Flood Mitigation (Is existing flooding issue mitigated by project?)
	H	TMDL Flow Target Addressed (Q03, Q95)
	I	Lake Champlain Phosphorus TMDL
	J	Other Project Benefits/Constraints

Values for each criteria were identified and assigned a relative score, so that proposed BMP projects could be ranked based on a total score. A full description of the ranking criteria is presented in Table D-1 in Appendix D, and a scoring key is presented in Table D-2 in Appendix D. The development of cost estimates is further defined in the Subsection 6.1.1. The final scoring of proposed BMP projects in the Centennial Brook Watershed is presented Table E-2 in Appendix E.

### 6.2 Proposed BMP Cost Estimates

BMP cost estimates are based on average costs for conceptual level projects and deviation from these estimates is expected as projects move forward with engineering design. It is anticipated that there will be differences between project cost estimates presented in the FRP and actual project bid costs. The BMP cost estimates presented in the FRP are based on limited site investigation and the application of this methodology may fail to accurately reflect project cost impacts due to actual site conditions and constraints. Therefore, the BMP cost estimates presented are suitable for planning purposes only and not detailed project budgeting. For consistency purposes, all project cost estimates presented are calculated using costs in 2014, when the methodology was developed.

The BMP cost estimates were developed based on the following assumptions:

**Design Control Volumes:** Design control volumes were based on the estimated runoff volume associated with the 1-year storm event for off-line, underground or green infrastructure-type practices. Control volumes for large, in-line infiltration or detention basins were based on the estimated runoff associated with the 100-year storm event plus approximately 2 feet of freeboard volume. Underground systems and green infrastructure-type practices were conceptually designed as offline practices that only accept runoff from the one-year event. Runoff volumes for all storm events were determined based on HydroCAD model results that rely on the Soil Conservation Service (SCS) TR-55 and TR-20 hydrologic methods.

**Unit Costs and Site Adjustment Factors:** Unit cost for each BMP and site adjustment factors were derived from research by the Charles River Watershed Association and Center for Watershed Protection, as well as from experience with actual construction. Underground detention chambers (UDC) and underground recharge chamber (URC) systems were typically designed using Stormtech SC-740™ chamber systems. Cost estimates for the retrofit sites described as “GI/URC” were calculated as bioretention treatment systems followed by Stormtech SC-740™ chambers for recharge benefits. Cost adjustment factors were used to account for site specific differences typically related to project size, location, and complexity. Retrofits of existing BMPs, for example, generally cost less than new installations. The values used to estimate BMP costs are summarized in Table 9 below:

**Table 9: Proposed BMP Unit Costs and Adjustment Factors**

BMP	Base Cost (\$/ft3)
Detention Basin	\$2
Infiltration Basin	\$4
Underground Chamber (infiltration or detention)	\$12
Bioretention	\$10
Green Infrastructure/ Underground Chamber Combo	\$22
Site Type	Cost Multiplier
Existing BMP retrofit	0.25
New BMP in undeveloped area	1
New BMP in partially developed area	1.5
New BMP in developed area	2
Adjustment factor for large aboveground basin projects	0.5

**Site Specific Costs:** Cost of significant utility or other work related to the construction of the BMP itself. Site specific costs were added to construction costs for certain project locations based on past experience. For example, sites may require significant drainage reconstruction, utility relocation, or ledge removal. Site-specific construction items are described in detail in the Retrofit Summary Sheets provided as part of the Revised Field Findings Memo (dated October 14), except for the retrofit concepts updated after submittal of the Revised Field Findings Memo.

**Base Construction Cost:** Calculated as the product of the design control volume, the unit cost, and the site adjustment factor.

**Permits and Engineering Costs:** Used either 20% (for largest storage volume projects), and 35% for smaller or complex projects.

**Land Acquisition Costs:** Added to the total costs for facilities located on non-MS4 properties. Retrofits that may require partial land acquisition fees were marked up by \$150,000; retrofits possibly requiring total land acquisition were marked up by \$300,000. These land acquisition estimates are considered to be place-holders at this time and may require adjustments based on current land values and the willingness of land owners to grant easements for the proposed drainage improvements.

**Total Project Cost:** Calculated as the sum of the base construction cost, permitting and engineering costs, and land acquisition costs.

**Cost per Impervious Acre:** Calculated as the construction costs plus the permitting and engineering costs divided by the impervious acres managed by the BMP.

**Operation and Maintenance:** The annual O&M was calculated as 3% of the base construction costs, with a maximum of \$10,000.

**Minimum Cost Adjustment:** After total project costs were determined for each proposed BMP, costs were reviewed and adjusted so that projects were assigned a minimum cost of \$25,000.

A summary of all project costs for each proposed BMP in the Centennial Brook Watershed are included in Table E-1 in Appendix E.

### 6.3 Implementation Schedule

The BMPDSS model run that ultimately achieved the required 51.8% reduction in stream flow during the 1-year storm event included 27 BMPs costing approximately \$10,000,000 (this value utilizes 2014 construction cost estimates). The MS4 general permit requires that the BMPs identified in the FRP be constructed within 20 years of the effective date of the MS4 general permit. Therefore, the MS4 entities developed a schedule for design and construction of all BMPs that concludes before December 5, 2032. The implementation schedule for the proposed BMP projects in the Centennial Brook watershed are included in Table E-3 in Appendix E.

In addition to a project's score within the BMP ranking matrix, development of a BMP implementation schedule required the consideration of additional factors. A number of the proposed BMPs are currently covered by expired State of Vermont stormwater permits. These BMPs were included in the beginning of the schedule so that the associated properties could complete the required stormwater improvements and achieve permit compliance. Other BMPs involve property containing more than 3 acres of impervious area. VTDEC is currently drafting a "3 Acre Stormwater Permit" that would require stormwater retrofits at these sites. BMPs in this situation were also placed towards the front of the implementation schedule. In addition, some of the proposed BMPs are located on land owned or controlled by the MS4 entities. These BMPs were given priority over those that were located on private property.

The BMP schedule presented in this FRP is expected to receive updates on an annual basis. Projects will be added, modified, or removed as necessary to meet FRP flow targets and respond to actual conditions. The primary reason being that the BMPs presented in the implementation schedule have only been developed to in concept. It is reasonable to anticipate that changes will occur when these concepts are further developed. Depending on actual circumstances, the level of treatment achieved may be more or less than the level of treatment anticipated (e.g. variations in soil conditions allow for either more or less infiltration of stormwater runoff than originally anticipated). These type of modifications are common when advancing BMP plans from concept to final design. Therefore, flexibility in the schedule is necessary to accommodate these changes.

Additionally, in order for project implementation to move forward in a cost effective manner, the MS4s will need to take advantage of opportunities for stormwater improvements as they present themselves. For example, a private property owner may decide to redevelop their property on a schedule that was not anticipated in the current BMP implementation schedule. If this occurs, the MS4s may need to shift available resources from a scheduled project in order to take advantage of a cost savings opportunity.

Finally, projects may need to be shifted in the BMP schedule based on Vermont's changing regulatory system. VTDEC is currently developing an implementation plan for the Lake Champlain Phosphorous TMDL. When this document is finalized, the MS4 permit will require regulated entities to develop Phosphorus Control Plans (PCPs), similar in size and scope to the FRPs being developed as part of stormwater TMDLs. When this occurs, the FRPs will likely need to be revised based on PCP requirements, which are yet to be defined by VTDEC.

## 7. Financial Plan

Subject to the requirements of the MS4 permit, a financial plan is required as a part of the FRP. This plan must provide initial BMP cost estimates and demonstrate the means by which BMP implementation will be financed. The financial plan must also include the steps that each MS4 will take to implement the finance plan.

Initial BMP cost estimates were arrived at using 2014 cost estimates. Once projects were scheduled over the remaining 17-year implementation schedule, an annual 3% inflation rate based on the construction cost index was applied. Table E-3 in Appendix E presents inflation adjusted project costs for each BMP project. Applying this inflation rate provides a more accurate annual cost for BMP construction in the later years of the schedule.

### 7.1 City of South Burlington Financial Plan

In 2005, the City of South Burlington created Vermont's first stormwater utility. Under the stormwater utility system, all developed properties in the City pay an impervious area-based stormwater fee using an Equivalent Residential Unit (ERU) system<sup>1</sup>. These stormwater fees provide the City with a stable funding source that is used to comply with State and Federal stormwater regulations and maintain stormwater infrastructure throughout the City. The stormwater utility was created with the understanding that there would be future stormwater

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<sup>1</sup> South Burlington's *Ordinance Regulating the Use of Public and Private Sanitary Sewerage and Stormwater Systems*, dated 10/5/15, can be viewed at the following link: [http://www.sburl.com/vertical/sites/%7BD1A8A14E-F9A2-40BE-A701-417111F9426B%7D/uploads/Sewer\\_and\\_Stormwater\\_Ordinance\\_Final\\_Clean\\_10.5.15.pdf](http://www.sburl.com/vertical/sites/%7BD1A8A14E-F9A2-40BE-A701-417111F9426B%7D/uploads/Sewer_and_Stormwater_Ordinance_Final_Clean_10.5.15.pdf)

costs related to the five stormwater impaired watersheds located in South Burlington, as well as costs related to future implementation of projects required by the Lake Champlain Phosphorous TMDL. The City anticipates using funds generated from stormwater utility fees to fund a portion of FRP related costs.

Once the BMP cost and implementation schedule was developed, the City of South Burlington Stormwater Utility was able to incorporate this information into its existing stormwater rate model. The City evaluated three different scenarios for funding the BMPs included in the FRP. The first scenario assumed that there would be no grant funding or low interest loans available to assist with implementation. The second scenario assumed that there would be no grant funding available, but low interest loans would be available to help the City pay for implementation. This scenario included \$5M in low interest loans to help pay for BMP implementation. The third funding scenario assumed that grant funding of approximately \$250,000 per year would be available in 2018 through 2029, and that this amount would increase to \$500,000 in 2030, 2031, and 2032. The third funding scenario does not include low interest loans. The impact that these scenarios would have on stormwater utility rates is summarized in Table 9. The resulting annual cost to a single family residential property and a commercial property owner containing 1 acre of impervious area is summarized in Table 11. Calculations for “Commercial Property Containing 1 Acre Impervious Area” in Table 11 assume an Equivalent Residential Unit (ERU) rate of 17 and do not take into account the City’s relative tier factors, based percent impervious cover, which would yield an ERU range of 13 to 22 ERUs.

**Table 10: Stormwater Billing Rate (Cost per Equivalent Residential Unit) Under Different Flow Restoration Plan Funding Scenarios**

<b>Fiscal Year</b>	<b>Funding Scenario 1 Receive No Grants and No Loans</b>	<b>Funding Scenario 2 Receive Low Interest Loans, No Grants</b>	<b>Funding Scenario 3 Receive \$250,000 in Grants Annually*</b>
<b>2018</b>	\$6.69	\$6.69	\$6.69
<b>2019</b>	\$6.87	\$6.84	\$6.84
<b>2020</b>	\$7.05	\$6.99	\$6.99
<b>2021</b>	\$7.26	\$7.14	\$7.14
<b>2022</b>	\$7.50	\$7.29	\$7.29
<b>2023</b>	\$7.77	\$7.47	\$7.44
<b>2024</b>	\$8.07	\$7.68	\$7.59
<b>2025</b>	\$8.40	\$7.92	\$7.74
<b>2026</b>	\$8.76	\$8.19	\$7.89
<b>2027</b>	\$9.15	\$8.49	\$8.04
<b>2028</b>	\$9.57	\$8.82	\$8.19
<b>2029</b>	\$9.99	\$9.18	\$8.34
<b>2030</b>	\$10.41	\$9.57	\$8.49
<b>2031</b>	\$10.83	\$9.99	\$8.64
<b>2032</b>	\$11.25	\$10.44	\$8.79

\*Funding Scenario 3 does not include low interest loans.

**Table 11: Annual Stormwater Fee Paid by Property Owners Under Different Flow Restoration Plan Funding Scenarios**

Fiscal Year	Funding Scenario 1 - Receive No Grants and No Loans		Funding Scenario 2 - Receive Low Interest Loans, No Grants		Funding Scenario 3 - Receive \$250,000 in Grants Annually*	
	Single Family Residential Property	Commercial Property Containing 1 Acre Impervious Area	Single Family Residential Property	Commercial Property Containing 1 Acre Impervious Area	Single Family Residential Property	Commercial Property Containing 1 Acre Impervious Area
2018	\$80.28	\$1,364.76	\$80.28	\$1,364.76	\$80.28	\$1,364.76
2019	\$82.44	\$1,401.48	\$82.08	\$1,395.36	\$82.08	\$1,395.36
2020	\$84.60	\$1,438.20	\$83.88	\$1,425.96	\$83.88	\$1,425.96
2021	\$87.12	\$1,481.04	\$85.68	\$1,456.56	\$85.68	\$1,456.56
2022	\$90.00	\$1,530.00	\$87.48	\$1,487.16	\$87.48	\$1,487.16
2023	\$93.24	\$1,585.08	\$89.64	\$1,523.88	\$89.28	\$1,517.76
2024	\$96.84	\$1,646.28	\$92.16	\$1,566.72	\$91.08	\$1,548.36
2025	\$100.80	\$1,713.60	\$95.04	\$1,615.68	\$92.88	\$1,578.96
2026	\$105.12	\$1,787.04	\$98.28	\$1,670.76	\$94.68	\$1,609.56
2027	\$109.80	\$1,866.60	\$101.88	\$1,731.96	\$96.48	\$1,640.16
2028	\$114.84	\$1,952.28	\$105.84	\$1,799.28	\$98.28	\$1,670.76
2029	\$119.88	\$2,037.96	\$110.16	\$1,872.72	\$100.08	\$1,701.36
2030	\$124.92	\$2,123.64	\$114.84	\$1,952.28	\$101.88	\$1,731.96
2031	\$129.96	\$2,209.32	\$119.88	\$2,037.96	\$103.68	\$1,762.56
2032	\$135.00	\$2,295.00	\$125.28	\$2,129.76	\$105.48	\$1,793.16

\*Funding Scenario 3 does not include low interest loans.

It is the City's expectation that significant funding from the State of Vermont and other Federal sources will be available to help with the cost of stormwater TMDL implementation. The State of Vermont has already taken initial steps towards providing this funding. In 2015 the Vermont legislature created the Clean Water Fund (CWF). The CWF was provided with \$2,005,000 in 2016, and \$7,688,000 in 2016. While these initial investments are not at the level necessary to provide significant funding to the MS4 communities subject to stormwater TMDLs, it is our understanding that the State is working to provide additional funding to the CWF in the future. In December 2016, the State Treasurer and State agencies will be delivering a report to the Vermont legislature that provides options for raising significant money to fund the CWF. The City of South Burlington intends to work closely with our legislative representatives to ensure that this funding is made available for the stormwater improvements included in the FRPs. The City of South Burlington will also pursue funding from existing and new grant sources from other organizations including, but not limited to, VTDEC, the Vermont Agency of Transportation, and the Lake Champlain Basin Program.

## 7.2 City of Burlington Financial Plan

In 2009, the City of Burlington followed the example of the City of South Burlington in implementing an impervious area based stormwater fee to provide the City of Burlington with a stable funding source to maintain stormwater infrastructure throughout the City and to comply with numerous State and Federal stormwater regulations including the Stormwater TMDLs, Lake Champlain TMDL and Combined Sewer requirements. Implementation of retrofits for which the

City is responsible will ultimately be the responsibility of the stormwater ratepayers. In order to limit the impact to the ratepayers, the City intends to leverage existing and new grant and loan sources, as they are available. Later analyses will determine exactly which retrofit financial obligations (i.e. paying into project completed elsewhere in the watershed) will be necessary for the City to meet its obligations in Centennial Brook as the City continues to work in partnership with the other Centennial Brook MS4s. Additionally, as part of the Integrated Planning effort, the City will be completing a financial capability assessment (FCA) to evaluate the long-term ability of ratepayers to fund these and other Clean Water Act obligations. An FCA doesn't mean that Clean Water Act obligations won't be met – but may point to an adjustment of the overall schedule of implementation of all of the City of Burlington's obligations, including implementation of this and other Flow Restoration Plan projects, in order to mitigate the impact of stormwater and wastewater rates increasing at an unsustainable rate for the Burlington community. This FRP and SWMP will be amended with an updated financial plan, including stormwater rate projections for this and other Clean Water Act obligations once the FCA under the Integrated Plan is completed (end of 2018). The City is aware that due to the nature of the several joint/regional projects that are part of the Centennial Brook watershed plan and the fact that other MS4s may not be pursuing the possible scheduling flexibilities associated with integrated permitting, it is likely that significant adjustments of implementation schedules and associated financial planning will not be plausible for this watershed. This reality will be evaluated within the context of the FCA and the Integrated Planning effort.

### **7.3 University of Vermont Financial Plan**

Under the current budgeting process, the University would establish project funds to fulfill the University of Vermont's obligation. We would endeavor to pursue federal and state stormwater grant opportunities.

### **7.4 Vermont Agency of Transportation Financial Plan**

Planning level costs were independently estimated for each VTTrans project using a consistent spreadsheet-based method for all projects. As such, some cost estimates may differ slightly from those presented in other FRP documents. VTTrans will request state and federal funding for the appropriate amount to implement the BMPs as outlined in their design and construction schedule. For those projects that will require a joint effort with another municipality, VTTrans will request funding for their portion of the cost share. In watersheds where VTTrans is either not meeting or exceeding their allocated target there may be cost sharing between MS4s.

### **7.5 Burlington International Airport Financial Plan**

A financial plan that estimates the costs for implementing the BMPs and describes a strategy for financing is a required element of the FRP. The financing plan includes the steps each permittee will take to implement the financing plan. The City of South Burlington Potash Brook and Centennial Brook FRPs include cost estimates for each of the BMPs, using 2014 cost estimates with an annual 3% inflation rate as noted above. The VTDEC and the contributing MS4 permittees within these watersheds have signed a Memorandum of Agreement (MOA) to perform monitoring and other data collection required under the MS4 permitting program. Each MS4 permittee, including BTV, has been assigned a percentage of the total cost of the contracted work

over a five-year timeframe. This type of collaborative arrangement will also apply to implementation and financing of the BMPs.

As described in the FRPs, it is BTV's expectation that significant funding from the State of Vermont and other Federal sources will be available to help with the cost of stormwater TMDL implementation. In 2015, the Vermont legislature created the Clean Water Fund (CWF). This fund was provided with \$2,005,000 in 2015 and \$7,688,000 in 2016, and will likely receive additional funding in the years to come. The City of South Burlington and Burlington Airport intend to work closely with legislative representatives to ensure that this funding is made available for the stormwater improvements included in the FRPs.

The Burlington Airport also intends to seek funding for implementing its commensurate share of the BMPs within the watersheds, including requests from the CWF and other sources. BTV is committed to participating in a cost share with the City of South Burlington to implement its FRP in a manner that is fair and reasonable for the airport. It is also noted that BTV reserves the right to achieve its FRP commitments through implementing projects of its own choosing that may not be identified on South Burlington's present list of proposed watershed improvement projects.

## 8. Regulatory Analysis

In accordance with the MS4 permit, an FRP requires a regulatory analysis that identifies and describes any additional regulatory authorities, including authority to require low impact development BMPs, that the permittees will need in order to effectively implement the FRP.

Currently, stormwater runoff within the Centennial Brook watershed is regulated primarily by the VTDEC, City of South Burlington, City of Burlington, and VTrans. VTDEC regulates new developments through issuance of Stormwater Discharge Permits with technical requirements as outlined in the 2002 Vermont Stormwater Manual. The cities of South Burlington and Burlington require improved stormwater practices and low impact development for new developments through their stormwater ordinances and Land Development Regulations (LDRs). VTrans regulates stormwater discharges to the state Right of Way through 19 V.S.A. §1111 "Permitted use of the right-of-way".

The City of South Burlington updated stormwater requirements in its LDRs in June 2016.<sup>1</sup> The revised LDRs require that any project resulting in ½ acre or more of impervious area implement stormwater controls that prioritize infiltration. The revised LDRs also contain new requirements for properties that are being redeveloped. It is the City's expectation that these changes will result in gradual improvements in stormwater management over the course of the BMP implementation schedule.

The City of South Burlington also revised its "Ordinance Regulating the Use of Public and Private Sanitary Sewerage and Stormwater Systems" in October 2015.<sup>2</sup> The ordinance provides a policy regarding the

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<sup>1</sup> Section 12.03 – Stormwater Management Standards, "South Burlington Land Development Regulations," dated 6/27/16, can be viewed at the following link: [http://www.sburl.com/vertical/Sites/%7BD1A8A14E-F9A2-40BE-A701-417111F9426B%7D/uploads/LDRs\\_Effective\\_6-27-2016\\_Complete\\_reduced\\_size.pdf](http://www.sburl.com/vertical/Sites/%7BD1A8A14E-F9A2-40BE-A701-417111F9426B%7D/uploads/LDRs_Effective_6-27-2016_Complete_reduced_size.pdf)

<sup>2</sup> South Burlington's "Ordinance Regulating the Use of Public and Private Sanitary Sewerage and Stormwater Systems," dated 10/5/15, can be viewed at the following link:

handling of expired VTDEC stormwater permits located in South Burlington. The City will continue to take over responsibility for exclusively residential stormwater systems that complete upgrades. In addition, the revised ordinance allows commercial properties with expired permits to obtain coverage under the City's MS4 permit if upgrades to the stormwater system are completed. These properties will still be responsible for maintaining their systems, but the permit coverage required by the State of Vermont can now be provided through the City's MS4 permit, instead of obtaining coverage under one of VTDEC's other permit programs.

While the City of South Burlington has taken significant steps to alleviate the problems caused by expired State of Vermont stormwater permits within its boundaries, there is still a significant role that the VTDEC needs to play in order to support these efforts. The City's revised ordinance provides the opportunity for properties to obtain their required State of Vermont stormwater permit coverage through the City's MS4 permit, but it does not require it. It is anticipated that some property owners will want to work directly with VTDEC to obtain this permit coverage. In order for South Burlington to effectively implement its FRP, VTDEC needs to update its State permit programs so that properties with expired stormwater permits in stormwater impaired watersheds can obtain permit coverage directly from VTDEC. This updated permit program should require stormwater treatment on the properties that are, at minimum, equal to the stormwater treatment requirements included in the City's LDRs and referenced in the City's Stormwater Ordinance. If VTDEC fails to take this step and creates a permit program that allows properties to obtain permits with minimal stormwater improvements it has the strong potential to undermine the City's efforts to meet the FRP targets.

A full list of the expired State of Vermont permits with discharges to Centennial Brook is presented in Table 1 in Section 2.2. BMPs with expired State of Vermont permits proposed for retrofit under this FRP are included in Table C-1: Final Proposed BMPs for Centennial Brook FRP in Appendix C.

## **9. Third Party Implementation**

In accordance with the MS4 permit, a FRP requires identification of the name of any party, other than the permittee, that is responsible for implementing any portion of the FRP. A full list of expired permits, identifying the third party permittee, within the Centennial Brook watershed is presented in Table 1 in Section 2.2.

## **10. Conclusion**

This Centennial Brook FRP was completed to meet the requirements under Part III of the MS4 general permit for the contributing MS4s; City of South Burlington, City of Burlington, BTV, UVM, and VTrans. In accordance with Subpart IV.C.1. of the General Permit, the MS4s were required to submit a final FRP within 3 years of the permit issuance. This Centennial Brook FRP fulfills those requirements. The Centennial Brook FRP will become a part of the permittees' SWMP upon approval by VTDEC. Once the final Centennial Brook FRP is approved by VTDEC, implementation of this FRP by the contributing MS4s is required. Additionally, updates on FRP progress toward the flow target reductions are required as a part of the MS4 annual reports.

## 11. Appendices

Appendix A - Stormwater BMP Site Inspection Field Sheets

Appendix B – Future Growth Memorandum

Appendix C – Centennial Brook Flow Restoration Plan Proposed Best Management Practices

Table C-1: Final Proposed BMPs for Centennial Brook FRP

Map C-1: Final Proposed BMPs for Centennial Brook FRP

Centennial Brook FRP BMP Summary Sheets

Appendix D – Project Ranking

Table D-1: BMP Ranking Criteria Key

Table D-2: BMP Ranking Scoring Key

Appendix E – Proposed Cost Estimates, Prioritization Ranking, and Implementation Schedule

Table E-1: Project Cost Estimates

Table E-2: Centennial Brook Watershed BMP Project Scoring

Table E-3: Centennial Brook Watershed BMP Project Implementation Schedule

## **APPENDIX A**

### **STORMWATER BMP SITE INSPECTION FIELD SHEETS**

ID#: Retrofit 12A					
<b>Name:</b> University Rd. soccer field					
<b>Concept Description:</b> UVM proposed a dry swale along the western edge of the soccer field to capture a portion of University Road. The site has been designed (K&L) and is currently under construction.					
<b>Notes/Feasibility:</b> The portion of the soccer field that does not flow to practice drains and infiltrates under bleachers. University Rd. was recently paved. West side of University Rd. is the drainage/watershed boundary.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> UVM	<b>Project Candidate:</b> Ok				
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Institutional	<b>Proposed Retrofit Practice 1:</b> Dry Swale				
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> -None Selected-				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> Nutrients / Organics	<b>Maintenance Burden:</b> Low				
<b>Sources/pollutants 2:</b> Sediment	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 50%;"> <b>Benefits:</b>                      Storage: NO                      Water Quality: YES                      Recharge: YES                      Demo: YES                      Repair: NO                      Reuse: NO                 </td> <td style="vertical-align: top; width: 50%;"> <b>Conflicts:</b>                      Soils: NO                      Access: NO                      Land Use: NO                      Utilities: NO                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> None</td> </tr> </table>	<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: YES Demo: YES Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> None	
<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: YES Demo: YES Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> None					
<b>Soils:</b> Good Infiltration					
<b>Use in Retrofit DA:</b> Street and field					
SIZING INFO					
<b>Drainage Area (ac):</b> 1.16					
<b>Impervious Area (ac):</b> 0.31					
<b>Practice Area Available (ft<sup>2</sup>):</b> 3,200					
<b>Existing Head Available?</b> --					

Date Assessed: May 16, 2013, 2:07 PM

Assessed by: KMH/AGM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend	
	Retrofit
	Retrofit DA
	PracticeArea
	Outfalls
	Catch basins
	Manholes
	Existing BMP
	AirportProperties
	Watershed
	Wetlands_SoBu
	Parcels
	Existing BMP DA
	2ft_Contours
	stream
	Storm
	Sanitary
	Combined
	Waterline

N

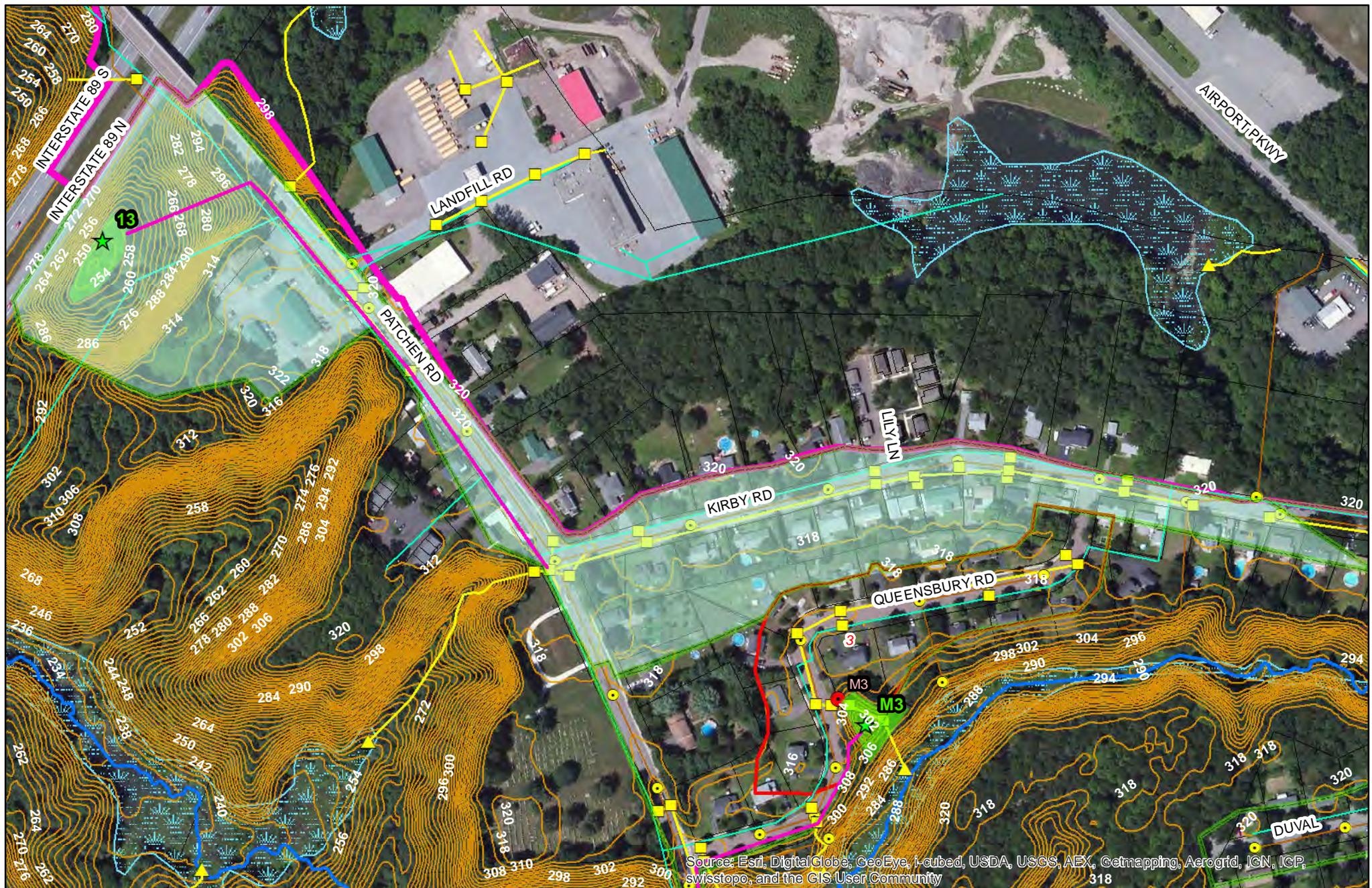
80 Feet

## Retrofit #12A: University Soccer Field

ID#: Retrofit 13											
<b>Name:</b> I-89 Kettle Hole											
<b>Concept Description:</b> Detention Pond (or infiltration basin-if soils are acceptable). Directly convey runoff from contributing area off Patchen Road down slope to sediment forebay. Modify existing 30" culvert headwall (under I-89) to achieve required flow control. Could pick up Kirby Rd.											
<b>Notes/Feasibility:</b> Good site; final feasibility will require verification of wetland limits (small area of wetland vegetation, but soils generally upland), assessment of impacts to existing water main (runs through parcel, see blow-off valve in photo), and coordination with VTrans for ponding against I-98 R/W.											
GENERAL SITE INFORMATION	RETROFIT DETAILS										
<b>Site Contact Info:</b> VTrans and private owner	<b>Project Candidate:</b> Yes										
<b>Ownership:</b> Public and Private	<b>Retrofit of new or existing BMP:</b> New BMP										
<b>Land Use 1:</b> Forest	<b>Proposed Retrofit Practice 1:</b> Pond										
<b>Land Use 2:</b> waterline ROW	<b>Proposed Retrofit Practice 2:</b> Infiltration if feasible possible HW issues with water line										
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-										
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-										
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> -Low										
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 50%;"> <b>Benefits:</b>                      Storage: YES                      Water Quality: NO                      Recharge: YES                      Demo: NO                      Repair: NO                      Reuse: NO                 </td> <td style="vertical-align: top; width: 50%;"> <b>Conflicts:</b>                      Soils: NO                      Access: NO                      Land Use: NO                      Utilities: YES                      Polluted: NO                      High WT: NO                      Wetlands: YES                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> None</td> </tr> <tr> <td colspan="2"><b>Other:</b> Small wetland pockets</td> </tr> <tr> <td colspan="2"></td> </tr> <tr> <td colspan="2"></td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: NO Recharge: YES Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: YES	<b>Other:</b> None		<b>Other:</b> Small wetland pockets					
<b>Benefits:</b> Storage: YES Water Quality: NO Recharge: YES Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: YES									
<b>Other:</b> None											
<b>Other:</b> Small wetland pockets											
<b>Soils:</b> Good Infiltration											
<b>Use in Retrofit DA:</b> Street, SF Res											
SIZING INFO											
<b>Drainage Area (ac):</b> 14.06											
<b>Impervious Area (ac):</b> 5.05											
<b>Practice Area Available (ft<sup>2</sup>):</b> 10,160											
<b>Existing Head Available?</b> n/a											

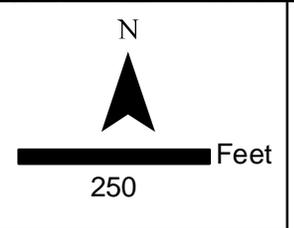
**Date Assessed:** May 16, 2013, 8:56 AM

**Assessed by:** RAC, NBP, SMM



Source: Esri, Digital Globe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, ICP, swisstopo, and the GIS User Community

Legend	
★ Retrofit	▲ Outfalls
■ Retrofit DA	● Catch basins
■ PracticeArea	● Manholes
	● Existing BMP
□ AirportProperties	□ Watershed
□ Wetlands_SoBu	□ Parcels
□ Existing BMP DA	— 2ft_Contours
	— stream
	— Storm
	— Sanitary
	— Combined
	— Waterline



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## Retrofit #13 Kettle Hole at I-89

ID#: Retrofit 14A					
<b>Name:</b> Chamberlain School (east)					
<b>Concept Description:</b> Underground detention in open space of school property. It seems possible to collect drainage off of White Street (and upgradient residential neighborhood) and connect to existing system via school entrance. Underground chambers could be designed as infiltration pending results of soils testpitting. (note HSG – D on east side of school property).					
<b>Notes/Feasibility:</b> Existing drainage system (12" cmp) drains parking lot. Would need to verify capacity to add addition upgradient lands – only need to be sized for 1- YR. Cp <sub>v</sub> .					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> School	<b>Project Candidate:</b> Undecided				
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> School	<b>Proposed Retrofit Practice 1:</b> Pre-treatment chambers				
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> Underground storage, no infiltration				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> Educational signage for school				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> -None Selected-				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: YES                      Water Quality: NO                      Recharge: NO                      Demo: NO                      Repair: NO                      Reuse: NO                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: YES                      Access: NO                      Land Use: NO                      Utilities: NO                      Polluted: NO                      High WT: YES                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> -None Selected-</td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: NO Recharge: NO Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: YES Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: YES Wetlands: NO	<b>Other:</b> -None Selected-	
<b>Benefits:</b> Storage: YES Water Quality: NO Recharge: NO Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: YES Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: YES Wetlands: NO			
<b>Other:</b> -None Selected-					
<b>Soils:</b> Poor (HSG D, according to soils mapping)					
<b>Use in Retrofit DA:</b> streets, single family res					
SIZING INFO					
<b>Drainage Area (ac):</b> 31.56 (with #14B)					
<b>Impervious Area (ac):</b> 10.08 (with #14B)					
<b>Practice Area Available (ft<sup>2</sup>):</b> 9,220					
<b>Existing Head Available?</b> n/a					

Date Assessed: May 16, 2013, 3:52 PM

Assessed by: RAC, NBP, SMM

ID#: Retrofit 14B	
<p><b>Name:</b> Chamberlain School (west)</p> <p><b>Concept Description:</b> Underground detention in open space of school property. It seems possible to collect drainage off of White Street (and upgradient residential neighborhood) and connect to existing system via school entrance. Underground chambers could be designed as infiltration pending results of soils testpitting. (note HSG – B on west side of school property). Would be in addition to Site 14A as its unlikely to be able to manage all area on one locations.</p> <p><b>Notes/Feasibility:</b> Existing drainage system (12" cmp) drains Bldg and parking lot. Would need to verify capacity to add addition upgradient lands – only need to be sized for 1- YR. Cp<sub>v</sub>.</p>	
GENERAL SITE INFORMATION	RETROFIT DETAILS
<b>Site Contact Info:</b> School	<b>Project Candidate:</b> Ok
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP
<b>Land Use 1:</b> School	<b>Proposed Retrofit Practice 1:</b> Infiltration
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> Requires pretreatment
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> Educational signage
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> -None Selected-
<b>Sources/pollutants 2:</b> -None Selected-	<p><b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: NO Repair: NO Reuse:</p> <p><b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: POSSIBLE Wetlands: NO</p>
<b>Soils:</b> Unknown, presumed OK (HSG B)	
<b>Use in Retrofit DA:</b> school, streets, single family res.	
SIZING INFO	
<b>Drainage Area (ac):</b> 31.56 (with #14A)	<p><b>Other:</b> -None Selected-</p>
<b>Impervious Area (ac):</b> 10.08 (with #14A)	
<b>Practice Area Available (ft<sup>2</sup>):</b> 23,780	
<b>Existing Head Available?</b> n/a	

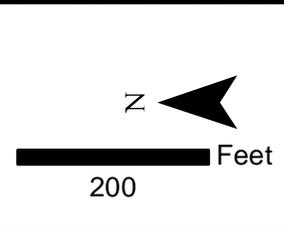
Date Assessed: May 16, 2013, 4:31 PM

Assessed by: RAC, NBP, SMM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getw swisstopo, and the GIS User Community

Legend	
★ Retrofit	▲ Outfalls
▭ Retrofit DA	● Catch basins
▭ PracticeArea	● Manholes
	● Existing BMP
	▭ AirportProperties
	▭ Watershed
	▭ Wetlands_SoBu
	▭ Parcels
	▭ Existing BMP DA
	— 2ft_Contours
	— stream
	— Storm
	— Sanitary
	— Combined
	— Waterline

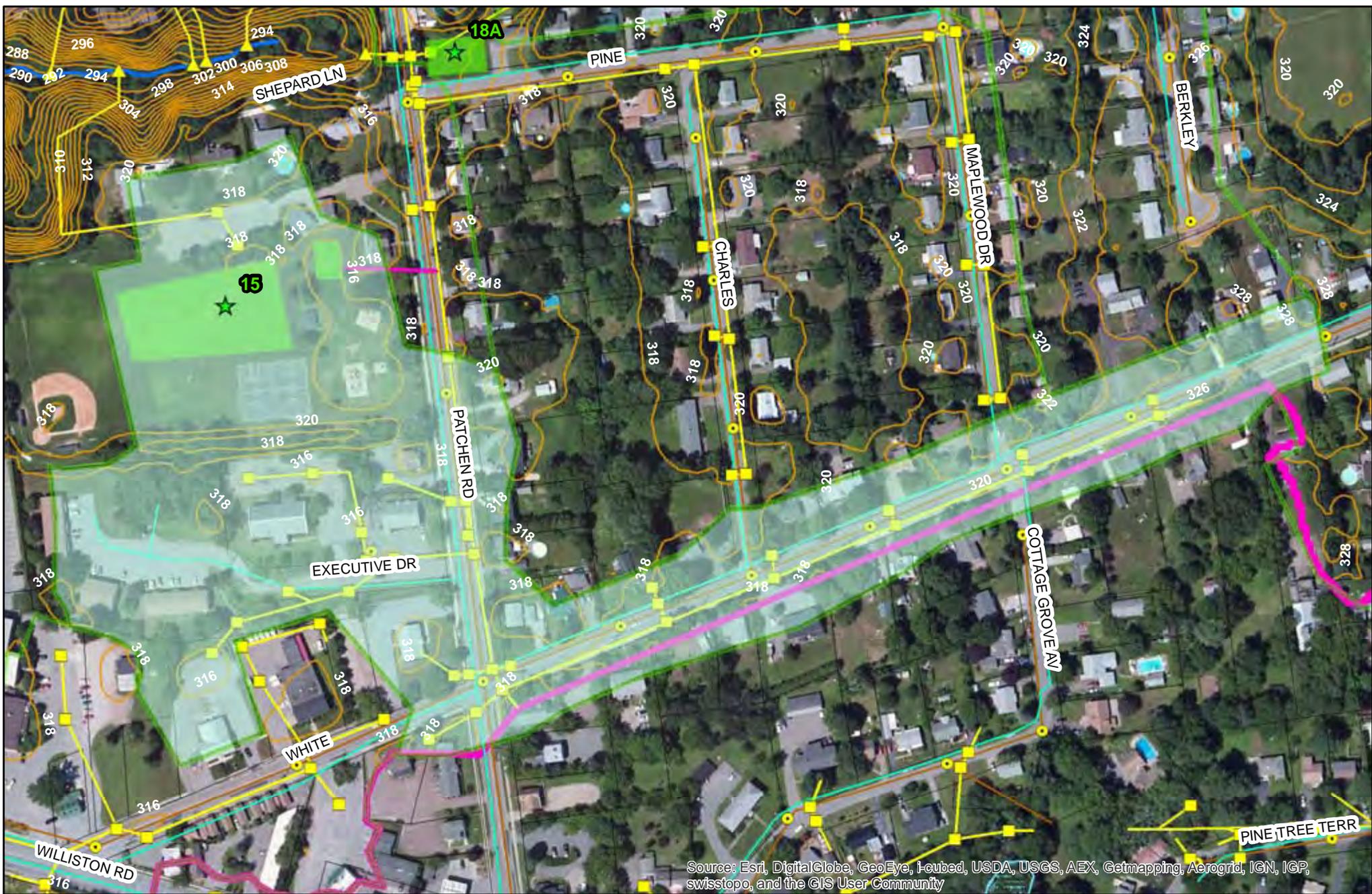


## Retrofit #14: Chamberlain School

ID#: Retrofit 15					
<b>Name:</b> Jaycee Park					
<b>Concept Description:</b> Pretreatment tank to underground infiltration chambers. Pretreatment could be proprietary device (e.g, StormCeptor or equal) before underground chambers. Access would need to be coordinated with playing fields. Flow diversion structure would be in Patchen Road, with depth to drain pipe at approx 6.5 feet.					
<b>Notes/Feasibility:</b> Flow diversion from Patchen Road drives depth of inflow approx 10.5 feet below grade (bottom of chambers 12-13 feet). Existing trees in park, reconstruction of fields Soils at design depth, unknown.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> South Burlington Parks and Rec.	<b>Project Candidate:</b> Yes.				
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Park	<b>Proposed Retrofit Practice 1:</b> Underground infiltration				
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> Pretreatment structure				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Medium				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: NO Repair: NO Reuse: NO</td> <td style="width: 50%;"><b>Conflicts:</b> Soils: NO Access: NO Land Use: YES Utilities: YES Polluted: NO High WT: NO Wetlands: NO</td> </tr> <tr> <td><b>Other:</b> -None Selected-</td> <td><b>Other:</b> -None Selected-</td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: NO Access: NO Land Use: YES Utilities: YES Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> -None Selected-	<b>Other:</b> -None Selected-
<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: NO Access: NO Land Use: YES Utilities: YES Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> -None Selected-	<b>Other:</b> -None Selected-				
<b>Soils:</b> Good Infiltration					
<b>Use in Retrofit DA:</b> streets, SF res, some commercial					
SIZING INFO					
<b>Drainage Area (ac):</b> 15.74					
<b>Impervious Area (ac):</b> 5.81					
<b>Practice Area Available (ft<sup>2</sup>):</b> 32,220 + 2,530 (pretreatment area)					
<b>Existing Head Available?</b> Yes (12- 13 ft depth, overflow ok)					

**Date Assessed:** May 17, 2013, 10:42 AM

**Assessed by:** RAC, SMM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

<b>Legend</b> Retrofit Retrofit DA PracticeArea	Outfalls Catch basins Manholes Existing BMP	AirportProperties Watershed Wetlands_SoBu Parcels Existing BMP DA	2ft_Contours stream Storm Sanitary Combined Waterline
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N

200 Feet

## Retrofit #15: Jaycee Park

ID#: Retrofit 16 (revised)					
<b>Name:</b> I-89 Outfall					
<b>Concept Description:</b> Detention storage facility. Location is flexible depending on evaluation of constraints. Most downstream location would be across from drainage outlet, below water main (best location for embankment – maximizes storage), but impact to water main R/W likely and partially on private property. Alternative is to move embankment upgradient to limit of I-89 R/W – would reduce available storage, but keep all work within VTrans jurisdiction.					
<b>Notes/Feasibility:</b> Feasible, but constraints need to be quantified, including property ownership, wetlands impacts (see Phrag in photo), water main. Construction and maintenance access good, via water main R/W. Vtrans noted that prior riprap work was NOT a permitting issues with COE or DEC.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> VTrans, unknown private owner	<b>Project Candidate:</b> Yes				
<b>Ownership:</b> Public and private (depending on option)	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Highway R/W	<b>Proposed Retrofit Practice 1:</b> Detention Pond				
<b>Land Use 2:</b> Open space next to interstate	<b>Proposed Retrofit Practice 2:</b> Could be a const wetland				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> -None Selected-				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: YES                      Water Quality: YES                      Recharge: NO                      Demo: NO                      Repair: NO                      Reuse: NO                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: YES                      Access: NO                      Land Use: YES                      Utilities: YES                      Polluted: NO                      High WT: NO                      Wetlands: YES                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> -None Selected-</td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: YES Access: NO Land Use: YES Utilities: YES Polluted: NO High WT: NO Wetlands: YES	<b>Other:</b> -None Selected-	
<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: YES Access: NO Land Use: YES Utilities: YES Polluted: NO High WT: NO Wetlands: YES			
<b>Other:</b> -None Selected-					
<b>Soils:</b> Poor Infiltration					
<b>Use in Retrofit DA:</b> Street, Interstate highway					
SIZING INFO					
<b>Drainage Area (ac):</b> 52.25					
<b>Impervious Area (ac):</b> 18.88					
<b>Practice Area Available (ft<sup>2</sup>):</b> 23,550					
<b>Existing Head Available?</b> n/a					

Date Assessed: May 16, 2013, 1:52 PM

Assessed by: RAC, NBP, SMM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend			
★ Retrofit	▲ Outfalls	□ AirportProperties	— 2ft_Contours
□ Retrofit DA	■ Catch basins	□ Watershed	— stream
■ PracticeArea	● Manholes	□ Wetlands_SoBu	— Storm
	● Existing BMP	□ Parcels	— Sanitary
		□ Existing BMP DA	— Waterline

N

300 Feet

## Retrofit #16: I-89 Outfall

ID#: Retrofit 16A					
<b>Name:</b> I-89 on-ramp (west)					
<b>Concept Description:</b> Depression bounded by eastern on-ramp, eastern off-ramp and northbound lanes of I-89. Not an ideal site because the 6' pipe runs under this area at a depth of approx. 8 feet – would have to daylight pipe.					
<b>Notes/Feasibility:</b> Feasible, but would require daylighting 8 ft deep pipe and addressing safely issues off or highway.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> VTrans	<b>Project Candidate:</b> No				
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Road	<b>Proposed Retrofit Practice 1:</b> Detention Pond				
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> Dry detention basin				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> -None Selected-				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><b>Benefits:</b> Storage: YES Water Quality: NO Recharge: NO Demo: NO Repair: NO Reuse: NO</td> <td style="width: 50%;"><b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO</td> </tr> <tr> <td><b>Other:</b> -None Selected-</td> <td><b>Other:</b> Fed highway approval</td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: NO Recharge: NO Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> -None Selected-	<b>Other:</b> Fed highway approval
<b>Benefits:</b> Storage: YES Water Quality: NO Recharge: NO Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> -None Selected-		<b>Other:</b> Fed highway approval			
<b>Soils:</b> Poor Infiltration					
<b>Use in Retrofit DA:</b> Highway interchange					
SIZING INFO					
<b>Drainage Area (ac):</b> --					
<b>Impervious Area (ac):</b> --					
<b>Practice Area Available (ft<sup>2</sup>):</b> 8,700					
<b>Existing Head Available?</b> n/a					

**Date Assessed:** May 16, 2013, 2:09 PM

**Assessed by:** RAC, NBP, SMM

ID#: Retrofit 16B					
<b>Name:</b> I-89 cloverleaf (northeast)					
<b>Concept Description:</b> Detention structure bounded by northbound lanes and off-ramp (directing traffic to westbound Williston Rd). Existing culvert drains all upgradient area from interchange and Williston Rd. Modify outlet to install new control structure for Cp <sub>v</sub> storage.					
<b>Notes/Feasibility:</b> Good location for detention retrofit. Existing outlet pipe (48" CMP) easily accessible for constructin and maintenance. Contrainits include safety considerations from highway and existing wetlands (though mapped- all areas appear to be phrag dominated and issolated). Approx 14 of grade from invert to low point on off-ramp.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> Jennifer Callahan- VTrans	<b>Project Candidate:</b> Yes, possibly combined with Site #16				
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Road	<b>Proposed Retrofit Practice 1:</b> Extended Detention				
<b>Land Use 2:</b> Highway interchange	<b>Proposed Retrofit Practice 2:</b> Const Wetland options				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> limit highway turf				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> -None Selected-	<b>Maintenance Burden:</b> Moderate				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO</td> <td style="width: 50%;"><b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: YES</td> </tr> <tr> <td><b>Other:</b> -None Selected-</td> <td><b>Other:</b> -None Selected-</td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: YES	<b>Other:</b> -None Selected-	<b>Other:</b> -None Selected-
<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: YES			
<b>Other:</b> -None Selected-		<b>Other:</b> -None Selected-			
<b>Soils:</b> Unknown					
<b>Use in Retrofit DA:</b> Highway Interchange					
SIZING INFO					
<b>Drainage Area (ac):</b> 39.23					
<b>Impervious Area (ac):</b> 15.65					
<b>Practice Area Available (ft<sup>2</sup>):</b> 62,650					
<b>Existing Head Available?</b> n/a					

Date Assessed: May 16, 2013, 2:21 PM

Assessed by: RAC, NBP, SMM

ID#: Retrofit 16D					
<b>Name:</b> Sheraton (in front)					
<b>Concept Description:</b> Underground detention structure, possibly infiltration – flow diversion from drainage inlets in Williston Road.					
<b>Notes/Feasibility:</b> Feasibly but not terrible cost effective. Small drainage area, private ownership (Sheraton) + coordination with VTrans required (drains to I-89 interchange), depth of pipe (~7.5 ft) require 6 – 8 ft deep facility, daylight to pipe system within I-89 R/W just barely works.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> Sheraton	<b>Project Candidate:</b> No, suggest #16 or #16B				
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Commercial	<b>Proposed Retrofit Practice 1:</b> Underground Detention				
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> Pretreatment structure needed				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> Yes	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Medium				
<b>Sources/pollutants 2:</b> Metals	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"><b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO</td> <td style="width: 50%; vertical-align: top;"><b>Conflicts:</b> Soils: YES Access: YES Land Use: YES Utilities: YES Polluted: 0 High WT: NO Wetlands: NO</td> </tr> <tr> <td><b>Other:</b> -None Selected-</td> <td><b>Other:</b> -None Selected-</td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: YES Access: YES Land Use: YES Utilities: YES Polluted: 0 High WT: NO Wetlands: NO	<b>Other:</b> -None Selected-	<b>Other:</b> -None Selected-
<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: YES Access: YES Land Use: YES Utilities: YES Polluted: 0 High WT: NO Wetlands: NO			
<b>Other:</b> -None Selected-		<b>Other:</b> -None Selected-			
<b>Soils:</b> Poor – HSG D					
<b>Use in Retrofit DA:</b> Williston Rd					
SIZING INFO					
<b>Drainage Area (ac):</b> 1.6 ac					
<b>Impervious Area (ac):</b> ~ 0.7					
<b>Practice Area Available (ft<sup>2</sup>):</b> ~11,500					
<b>Existing Head Available?</b> Yes, but only about 2-3 ft.					

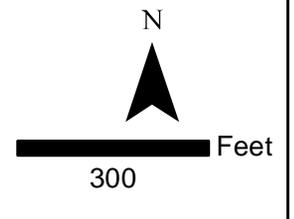
**Date Assessed:** May 15, 2013

**Assessed by:** RAC, SMM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend			
★ Retrofit	▲ Outfalls	□ AirportProperties	— 2ft_Contours
□ Retrofit DA	■ Catch basins	□ Watershed	— stream
■ PracticeArea	● Manholes	□ Wetlands_SoBu	— Storm
	● Existing BMP	□ Parcels	— Sanitary
		□ Existing BMP DA	— Combined
			— Waterline

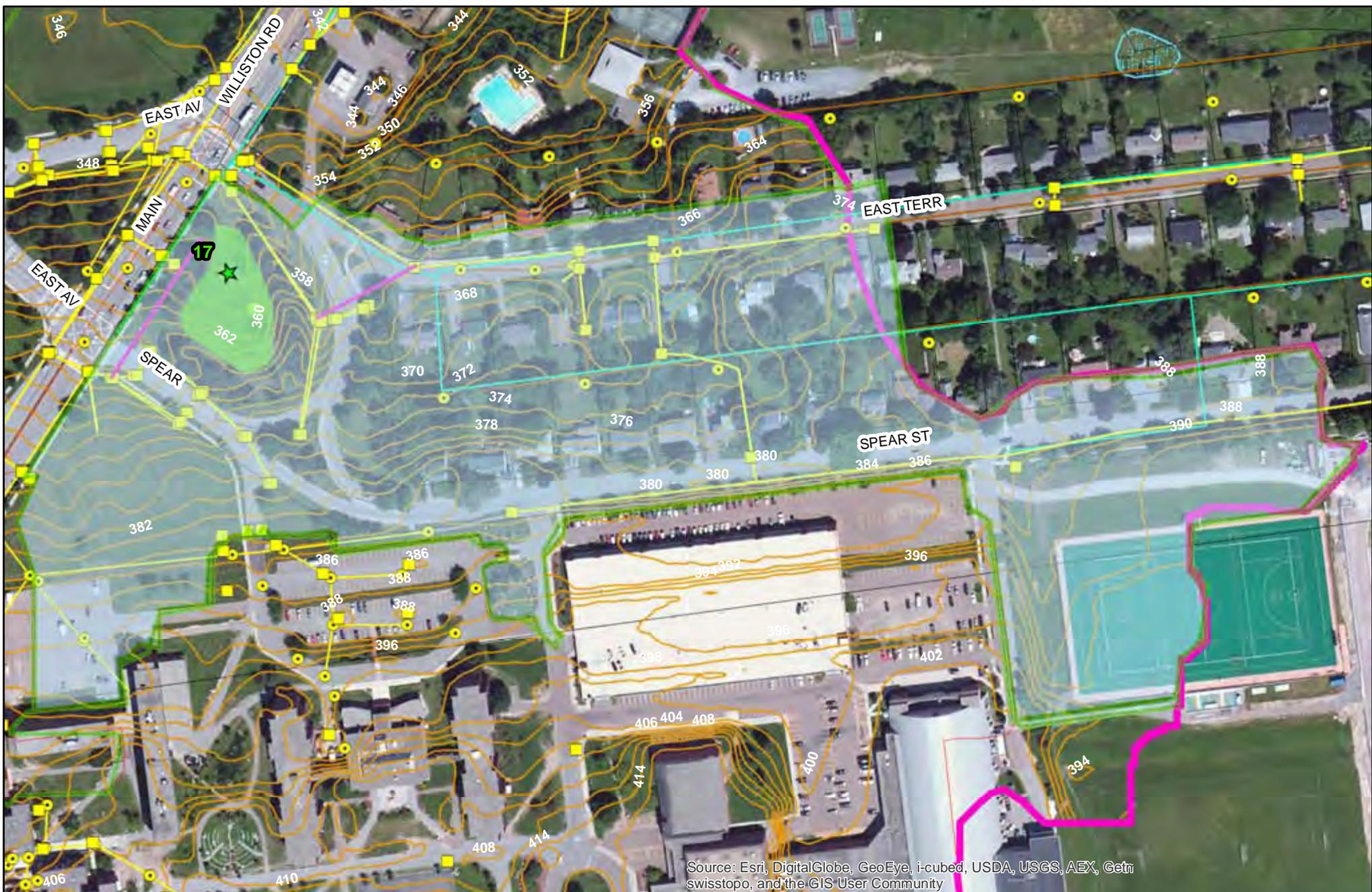


## Retrofit #16B: I-89 Cloverleaf (northeast)

ID#: Retrofit 17 (revised)					
<b>Name:</b> "Jug handle" at Spear & Main St. (east)					
<b>Concept Description:</b> Underground detention chambers (UDC) at existing green space to capture drainage from Spear Street and East Terrace. Modify existing drainage inlets to divert flows into basin. Drainage area is currently unmanaged and could be routed to Main St. Pond retrofit #M5A/24 or M5A2, alternatively. Retrofit includes the option of adding paved flumes from the roadways and risers to the outlet structures for the existing swales that run the perimeter of green space. Alternative option for an above ground detention basin may be considered for a reduced construction cost.					
<b>Notes/Feasibility:</b> Original concept was for a surface detention feature, which UVM was not interested in (K&L email dated 6/5/13) due to aesthetics.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> UVM	<b>Project Candidate:</b> Ok				
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Institutional	<b>Proposed Retrofit Practice 1:</b> UDC or Dry Pond				
<b>Land Use 2:</b> Landscaped green space	<b>Proposed Retrofit Practice 2:</b> Surface swale w/ riser				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Low				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: YES                      Water Quality: YES                      Recharge: YES                      Demo: NO                      Repair: NO                      Reuse: NO                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: YES                      Access: NO                      Land Use: YES                      Utilities: NO                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> None</td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: YES Access: NO Land Use: YES Utilities: NO Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> None	
<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: YES Access: NO Land Use: YES Utilities: NO Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> None					
<b>Soils:</b> Poor Infiltration					
<b>Use in Retrofit DA:</b> Street					
SIZING INFO					
<b>Drainage Area (ac):</b> 22.01					
<b>Impervious Area (ac):</b> 7.28					
<b>Practice Area Available (ft<sup>2</sup>):</b> 21,600					
<b>Existing Head Available?</b> Yes					

Date Assessed: May 16, 2013, 11:36 AM

Assessed by: KMH/AGM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getri swisstopo, and the GIS User Community

<b>Legend</b>		<ul style="list-style-type: none"> <li>▲ Outfalls</li> <li>■ Catch basins</li> <li>● Manholes</li> <li>● Existing BMP</li> </ul>	<ul style="list-style-type: none"> <li>□ AirportProperties</li> <li>□ Watershed</li> <li>□ Wetlands_SoBu</li> <li>□ Parcels</li> <li>□ Existing BMP DA</li> </ul>	<ul style="list-style-type: none"> <li>— 2ft_Contours</li> <li>— stream</li> <li>— Storm</li> <li>— Sanitary</li> <li>— Combined</li> <li>— Waterline</li> </ul>
★ Retrofit	□ Retrofit DA	■ PracticeArea		

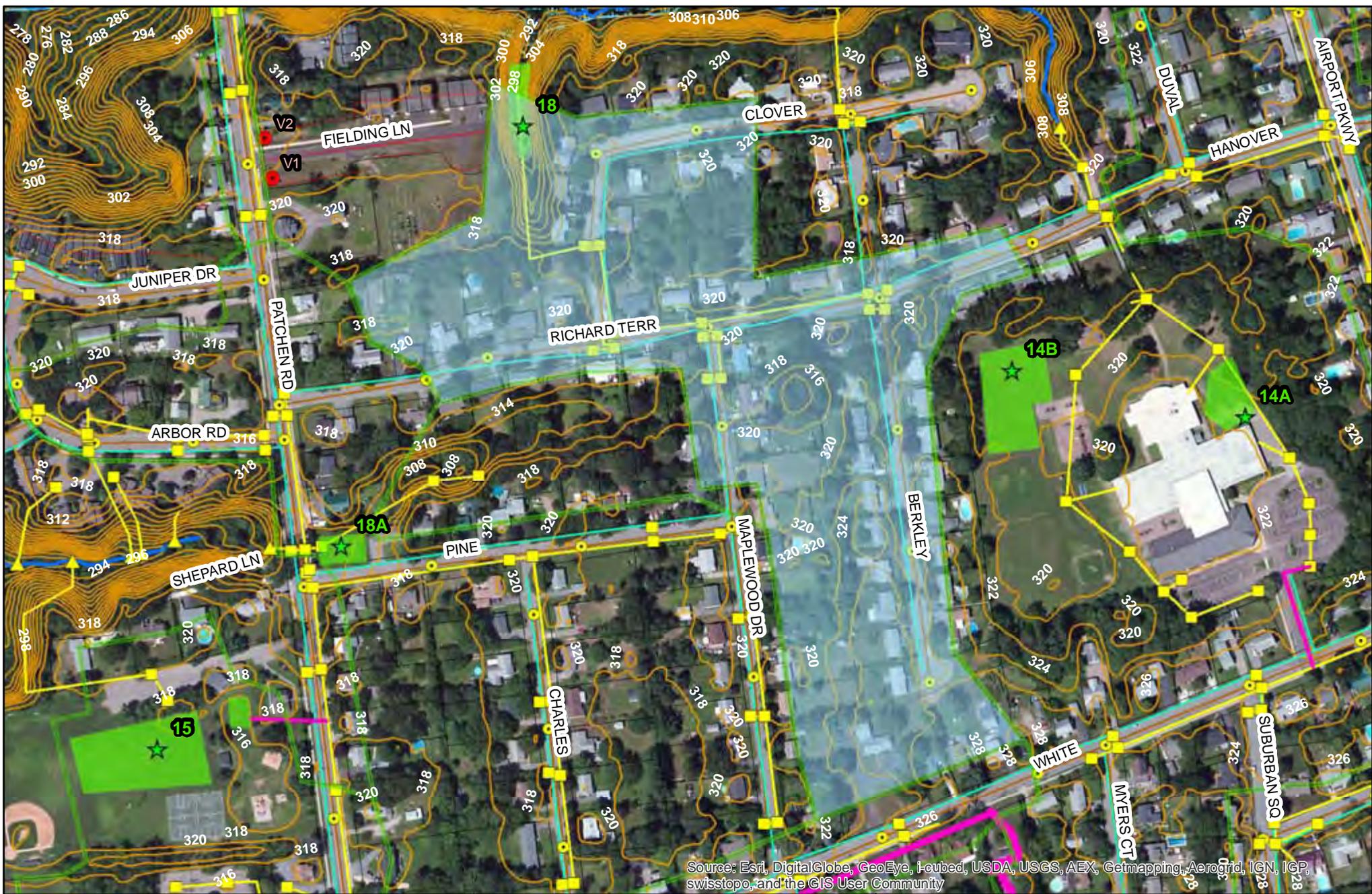
N

## Retrofit #17: "Jug handle" at Spear & Main St.

ID#: Retrofit 18					
<b>Name:</b> Fielding Lane Condos – Clover Street					
<b>Concept Description:</b> Detention-retention facility. Open parcel adjacent to Fielding Lane Condos – seems to be owned by Fielding Lane Condos, existing surface storage available below outfall pipe. Would require access from Fielding Lane					
<b>Notes/Feasibility:</b> Likely private land - Major constraint is construction and maintenance access. Homeowners on Clover Street most impacted. Downgradient wetlands/stream below outfall pipe.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> Tom DiPietro – S. Burl.	<b>Project Candidate:</b> Yes				
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Single Family Residential	<b>Proposed Retrofit Practice 1:</b> Detention Pond				
<b>Land Use 2:</b> Adjacent Fielding Lane condos	<b>Proposed Retrofit Practice 2:</b> -None Selected-				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> -No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Medium				
<b>Sources/pollutants 2:</b> Leaf dumping area	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;"><b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO</td> <td style="vertical-align: top;"><b>Conflicts:</b> Soils: NO Access: YES Land Use: YES Utilities: NO Polluted: NO High WT: YES Wetlands: YES</td> </tr> <tr> <td><b>Other:</b> -None Selected-</td> <td><b>Other:</b> -None Selected-</td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: NO Access: YES Land Use: YES Utilities: NO Polluted: NO High WT: YES Wetlands: YES	<b>Other:</b> -None Selected-	<b>Other:</b> -None Selected-
<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: NO Access: YES Land Use: YES Utilities: NO Polluted: NO High WT: YES Wetlands: YES			
<b>Other:</b> -None Selected-		<b>Other:</b> -None Selected-			
<b>Soils:</b> Good Infiltration					
<b>Use in Retrofit DA:</b> streets, single family res.					
SIZING INFO					
<b>Drainage Area (ac):</b> 17.11					
<b>Impervious Area (ac):</b> 5.24					
<b>Practice Area Available (ft<sup>2</sup>):</b> 6,950					
<b>Existing Head Available?</b> N/A					

Date Assessed: May 17, 2013, 8:39 AM

Assessed by: RAC, SMM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend	
★ Retrofit	▲ Outfalls
□ Retrofit DA	● Catch basins
■ PracticeArea	● Manholes
	● Existing BMP
□ AirportProperties	□ Watershed
□ Wetlands_SoBu	□ Parcels
□ Existing BMP DA	— 2ft_Contours
	— stream
	— Storm
	— Sanitary
	— Combined
	— Waterline

N

250 Feet

## Retrofit #18: Fielding Ln Condos

ID#: Retrofit 18A (revised)					
<b>Name:</b> Lot at corner of Patchen & Pine St.					
<b>Concept Description:</b> Underground recharge chambers. Diversion of flows from Patchen Road feasible, incoming pipe from open space/low point behind lots too deep to capture. Single lot also contains SF house (see photo). Would require diversion structure and pretreatment tank/structure.					
<b>Notes/Feasibility:</b> Pipe inverts in Patchen Rd. feasible to divert to underground storage, except west side of road would require crossing water and sewer. Depth of construction ~ 8 to 10 ft. Site owned by Yellow Dog Real Estate, LLC. Existing 20' wide drainage easement in the project area.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> Century 21 "Jack"	<b>Project Candidate:</b> Yes				
<b>Ownership:</b> Public/Private	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Multi-family Residential	<b>Proposed Retrofit Practice 1:</b> Pre-treatment Str				
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> Underground recharge				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Medium				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: YES                      Water Quality: NO                      Recharge: NO                      Demo: NO                      Repair: NO                      Reuse: NO                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: YES                      Access: YES                      Land Use: YES                      Utilities: YES                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> -None Selected-</td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: NO Recharge: NO Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: YES Access: YES Land Use: YES Utilities: YES Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> -None Selected-	
<b>Benefits:</b> Storage: YES Water Quality: NO Recharge: NO Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: YES Access: YES Land Use: YES Utilities: YES Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> -None Selected-					
<b>Soils:</b> Unknown – HSG A on maps					
<b>Use in Retrofit DA:</b> street, SF residential					
SIZING INFO					
<b>Drainage Area (ac):</b> 20.42					
<b>Impervious Area (ac):</b> 6.02					
<b>Practice Area Available (ft<sup>2</sup>):</b> 5,180					
<b>Existing Head Available?</b> n/a					

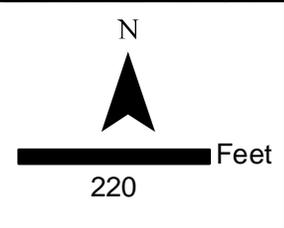
Date Assessed: May 17, 2013, 11:19 AM

Assessed by: RAC, SMM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend			
★ Retrofit	▲ Outfalls	□ AirportProperties	— 2ft_Contours
□ Retrofit DA	■ Catch basins	□ Watershed	— stream
■ PracticeArea	● Manholes	□ Wetlands_SoBu	— Storm
	● Existing BMP	□ Parcels	— Sanitary
		□ Existing BMP DA	— Combined
			— Waterline



**tce** TRUDELL  
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Sustainable Environmental Solutions  
45 Plum St - Concord MA - 01702  
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## Retrofit # 18A Lot at corner of Patchen & Pine St.

ID#: Retrofit 19					
<b>Name:</b> Bilodeau Court					
<b>Concept Description:</b> Divert flow from existing catchbasins to proposed underground infiltration behind Bilodeau Parkway residential properties. Residential drainage currently discharges directly to the stream corridor. Larger events would bypass to existing outfall.					
<b>Notes/Feasibility:</b> Low feasibility due to ownership & use issues; existing garden and backyard.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> Megan Moir, Burlington	<b>Project Candidate:</b> No				
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Single Family Residential	<b>Proposed Retrofit Practice 1:</b> Infiltration				
<b>Land Use 2:</b> Backyard/Garden	<b>Proposed Retrofit Practice 2:</b> Underground infiltration or detention system				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Medium				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: YES                      Water Quality: YES                      Recharge: YES                      Demo: YES                      Repair: NO                      Reuse:                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: NO                      Access: YES                      Land Use: NO                      Utilities: NO                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> None</td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: YES Repair: NO Reuse:	<b>Conflicts:</b> Soils: NO Access: YES Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> None	
<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: YES Repair: NO Reuse:		<b>Conflicts:</b> Soils: NO Access: YES Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> None					
<b>Soils:</b> Good Infiltration					
<b>Use in Retrofit DA:</b> Street					
SIZING INFO					
<b>Drainage Area (ac):</b> 0.81					
<b>Impervious Area (ac):</b> 0.52					
<b>Practice Area Available (ft<sup>2</sup>):</b> 9,340					
<b>Existing Head Available?</b> --					

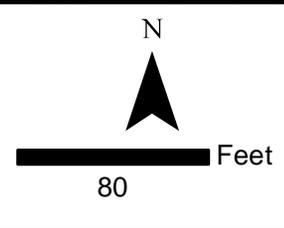
Date Assessed: May 17, 2013, 10:42 AM

Assessed by: KMH/AGM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend			
	Retrofit		AirportProperties
	Retrofit DA		Watershed
	PracticeArea		Wetlands_SoBu
	Outfalls		Parcels
	Catch basins		Existing BMP DA
	Manholes		2ft_Contours
	Existing BMP		stream
			Storm
			Sanitary
			Combined
			Waterline



## Retrofit #19: Bilodeau Court

ID#: Retrofit 20																			
<b>Name:</b> Grove St. City Parking Lot																			
<b>Concept Description:</b> Divert existing drainage network and capture runoff from parking lot and direct to proposed underground recharge system. Low point in road drainage area is immediately south of the City parking lot. Consider replacing parking lot with permeable pavement.																			
<b>Notes/Feasibility:</b> High feasibility since parking lot is currently in poor condition. Adequate head to capture roadway drainage. Test pits or borings needed to confirm soils and depth to groundwater.																			
GENERAL SITE INFORMATION	RETROFIT DETAILS																		
<b>Site Contact Info:</b> Megan Moir, Burlington	<b>Project Candidate:</b> Yep, Love It																		
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP																		
<b>Land Use 1:</b> Road	<b>Proposed Retrofit Practice 1:</b> Infiltration																		
<b>Land Use 2:</b> Parking lot	<b>Proposed Retrofit Practice 2:</b> Permeable pavements																		
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-																		
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-																		
<b>Sources/pollutants 1:</b> No	<b>Maintenance Burden:</b> -None Selected-																		
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><b>Benefits:</b></td> <td style="width: 50%;"><b>Conflicts:</b></td> </tr> <tr> <td>Storage: YES</td> <td>Soils: NO</td> </tr> <tr> <td>Water Quality: YES</td> <td>Access: NO</td> </tr> <tr> <td>Recharge: YES</td> <td>Land Use: NO</td> </tr> <tr> <td>Demo: NO</td> <td>Utilities: NO</td> </tr> <tr> <td>Repair: NO</td> <td>Polluted: NO</td> </tr> <tr> <td>Reuse: NO</td> <td>High WT: NO</td> </tr> <tr> <td></td> <td>Wetlands: NO</td> </tr> <tr> <td><b>Other:</b> None</td> <td><b>Other:</b> None</td> </tr> </table>	<b>Benefits:</b>	<b>Conflicts:</b>	Storage: YES	Soils: NO	Water Quality: YES	Access: NO	Recharge: YES	Land Use: NO	Demo: NO	Utilities: NO	Repair: NO	Polluted: NO	Reuse: NO	High WT: NO		Wetlands: NO	<b>Other:</b> None	<b>Other:</b> None
<b>Benefits:</b>		<b>Conflicts:</b>																	
Storage: YES		Soils: NO																	
Water Quality: YES		Access: NO																	
Recharge: YES	Land Use: NO																		
Demo: NO	Utilities: NO																		
Repair: NO	Polluted: NO																		
Reuse: NO	High WT: NO																		
	Wetlands: NO																		
<b>Other:</b> None	<b>Other:</b> None																		
<b>Soils:</b> Good Infiltration																			
<b>Use in Retrofit DA:</b> Street and public park																			
SIZING INFO																			
<b>Drainage Area (ac):</b> 8.39																			
<b>Impervious Area (ac):</b> 2.29																			
<b>Practice Area Available (ft<sup>2</sup>):</b> 8,850																			
<b>Existing Head Available?</b> --																			

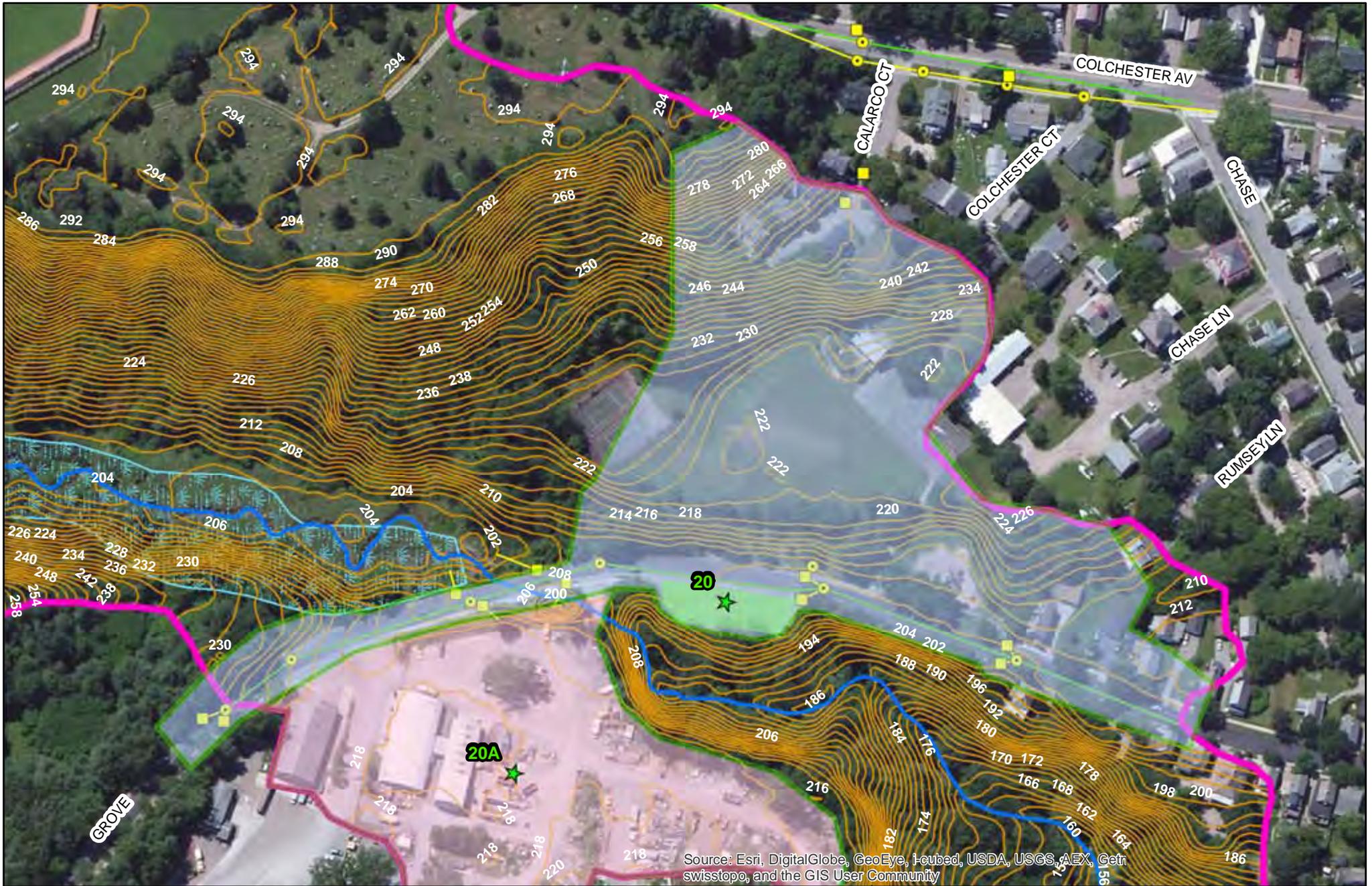
Date Assessed: May 16, 2013, 3:13 PM

Assessed by: KMH/AGM

ID#: Retrofit 20A							
<p><b>Name:</b> SD Ireland Property</p> <p><b>Concept Description:</b> SD Ireland proposed redevelopment to a housing complex. Site will reportedly be required to manage runoff on-site. Site currently drains to city drainage system in Grove St. Plans should address severe bank erosion at Centennial Brook culvert under SD Ireland driveway.</p> <p><b>Notes/Feasibility:</b> Centennial Brook runs between property and Grove St.</p>							
GENERAL SITE INFORMATION	RETROFIT DETAILS						
<b>Site Contact Info:</b> Megan Moir, Burlington	<b>Project Candidate:</b> Undecided						
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> New BMP						
<b>Land Use 1:</b> Commercial/Industrial	<b>Proposed Retrofit Practice 1:</b> -None Selected-						
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> -None Selected-						
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-						
<b>Is site a hotspot?</b> Yes	<b>Non-Structural Other:</b> -None Selected-						
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Low						
<b>Sources/pollutants 2:</b> Concrete plant	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;"> <b>Benefits:</b>                      Storage: NO                      Water Quality: NO                      Recharge: NO                      Demo: NO                      Repair: NO                      Reuse: NO                 </td> <td style="vertical-align: top;"> <b>Conflicts:</b>                      Soils: NO                      Access: NO                      Land Use: NO                      Utilities: NO                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> None</td> </tr> <tr> <td colspan="2"><b>Other:</b></td> </tr> </table>	<b>Benefits:</b> Storage: NO Water Quality: NO Recharge: NO Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> None		<b>Other:</b>	
<b>Benefits:</b> Storage: NO Water Quality: NO Recharge: NO Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO					
<b>Other:</b> None							
<b>Other:</b>							
<b>Soils:</b> Unknown							
<b>Use in Retrofit DA:</b> -None Selected-							
SIZING INFO							
<b>Drainage Area (ac):</b> 4.67							
<b>Impervious Area (ac):</b> 3.82							
<b>Practice Area Available (ft<sup>2</sup>):</b> --							
<b>Existing Head Available?</b> --							

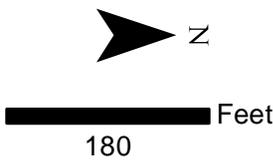
Date Assessed: May 16, 2013, 4:00 PM

Assessed by: KMH/AGM



### Legend

- |                |                |                     |                |
|----------------|----------------|---------------------|----------------|
| ★ Retrofit     | ▲ Outfalls     | □ AirportProperties | — 2ft_Contours |
| □ Retrofit DA  | ● Catch basins | □ Watershed         | — stream       |
| ■ PracticeArea | ● Manholes     | □ Wetlands_SoBu     | — Storm        |
|                | ● Existing BMP | □ Parcels           | — Sanitary     |
|                |                | □ Existing BMP DA   | — Combined     |
|                |                |                     | — Waterline    |



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## Retrofit #20/20A: Grove St. Parking Lot/ Ireland Property

ID#: Retrofit 21	
<b>Name:</b> Dumont Ave. lot	
<b>Concept Description:</b> Divert flows from existing catch basin on southeast corner of White St. and Delaware across White St. and convey down Dumont Ave. via pipe or swale to underground recharge chambers on empty lot. Options exist for practice type, siting and conveyance mechanism depending on depth to groundwater, existing inverts, and future use by Airport (e.g., there are other open parcels, could daylight into dry swale, consider surface filtering options). Discharge to existing pipe outlet at Airport basin.	

**Notes/Feasibility:**  
 Invert at White St. 321.40. Distance to vacant lot on corner – approx. 580’ @ .005 slope; pipe outlets at 318.5’. Storage would need to be below grade. Depth to GW could be an issue and eliminate infiltration option (i.e., system would be detention only). For an above grade system inverts at White/Delaware would need to be raised. This may be possible by resetting pipe inverts starting at the intersection of Delaware and Maryland. Possible to create sand filter on top of underground chambers or a large shallow infiltration basin, but can’t have standing water due to airport proximity. We have copy of White St. repair plans with sewer line and water lines (both are deep).

GENERAL SITE INFORMATION	RETROFIT DETAILS	
<b>Site Contact Info:</b> Airport	<b>Project Candidate:</b> Yep, Love It	
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP	
<b>Land Use 1:</b> Single Family Residential	<b>Proposed Retrofit Practice 1:</b> Infiltration	
<b>Land Use 2:</b> None Selected	<b>Proposed Retrofit Practice 2:</b> Dry swale	
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-	
<b>Is site a hotspot?</b> -No	<b>Non-Structural Other:</b> -None Selected-	
<b>Sources/pollutants 1:</b> -None Selected-	<b>Maintenance Burden:</b> -None Selected-	
<b>Sources/pollutants 2:</b> -None Selected-	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: NO Repair: NO Reuse:	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: YES Wetlands: NO
<b>Soils:</b> Good Infiltration		
<b>Use in Retrofit DA:</b> streets, driveways		
SIZING INFO		
<b>Drainage Area (ac):</b> 13.88	<b>Other:</b> -None Selected-	<b>Other:</b> Need a test pit to find clay layer and water table. Sewer line elevation on White St.
<b>Impervious Area (ac):</b> 4.90		
<b>Practice Area Available (ft<sup>2</sup>):</b> 15,000		
<b>Existing Head Available?</b> n/a		

ID#: Retrofit 21A					
<b>Name:</b> Dumont/Existing Airport basin					
<b>Concept Description:</b> Abandoned detention basin on airport property could be a location for discharge from the proposed underground chambers (retrofit #21), be an area for expanded storage capacity if needed, or designed to provide for extra water quality "polishing."					
<b>Notes/Feasibility:</b> Not likely that this can be used for surface storage due to FAA standing water restrictions.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> Airport	<b>Project Candidate:</b> Undecided				
<b>Ownership:</b> Public / Airport Authority	<b>Retrofit of new or existing BMP:</b> -None Selected-				
<b>Land Use 1:</b> Industrial	<b>Proposed Retrofit Practice 1:</b> -None Selected-				
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> 0				
<b>Existing BMP on site?</b> -Yes, abandoned	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> -None Selected-	<b>Maintenance Burden:</b> -None Selected-				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: MAYBE                      Water Quality: YES                      Recharge: NO                      Demo: NO                      Repair: NO                      Reuse: NO                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: NO                      Access: YES                      Land Use: YES                      Utilities: NO                      Polluted: NO                      High WT: NO                      Wetlands: MAYBE                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> -None Selected-</td> </tr> </table>	<b>Benefits:</b> Storage: MAYBE Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: NO Access: YES Land Use: YES Utilities: NO Polluted: NO High WT: NO Wetlands: MAYBE	<b>Other:</b> -None Selected-	
<b>Benefits:</b> Storage: MAYBE Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: NO Access: YES Land Use: YES Utilities: NO Polluted: NO High WT: NO Wetlands: MAYBE			
<b>Other:</b> -None Selected-					
<b>Soils:</b> -None Selected-					
<b>Use in Retrofit DA:</b> -None Selected-					
SIZING INFO					
<b>Drainage Area (ac):</b> 1.16					
<b>Impervious Area (ac):</b> 0.10					
<b>Practice Area Available (ft<sup>2</sup>):</b> 7,600					
<b>Existing Head Available?</b> N/A					

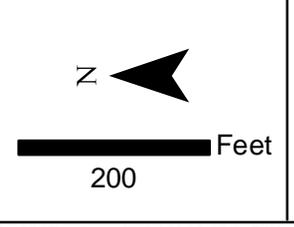
Date Assessed: May 16, 2013, 11 AM

Assessed by: ACK, BK



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getr swisstopo, and the GIS User Community

Legend	
★ Retrofit	▲ Outfalls
■ Retrofit DA	■ Catch basins
■ PracticeArea	● Manholes
	● Existing BMP
□ AirportProperties	□ Watershed
□ Wetlands_SoBu	□ Parcels
□ Existing BMP DA	
— 2ft_Contours	— stream
— Storm	— Sanitary
— Combined	— Waterline



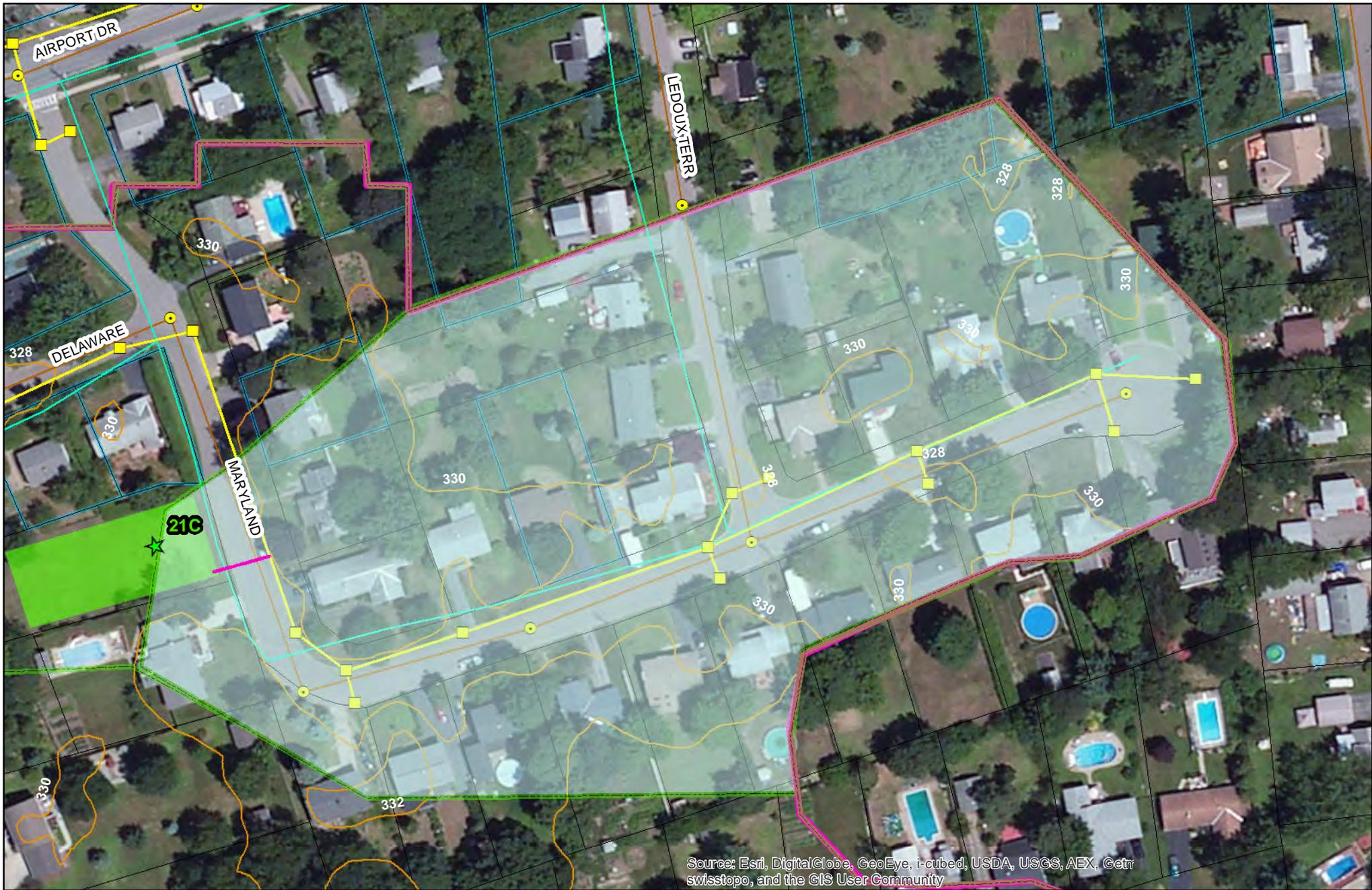
45 Plum St - Concord, MA - 01702  
Tel: 603-823-6862 - Fax: 603-823-6160 - www.horsleywitten.com

## Retrofit #21: Dumont Ave.

ID#: Retrofit 21C					
<b>Name:</b> Maryland St. lot					
<b>Concept Description:</b> Underground recharge chambers under grassed lot. Expensive and high hanging fruit, since lot is currently privately owned and existing neighborhood drainage inlets are deep.					
<b>Notes/Feasibility:</b> Would have to re-plumb drainage network to get it here.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> Unknown	<b>Project Candidate:</b> Undecided				
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Single Family Residential	<b>Proposed Retrofit Practice 1:</b> Infiltration				
<b>Land Use 2:</b> None Selected-	<b>Proposed Retrofit Practice 2:</b> None Selected-				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> None Selected-				
<b>Sources/pollutants 1:</b> -None Selected-	<b>Maintenance Burden:</b> -None Selected-				
<b>Sources/pollutants 2:</b> None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: YES                      Water Quality: NO                      Recharge: YES                      Demo: NO                      Repair: NO                      Reuse:                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: NO                      Access: NO                      Land Use: YES                      Utilities: NO                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> None Selected-</td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: NO Recharge: YES Demo: NO Repair: NO Reuse:	<b>Conflicts:</b> Soils: NO Access: NO Land Use: YES Utilities: NO Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> None Selected-	
<b>Benefits:</b> Storage: YES Water Quality: NO Recharge: YES Demo: NO Repair: NO Reuse:		<b>Conflicts:</b> Soils: NO Access: NO Land Use: YES Utilities: NO Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> None Selected-					
<b>Soils:</b> Good Infiltration					
<b>Use in Retrofit DA:</b> Street					
SIZING INFO					
<b>Drainage Area (ac):</b> 6.51					
<b>Impervious Area (ac):</b> 2.46					
<b>Practice Area Available (ft<sup>2</sup>):</b> 9,800					
<b>Existing Head Available?</b> N/A					

Date Assessed: May 20, 2013, 12:19 AM

Assessed by: ACK, BK



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getty swisstopo, and the GIS User Community

<b>Legend</b>	Outfalls	AirportProperties	2ft_Contours
	Catch basins	Watershed	stream
	Manholes	Wetlands_SoBu	Storm
	Existing BMP	Parcels	Sanitary
Retrofit DA	Existing BMP DA	Waterline	
PracticeArea			

N

100 Feet

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## Retrofit #21C: Maryland St. lot

ID#: Retrofit 22					
<b>Name:</b> Best Western/Windjammer Inn (north)					
<p><b>Concept Description:</b>                      Outfall is located north of Best Western. Site drainage area currently includes only the Best Western property. Outfall is severely eroded and is headcutting to the east and may soon reach the paved access road. Concept includes stabilizing the outfall and constructing a detention basin within the existing gully. Expand the current drainage area to intercept runoff from the Williston Road drainage network and redirect drainage from abutting commercial properties.</p> <p>The proposed drainage network is depicted by the magenta lines in the concept drainage area map.</p>					
<p><b>Notes/Feasibility:</b>                      Priority project. The proposed site could manage a large drainage area that is currently unmanaged and unstable. Since the outfall is in need of immediate repair, feasibility is high. Planning considerations include the redirection of flow from abutting commercial properties.</p>					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> Tom Dipietro, S. Burlington	<b>Project Candidate:</b> Yep, Love It				
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Commercial/Industrial	<b>Proposed Retrofit Practice 1:</b> Pond				
<b>Land Use 2:</b> Woods	<b>Proposed Retrofit Practice 2:</b> Possible infiltration				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> No	<b>Maintenance Burden:</b> Low				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p><b>Benefits:</b>                              Storage: YES                              Water Quality: NO                              Recharge: YES                              Demo: NO                              Repair: YES                              Reuse: NO</p> </td> <td style="width: 50%; vertical-align: top;"> <p><b>Conflicts:</b>                              Soils: NO                              Access: NO                              Land Use: NO                              Utilities: NO                              Polluted: NO                              High WT: NO                              Wetlands: YES</p> </td> </tr> <tr> <td colspan="2"><b>Other:</b> None</td> </tr> </table>	<p><b>Benefits:</b>                              Storage: YES                              Water Quality: NO                              Recharge: YES                              Demo: NO                              Repair: YES                              Reuse: NO</p>	<p><b>Conflicts:</b>                              Soils: NO                              Access: NO                              Land Use: NO                              Utilities: NO                              Polluted: NO                              High WT: NO                              Wetlands: YES</p>	<b>Other:</b> None	
<p><b>Benefits:</b>                              Storage: YES                              Water Quality: NO                              Recharge: YES                              Demo: NO                              Repair: YES                              Reuse: NO</p>		<p><b>Conflicts:</b>                              Soils: NO                              Access: NO                              Land Use: NO                              Utilities: NO                              Polluted: NO                              High WT: NO                              Wetlands: YES</p>			
<b>Other:</b> None					
<b>Soils:</b> Good Infiltration					
<b>Use in Retrofit DA:</b> Parking Lot					
SIZING INFO	<p><b>Other:</b> Possible wetland conflicts</p>				
<b>Drainage Area (ac):</b> 29.39					
<b>Impervious Area (ac):</b> 21.70					
<b>Practice Area Available (ft<sup>2</sup>):</b> 10,900					
<b>Existing Head Available?</b> --					

Date Assessed: May 15, 2013, 1:07 PM

Assessed by: KMH/AGM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend	
★ Retrofit	▲ Outfalls
□ Retrofit DA	■ Catch basins
■ PracticeArea	● Manholes
	● Existing BMP
	□ AirportProperties
	□ Watershed
	□ Wetlands_SoBu
	□ Parcels
	□ Existing BMP DA
	— 2ft_Contours
	— stream
	— Storm
	— Sanitary
	— Combined
	— Waterline

▲

250 Feet

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**Retrofit #22: Best Western Windjammer Inn (north)**

ID#: Retrofit 22A	
<p><b>Name:</b> Best Western/Windjammer Inn (west/south)</p>	
<p><b>Concept Description:</b> Outfall is located west of Best Western. Site drainage area currently includes only the Best Western property. Moderate erosion has occurred. Concept includes stabilizing outfalls and constructing a detention basin within the existing gully. Expand the current drainage area to intercept runoff from the Williston Road drainage network. A portion of this drainage area could be directed to Retrofit 22, if necessary.</p>	
<p><b>Notes/Feasibility:</b> Good. May make economic sense to divert some or all of this area to Retrofit site #22.</p>	
GENERAL SITE INFORMATION	RETROFIT DETAILS
<b>Site Contact Info:</b> Tom Dipietro, S. Burlington	<b>Project Candidate:</b> Yep, Love It
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> New BMP
<b>Land Use 1:</b> Commercial/Industrial	<b>Proposed Retrofit Practice 1:</b> Pond
<b>Land Use 2:</b> Woods	<b>Proposed Retrofit Practice 2:</b> Possible infiltration
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-
<b>Sources/pollutants 1:</b> No	<b>Maintenance Burden:</b> Low
<b>Sources/pollutants 2:</b> -None Selected-	<p><b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO</p> <p><b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: YES</p> <p><b>Other:</b> Possible wetland conflicts</p>
<b>Soils:</b> Good Infiltration	
<b>Use in Retrofit DA:</b> Parking Lot	
SIZING INFO	
<b>Drainage Area (ac):</b> 6.45	<b>Other:</b> None
<b>Impervious Area (ac):</b> 2.88	
<b>Practice Area Available (ft<sup>2</sup>):</b> 13,800	
<b>Existing Head Available?</b> --	

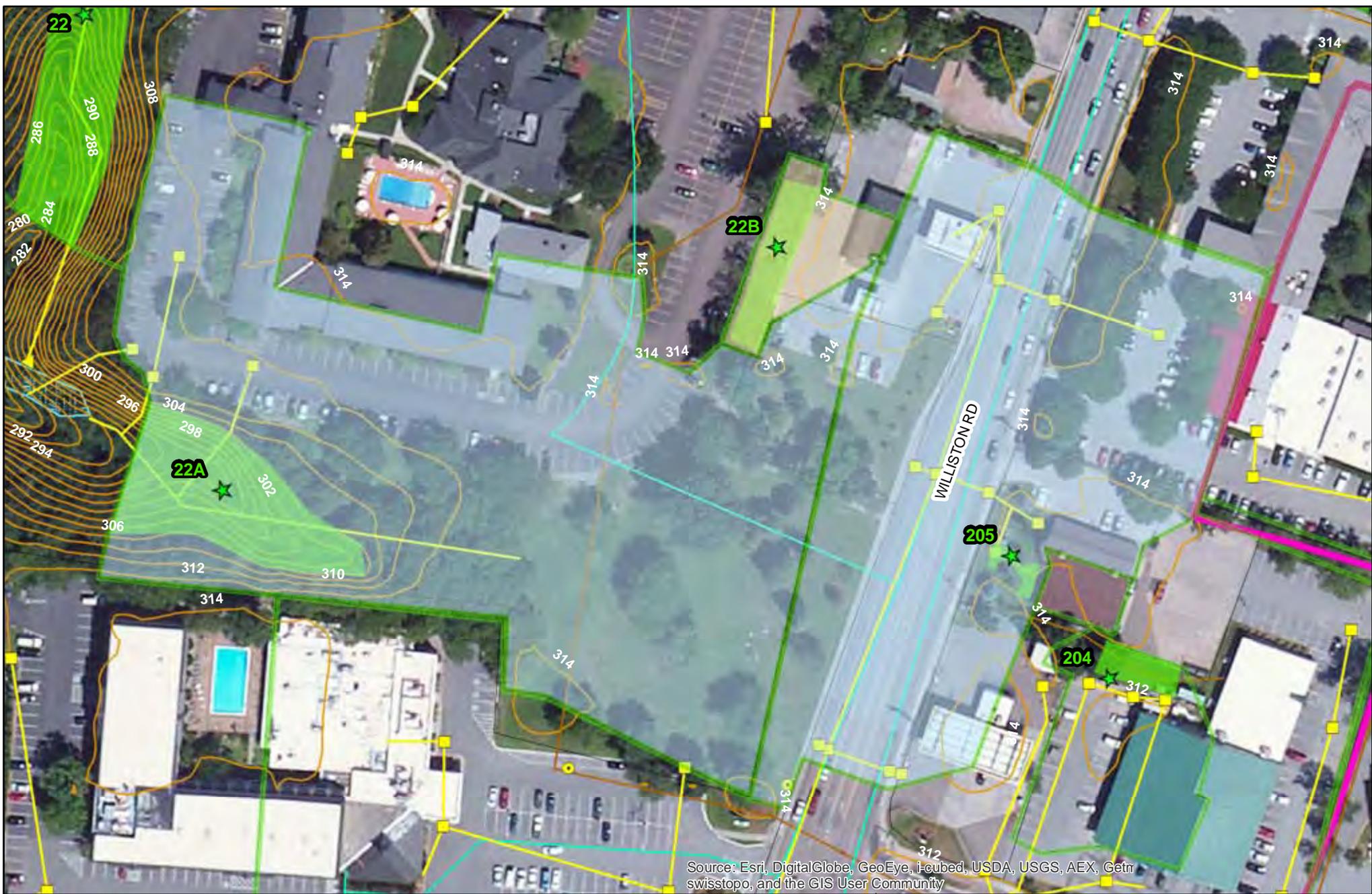
Date Assessed: May 15, 2013, 3:12 PM

Assessed by: KMH/AGM

ID#: Retrofit 22B					
<p><b>Name:</b> Best Western/Windjammer Inn (south)/Gulf Station</p>					
<p><b>Concept Description:</b> Proposed bioretention in existing grass depression to manage sheet flow from the Gulf Station parking lot and roof. Overflow (if required) could connect to existing Best Western drainage system, or be directed to Retrofit 22.</p>					
<p><b>Notes/Feasibility:</b> Site is an existing depression that appears to already infiltrate. Retrofit would only enhance treatment. Small drainage area.</p>					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> Tom Dipietro, S. Burlington	<b>Project Candidate:</b> Undecided				
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Commercial/Industrial	<b>Proposed Retrofit Practice 1:</b> Bioretention				
<b>Land Use 2:</b> Grass island	<b>Proposed Retrofit Practice 2:</b> -None Selected-				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Medium				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;"> <p><b>Benefits:</b> Storage: NO Water Quality: YES Recharge: YES Demo: YES Repair: NO Reuse: NO</p> </td> <td style="vertical-align: top;"> <p><b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO</p> </td> </tr> <tr> <td colspan="2"><b>Other:</b> None</td> </tr> </table>	<p><b>Benefits:</b> Storage: NO Water Quality: YES Recharge: YES Demo: YES Repair: NO Reuse: NO</p>	<p><b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO</p>	<b>Other:</b> None	
<p><b>Benefits:</b> Storage: NO Water Quality: YES Recharge: YES Demo: YES Repair: NO Reuse: NO</p>		<p><b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO</p>			
<b>Other:</b> None					
<b>Soils:</b> Good Infiltration					
<b>Use in Retrofit DA:</b> Parking Lot					
SIZING INFO					
<b>Drainage Area (ac):</b> 0.22					
<b>Impervious Area (ac):</b> 0.13					
<b>Practice Area Available (ft<sup>2</sup>):</b> 3,670					
<b>Existing Head Available?</b> --					

**Date Assessed:** May 15, 2013, 6:45 PM

**Assessed by:** KMH/AGM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getr swisstopo, and the GIS User Community

<b>Legend</b>		<ul style="list-style-type: none"> <li>▲ Outfalls</li> <li>▲ Catch basins</li> <li>● Manholes</li> <li>● Existing BMP</li> </ul>	<ul style="list-style-type: none"> <li>□ AirportProperties</li> <li>□ Watershed</li> <li>□ Wetlands_SoBu</li> <li>□ Parcels</li> <li>□ Existing BMP DA</li> </ul>	<ul style="list-style-type: none"> <li>— 2ft_Contours</li> <li>— stream</li> <li>— Storm</li> <li>— Sanitary</li> <li>— Combined</li> <li>— Waterline</li> </ul>
<ul style="list-style-type: none"> <li>★ Retrofit</li> <li>□ Retrofit DA</li> <li>□ PracticeArea</li> </ul>				

N

100 Feet

## Retrofit #22A/B: Best Western Windjammer Inn (west/south)

ID#: Retrofit 23A		
<b>Name:</b> Staples Plaza		
<b>Concept Description:</b> Convert existing landscape island in front of PetCo into a bioswale with underground storage to manage runoff from parking lot and small roof area. Overflow into existing drain inlets. Add some trees for canopy cover, shading, and interception. Reduce existing one-way aisle width to allow for widening of proposed bioswale. This collects drainage from the parking area, as well as from the small awning roof. It appears that this area drains across Williston Rd. and is piped under the East Campus pond for a direct discharge to the stream.		
<b>Notes/Feasibility:</b> This area could be managed in a larger retrofit downstream (Site # 24_M5). Primary outlet in catch basin at lot entrance/exit. Rim to invert = 5.05'. Stalls are 18'x8', with a 27' drive aisle (60' and 57' curb to curb on the north and south side of island, respectively).		
GENERAL SITE INFORMATION	RETROFIT DETAILS	
<b>Site Contact Info:</b> Unknown	<b>Project Candidate:</b> Ok	
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> New BMP	
<b>Land Use 1:</b> Commercial/Industrial	<b>Proposed Retrofit Practice 1:</b> Bioretention	
<b>Land Use 2:</b> None Selected-	<b>Proposed Retrofit Practice 2:</b> Underground storage chambers	
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> Impervious Cover Removal	
<b>Is site a hotspot?</b> Possibly	<b>Non-Structural Other:</b> None Selected-	
<b>Sources/pollutants 1:</b> -None Selected-	<b>Maintenance Burden:</b> Medium	
<b>Sources/pollutants 2:</b> None Selected-	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse:	
<b>Soils:</b> Poor Infiltration		<b>Conflicts:</b> Soils: YES Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO
<b>Use in Retrofit DA:</b> Parking Lot		
SIZING INFO	<b>Other:</b> Aesthetics, tree canopy increase  <b>Other:</b> None Selected-	
<b>Drainage Area (ac):</b> 1.29		
<b>Impervious Area (ac):</b> 1.15		
<b>Practice Area Available (ft<sup>2</sup>):</b> 6,530		
<b>Existing Head Available?</b> n/a		

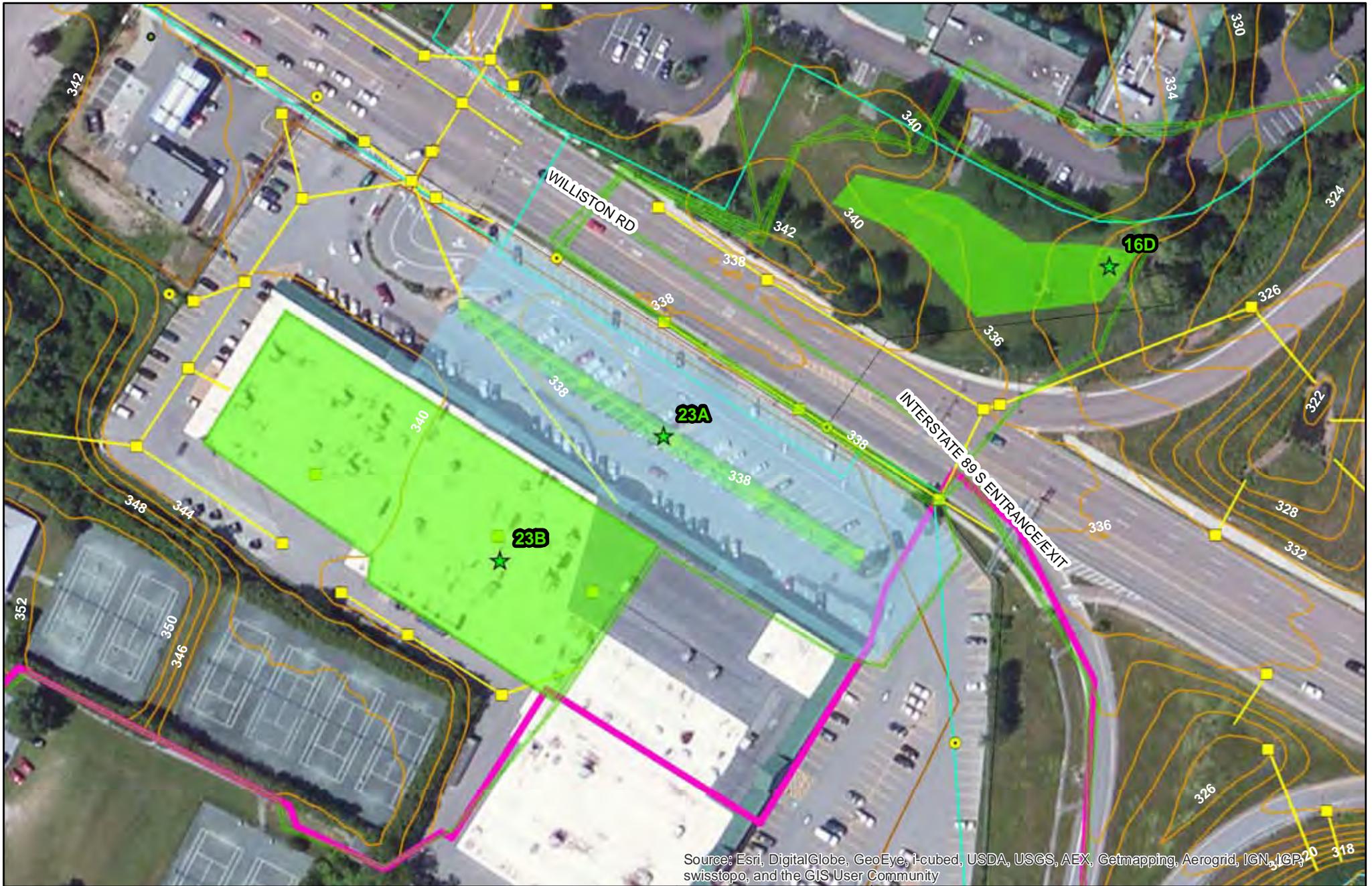
Date Assessed: May 15, 2013, 11:40 AM

Assessed by: ACK, BK, KH, AM

ID#: Retrofit 23B									
<b>Name:</b> Staples Plaza (roof)									
<b>Concept Description:</b> Flat portion of roof drains internally and is discharged into drain inlet on the east side of the building. Modify internal roof drains, install trays, or use other blue roof design to provide temporary detention.									
<b>Notes/Feasibility:</b> May be able to manage all of this drainage downstream at Site #24 behind Sheraton /M5A Main St. Pond.									
GENERAL SITE INFORMATION	RETROFIT DETAILS								
<b>Site Contact Info:</b> Unknown	<b>Project Candidate:</b> Ok								
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> New BMP								
<b>Land Use 1:</b> Commercial/Industrial	<b>Proposed Retrofit Practice 1:</b> -None Selected-								
<b>Land Use 2:</b> Roof	<b>Proposed Retrofit Practice 2:</b> Blue roof								
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-								
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-								
<b>Sources/pollutants 1:</b> -None Selected-	<b>Maintenance Burden:</b> Low								
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 50%;"> <b>Benefits:</b>                      Storage: YES                      Water Quality: NO                      Recharge: NO                      Demo: NO                      Repair: NO                      Reuse: MAYBE                 </td> <td style="vertical-align: top; width: 50%;"> <b>Conflicts:</b>                      Soils: NO                      Access: NO                      Land Use: NO                      Utilities: YES                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> Not Selected</td> </tr> <tr> <td colspan="2"><b>Other:</b> Structural? Need to investigate drains and structural capacity.</td> </tr> <tr> <td colspan="2"></td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: NO Recharge: NO Demo: NO Repair: NO Reuse: MAYBE	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> Not Selected		<b>Other:</b> Structural? Need to investigate drains and structural capacity.			
<b>Benefits:</b> Storage: YES Water Quality: NO Recharge: NO Demo: NO Repair: NO Reuse: MAYBE		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO							
<b>Other:</b> Not Selected									
<b>Other:</b> Structural? Need to investigate drains and structural capacity.									
<b>Soils:</b> -None Selected-									
<b>Use in Retrofit DA:</b> Individual Rooftop									
SIZING INFO									
<b>Drainage Area (ac):</b> 1.06									
<b>Impervious Area (ac):</b> 1.06									
<b>Practice Area Available (ft<sup>2</sup>):</b> 46,300									
<b>Existing Head Available?</b> n/a									

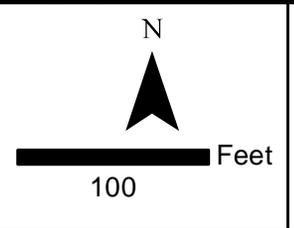
**Date Assessed:** May 15, 2013, 10:51 AM

**Assessed by:** ACK, NP, BK



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend			
★ Retrofit	▲ Outfalls	□ AirportProperties	— 2ft_Contours
□ Retrofit DA	● Catch basins	□ Watershed	— stream
■ PracticeArea	● Manholes	□ Wetlands_SoBu	— Storm
	● Existing BMP	□ Parcels	— Sanitary
		□ Existing BMP DA	— Combined
			— Waterline



## Retrofit #23 A/B: Staples Plaza

ID#: Retrofit 24 (revised)							
<b>Name:</b> Sheraton Hotel (back)							
<b>Concept Description:</b> Install embankment and construct detention basin or constructed wetland to manage portion of Sheraton parking lot and other surrounding areas (e.g., Williston Rd., Staples plaza) as part of a regional stormwater complex in conjunction with Main St. Pond retrofit (M5A). The parking lot at Sheraton currently drains to three rip rap channels, and evidence of channelized flow and sedimentation from parking lot and eroding slope were observed into the open area and wetlands below. The Main St. Pond (M5A) would serve as a forebay to this facility, and rerouting of existing drain pipes from #23 and #17 could be feasible.							
<b>Notes/Feasibility:</b> Need to check in with DEC on potential impact to wetlands. If the Main St Pond was expanded (M5A2) then there would be minimal need for a facility at this location.							
GENERAL SITE INFORMATION	RETROFIT DETAILS						
<b>Site Contact Info:</b> UVM	<b>Project Candidate:</b> Yep, love it						
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP						
<b>Land Use 1:</b> Commercial/Industrial	<b>Proposed Retrofit Practice 1:</b> Pond						
<b>Land Use 2:</b> Open field	<b>Proposed Retrofit Practice 2:</b> Constructed Wetland						
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-						
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-						
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Low						
<b>Sources/pollutants 2:</b> None Selected	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: YES                      Water Quality: YES                      Recharge: NO                      Demo: NO                      Repair: NO                      Reuse: NO                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: NO                      Access: NO                      Land Use: NO                      Utilities: NO                      Polluted: NO                      High WT: NO                      Wetlands: YES                 </td> </tr> <tr> <td colspan="2" style="vertical-align: top;"> <b>Other:</b> Erosion down slide slopes, evidence of sediment in wetland area. New rip rap channels have been installed.                 </td> </tr> <tr> <td colspan="2" style="vertical-align: top;"> <b>Other:</b> -None Selected-                 </td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: YES	<b>Other:</b> Erosion down slide slopes, evidence of sediment in wetland area. New rip rap channels have been installed.		<b>Other:</b> -None Selected-	
<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: YES					
<b>Other:</b> Erosion down slide slopes, evidence of sediment in wetland area. New rip rap channels have been installed.							
<b>Other:</b> -None Selected-							
<b>Soils:</b> Unknown (A-D according to soils mapping)							
<b>Use in Retrofit DA:</b> parking lot							
SIZING INFO							
<b>Drainage Area (ac):</b> 74.04 (w. M5A) / 6.11							
<b>Impervious Area (ac):</b> 31.12 (w. M5A) / 2.08							
<b>Practice Area Available (ft<sup>2</sup>):</b> 61,000 (not including M5A)							
<b>Existing Head Available?</b> n/a							

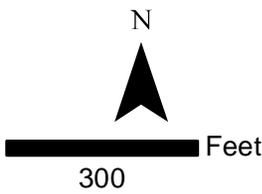
**Date Assessed:** May 15, 2013, 8:57 AM

**Assessed by:** RAC, SM



### Legend

- |                |                |                     |                |
|----------------|----------------|---------------------|----------------|
| ★ Retrofit     | ▲ Outfalls     | ▭ AirportProperties | — 2ft_Contours |
| ▭ Retrofit DA  | ● Catch basins | ▭ Watershed         | — stream       |
| ▭ PracticeArea | ● Manholes     | ▭ Wetlands_SoBu     | — Storm        |
|                | ● Existing BMP | ▭ Parcels           | — Sanitary     |
|                |                | ▭ Existing BMP DA   | — Combined     |
|                |                |                     | — Waterline    |



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## Retrofit M5A/24: Main St. Pond and Sheraton (rear open space)

ID#: Retrofit 25							
<b>Name:</b> Picard Circle							
<b>Concept Description:</b> Subsurface infiltration system. All houses within Picard Circle have been purchased by Airport and are now abandoned. Significant site area exists within yards and the road for major underground infiltration/detention system. Constraints include depth of existing drainage pipe and depth above groundwater (adjacent brook approx 14 feet below existing ground).							
<b>Notes/Feasibility:</b> Depth of existing drainage line in Airport Pkwy may preclude piping from existing infrastructure to new system. One option would be to install diversion structure and partially submerge existing piping system.							
GENERAL SITE INFORMATION	RETROFIT DETAILS						
<b>Site Contact Info:</b> Airport, So. Burlington	<b>Project Candidate:</b> Undecided (allowable reuse ??)						
<b>Ownership:</b> Public (Airport buyout program)	<b>Retrofit of new or existing BMP:</b> New BMP						
<b>Land Use 1:</b> Multi-family Residential	<b>Proposed Retrofit Practice 1:</b> Infiltration						
<b>Land Use 2:</b> Decommissioned buildings bought by airport	<b>Proposed Retrofit Practice 2:</b> Underground detention						
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> Impervious Cover Removal						
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-						
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Medium						
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: YES                      Water Quality: YES                      Recharge: YES                      Demo: YES                      Repair: NO                      Reuse: NO                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: NO                      Access: NO                      Land Use: NO                      Utilities: YES                      Polluted: NO                      High WT: YES                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> -None Selected-</td> </tr> <tr> <td colspan="2" style="vertical-align: top;"> <b>Other:</b> Depth of existing trunk line may preclude piping from existing infrastructure to new system                 </td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: YES Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: YES Wetlands: NO	<b>Other:</b> -None Selected-		<b>Other:</b> Depth of existing trunk line may preclude piping from existing infrastructure to new system	
<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: YES Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: YES Wetlands: NO					
<b>Other:</b> -None Selected-							
<b>Other:</b> Depth of existing trunk line may preclude piping from existing infrastructure to new system							
<b>Soils:</b> Good Infiltration							
<b>Use in Retrofit DA:</b> Street, single family res							
SIZING INFO							
<b>Drainage Area (ac):</b> 51.88							
<b>Impervious Area (ac):</b> 16.71							
<b>Practice Area Available (ft<sup>2</sup>):</b> 40,420							
<b>Existing Head Available?</b> n/a							

Date Assessed: May 16, 2013, 11:30 AM

Assessed by: RAC, NBP, SMM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, I swisstopo, and the GIS User Community

Legend			
★ Retrofit	▲ Outfalls	□ Airport Properties	— 2ft Contours
□ Retrofit DA	● Catch basins	□ Watershed	— stream
■ PracticeArea	● Manholes	□ Wetlands_SoBu	— Storm
	● Existing BMP	□ Parcels	— Sanitary
		□ Existing BMP DA	— Combined
			— Waterline

N

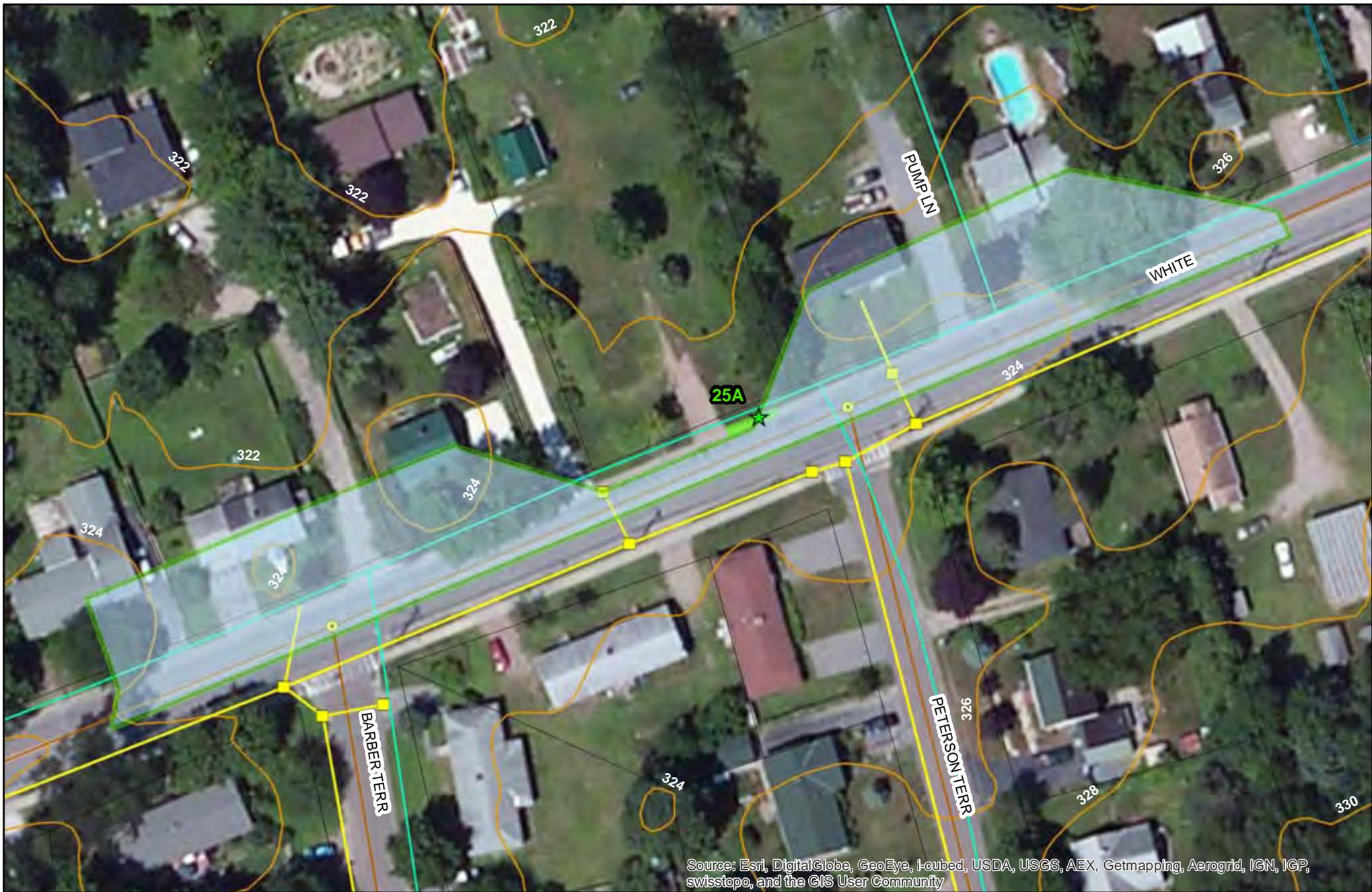
350 Feet

## Retrofit #25: Picard Circle

ID#: Retrofit 25A							
<b>Name:</b> White St. ROW							
<b>Concept Description:</b> Block or modify two existing drain inlets on White Rd. to direct flow through curb cuts/outlets into grass filter strip and infiltrating catchbasin. Localized flooding issue in front of property owners driveway that could be solved by this.							
<b>Notes/Feasibility:</b> Low. Depending on size of ROW, ability to modify drain inlets, property owner. Small green infrastructure project, but doesn't capture a lot of area, plus is within drainage area to #25.							
GENERAL SITE INFORMATION	RETROFIT DETAILS						
<b>Site Contact Info:</b> So. Burlington	<b>Project Candidate:</b> Probably not						
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> New BMP						
<b>Land Use 1:</b> Road	<b>Proposed Retrofit Practice 1:</b> Infiltration						
<b>Land Use 2:</b> None Selected-	<b>Proposed Retrofit Practice 2:</b> Pretreatment swale						
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-						
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> None Selected-						
<b>Sources/pollutants 1:</b> -None Selected-	<b>Maintenance Burden:</b> -None Selected-						
<b>Sources/pollutants 2:</b> None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: NO                      Water Quality: YES                      Recharge: YES                      Demo: NO                      Repair: YES                      Reuse:                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: NO                      Access: NO                      Land Use: YES                      Utilities: NO                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2" style="vertical-align: top;"> <b>Other:</b> Low point in road with signs of deterioration. Gavel Driveway entrance beamed up to prevent flooding/erosion.                 </td> </tr> <tr> <td colspan="2" style="vertical-align: top;"> <b>Other:</b> There could be more room here to do a larger practice if needed, but currently confined to ROW. May be issue with blocking of drain inlets.                 </td> </tr> </table>	<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: YES Demo: NO Repair: YES Reuse:	<b>Conflicts:</b> Soils: NO Access: NO Land Use: YES Utilities: NO Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> Low point in road with signs of deterioration. Gavel Driveway entrance beamed up to prevent flooding/erosion.		<b>Other:</b> There could be more room here to do a larger practice if needed, but currently confined to ROW. May be issue with blocking of drain inlets.	
<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: YES Demo: NO Repair: YES Reuse:		<b>Conflicts:</b> Soils: NO Access: NO Land Use: YES Utilities: NO Polluted: NO High WT: NO Wetlands: NO					
<b>Other:</b> Low point in road with signs of deterioration. Gavel Driveway entrance beamed up to prevent flooding/erosion.							
<b>Other:</b> There could be more room here to do a larger practice if needed, but currently confined to ROW. May be issue with blocking of drain inlets.							
<b>Soils:</b> Good Infiltration							
<b>Use in Retrofit DA:</b> Street							
SIZING INFO							
<b>Drainage Area (ac):</b> 0.66							
<b>Impervious Area (ac):</b> 0.36							
<b>Practice Area Available (ft<sup>2</sup>):</b> 130							
<b>Existing Head Available?</b> N/A							

**Date Assessed:** May 16, 2013, 1:15 PM

**Assessed by:** ACK, BK



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend	
★ Retrofit	▲ Outfalls
▭ Retrofit DA	■ Catch basins
▭ PracticeArea	● Manholes
	● Existing BMP
▭ AirportProperties	▭ Watershed
▭ Wetlands_SoBu	▭ Parcels
▭ Existing BMP DA	
— 2ft_Contours	— stream
— Storm	— Sanitary
— Combined	— Waterline

N

60 Feet

## Retrofit #25A: White St. ROW

ID#: Retrofit 26 & 27					
<b>Name:</b> Duval St. & Clover St.					
<b>Concept Description:</b> 30-ft wide residential streets with direct outfalls to streams, flat terrain, and good soils offer green street and neighborhood-scale disconnection opportunities (e.g., dry wells, rain gardens, pervious driveways, bump outs).					
<b>Notes/Feasibility:</b> Small drainage area; requires participation by homeowners.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> So. Burlington and private owners	<b>Project Candidate:</b> OK, green infrastructure				
<b>Ownership:</b> Public and Private	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Single Family Residential	<b>Proposed Retrofit Practice 1:</b> green streets				
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> dry wells, rain gardens				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> -None Selected-	<b>Maintenance Burden:</b> -Medium				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: NO                      Water Quality: YES                      Recharge: YES                      Demo: YES                      Repair: NO                      Reuse: NO                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: NO                      Access: NO                      Land Use: YES                      Utilities: YES                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> None Selected-</td> </tr> </table>	<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: YES Demo: YES Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: NO Access: NO Land Use: YES Utilities: YES Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> None Selected-	
<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: YES Demo: YES Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: NO Access: NO Land Use: YES Utilities: YES Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> None Selected-					
<b>Soils:</b> Good Infiltration					
<b>Use in Retrofit DA:</b> Streets, driveways, and rooftops					
SIZING INFO					
<b>Drainage Area (ac):</b> 3.59 Duval St./ 3.81 Clover St.					
<b>Impervious Area (ac):</b> 1.19 / 1.4					
<b>Practice Area Available (ft<sup>2</sup>):</b> --					
<b>Existing Head Available?</b> n/a					

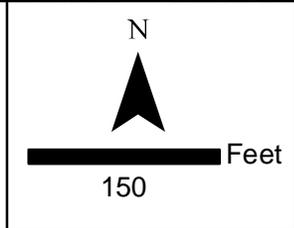
Date Assessed: May 17, 2013

Assessed by: RAC, SMM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community

Legend	
★ Retrofit	▲ Outfalls
■ Retrofit DA	● Catch basins
■ PracticeArea	● Manholes
	● Existing BMP
■ AirportProperties	■ Watershed
■ Wetlands_SoBu	■ Parcels
■ Existing BMP DA	■ Existing BMP DA
— 2ft_Contours	— stream
— Storm	— Sanitary
— Combined	— Waterline



## Retrofit # 26/27. Duval St. & Clover St.

ID#: Retrofit 200					
<b>Name:</b> N. Henry Court					
<b>Concept Description:</b> Dead-end road with excess impervious cover. Currently, drainage comes down the the road and flows directly down a steep slope to the stream/wetland area below. Install a rain garden/bio with an overflow to a leaching catch basin at end of road. Dumping of yard waste and debris was also observed down the slope. An old corrugated discharge pipe was found down in stream.					
<b>Notes/Feasibility:</b> Small project, but could be a good GI demonstration.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> So. Burlington	<b>Project Candidate:</b> Ok				
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Single Family Residential	<b>Proposed Retrofit Practice 1:</b> Raingarden				
<b>Land Use 2:</b> Road	<b>Proposed Retrofit Practice 2:</b> Infiltrating catchbasin				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> Impervious Cover Removal				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> -None Selected-				
<b>Sources/pollutants 2:</b> yard waste/debris	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"><b>Benefits:</b> Storage: NO Water Quality: YES Recharge: YES Demo: NO Repair: YES Reuse:</td> <td style="width: 50%; vertical-align: top;"><b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO</td> </tr> <tr> <td><b>Other:</b> none</td> <td><b>Other:</b> Large oaks and ash</td> </tr> </table>	<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: YES Demo: NO Repair: YES Reuse:	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> none	<b>Other:</b> Large oaks and ash
<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: YES Demo: NO Repair: YES Reuse:		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> none		<b>Other:</b> Large oaks and ash			
<b>Soils:</b> Good infiltration					
<b>Use in Retrofit DA:</b> -Street					
SIZING INFO					
<b>Drainage Area (ac):</b> 1.03					
<b>Impervious Area (ac):</b> 0.45					
<b>Practice Area Available (ft<sup>2</sup>):</b> 490					
<b>Existing Head Available?</b> n/a					

Date Assessed: May 16, 2013, 10:38 AM

Assessed by: ACK, BK



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend	
★ Retrofit	▲ Outfalls
▭ Retrofit DA	▲ Catch basins
▭ PracticeArea	● Manholes
	● Existing BMP
▭ AirportProperties	▭ Watershed
▭ Wetlands_SoBu	▭ Parcels
▭ Existing BMP DA	
— 2ft_Contours	— stream
— Storm	— Sanitary
— Combined	— Waterline

N

60 Feet

**tce** TRUDELL  
CONSULTING ENGINEERS

Horsley Witten Group  
Sustainable Environmental Solutions  
300 South 10th St. • Savannah, GA • 30301  
tel: 912-434-8800 • fax: 912-434-8700 • www.horsleywitten.com

## Retrofit #200: N. Henry Court

ID#: Retrofit 201																			
<b>Name:</b> Lynn St./Barber Tr. (north)																			
<b>Concept Description:</b> Small green infrastructure example for neighborhood application. Remove pavement at corner and install a curb “bump out” with vegetated pretreatment pretreatment bioretention with overflow into leaching catchbasin.																			
<b>Notes/Feasibility:</b> In road ROW, however homeowner would be part of maintenance. Right at park, so high visibility.																			
GENERAL SITE INFORMATION	RETROFIT DETAILS																		
<b>Site Contact Info:</b> So. Burlington	<b>Project Candidate:</b> Ok																		
<b>Ownership:</b> -Public	<b>Retrofit of new or existing BMP:</b> -None Selected-																		
<b>Land Use 1:</b> -Single Family Residential	<b>Proposed Retrofit Practice 1:</b> bioretention																		
<b>Land Use 2:</b> None Selected-	<b>Proposed Retrofit Practice 2:</b> infiltrating catch basin																		
<b>Existing BMP on site?</b> -No	<b>Non-Structural Controls:</b> -None Selected-																		
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> None Selected-																		
<b>Sources/pollutants 1:</b> -None Selected-	<b>Maintenance Burden:</b> Medium																		
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><b>Benefits:</b></td> <td style="width: 50%;"><b>Conflicts:</b></td> </tr> <tr> <td>Storage: NO</td> <td>Soils: NO</td> </tr> <tr> <td>Water Quality: YES</td> <td>Access: NO</td> </tr> <tr> <td>Recharge: YES</td> <td>Land Use: YES</td> </tr> <tr> <td>Demo: YES</td> <td>Utilities: NO</td> </tr> <tr> <td>Repair: NO</td> <td>Polluted: NO</td> </tr> <tr> <td>Reuse: NO</td> <td>High WT: NO</td> </tr> <tr> <td></td> <td>Wetlands: NO</td> </tr> <tr> <td><b>Other:</b> -None Selected-</td> <td><b>Other:</b> -None Selected-</td> </tr> </table>	<b>Benefits:</b>	<b>Conflicts:</b>	Storage: NO	Soils: NO	Water Quality: YES	Access: NO	Recharge: YES	Land Use: YES	Demo: YES	Utilities: NO	Repair: NO	Polluted: NO	Reuse: NO	High WT: NO		Wetlands: NO	<b>Other:</b> -None Selected-	<b>Other:</b> -None Selected-
<b>Benefits:</b>		<b>Conflicts:</b>																	
Storage: NO		Soils: NO																	
Water Quality: YES		Access: NO																	
Recharge: YES	Land Use: YES																		
Demo: YES	Utilities: NO																		
Repair: NO	Polluted: NO																		
Reuse: NO	High WT: NO																		
	Wetlands: NO																		
<b>Other:</b> -None Selected-	<b>Other:</b> -None Selected-																		
<b>Soils:</b> -Good Infiltration																			
<b>Use in Retrofit DA:</b> -Street																			
SIZING INFO																			
<b>Drainage Area (ac):</b> 0.67																			
<b>Impervious Area (ac):</b> 0.11																			
<b>Practice Area Available (ft<sup>2</sup>):</b> 250																			
<b>Existing Head Available?</b> N/A																			

Date Assessed: May 16, 2013, 1:44 PM

Assessed by: ACK, BK

ID#: Retrofit 202					
<b>Name:</b> Lynn St./Barber ter. (south)					
<b>Concept Description:</b> Replace existing catch basin at corner of driveway with an infiltrating catch basin. Provide pretreatment grass swale, or simple rain garden between the park entrance and adjacent residence.					
<b>Notes/Feasibility:</b> Small green infrastructure example for neighborhood application.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> 0	<b>Project Candidate:</b> -Probably not				
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Single Family Residential	<b>Proposed Retrofit Practice 1:</b> Infiltration				
<b>Land Use 2:</b> Road	<b>Proposed Retrofit Practice 2:</b> Pretreatment swale				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> -None Selected-	<b>Maintenance Burden:</b> -None Selected-				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"><b>Benefits:</b> Storage: NO Water Quality: NO Recharge: YES Demo: NO Repair: NO Reuse:</td> <td style="width: 50%; vertical-align: top;"><b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO</td> </tr> <tr> <td><b>Other:</b> -None Selected-</td> <td><b>Other:</b> -None Selected-</td> </tr> </table>	<b>Benefits:</b> Storage: NO Water Quality: NO Recharge: YES Demo: NO Repair: NO Reuse:	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> -None Selected-	<b>Other:</b> -None Selected-
<b>Benefits:</b> Storage: NO Water Quality: NO Recharge: YES Demo: NO Repair: NO Reuse:		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> -None Selected-		<b>Other:</b> -None Selected-			
<b>Soils:</b> Good Infiltration					
<b>Use in Retrofit DA:</b> street					
SIZING INFO					
<b>Drainage Area (ac):</b> 0.54					
<b>Impervious Area (ac):</b> 0.05					
<b>Practice Area Available (ft<sup>2</sup>):</b> 150					
<b>Existing Head Available?</b> N/A					

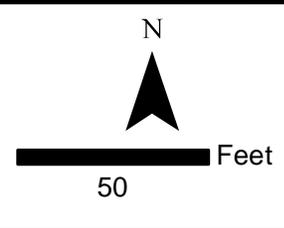
Date Assessed: May 16, 2013, 1:44 PM

Assessed by: ACK, BK



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend	
★ Retrofit	▲ Outfalls
□ Retrofit DA	● Catch basins
■ PracticeArea	● Manholes
	● Existing BMP
□ AirportProperties	□ Watershed
□ Wetlands_SoBu	□ Parcels
□ Existing BMP DA	□ Existing BMP DA
— 2ft_Contours	— stream
— Storm	— Sanitary
— Combined	— Waterline



## Retrofit #201/202: Lynn St./Barber Terrace

ID#: Retrofit 203					
<b>Name:</b> Suburban Sq. neighborhood					
<b>Concept Description:</b> This neighborhood has 30ft road width and 90% of homes have potential for downspout disconnection. Green street options to include infiltrating catch basins, dry wells for individual roofs, and rain gardens for roofs and driveways are options here.					
<b>Notes/Feasibility:</b> Neighborhood is in area draining to Retrofit #14. Could be a good GI neighborhood for demonstration, if needed. 4.1' invert at drain inlet pictured here.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> So. Burlington; individual homeowners	<b>Project Candidate:</b> -Probably not				
<b>Ownership:</b> public and private	<b>Retrofit of new or existing BMP:</b> -New BMP				
<b>Land Use 1:</b> Single family residential	<b>Proposed Retrofit Practice 1:</b> -None Selected-				
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> -None Selected-				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> downspout disconnection				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> -None Selected-	<b>Maintenance Burden:</b> -None Selected-				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: NO                      Water Quality: NO                      Recharge: NO                      Demo: NO                      Repair: NO                      Reuse:                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: NO                      Access: NO                      Land Use: NO                      Utilities: NO                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> -None Selected-</td> </tr> </table>	<b>Benefits:</b> Storage: NO Water Quality: NO Recharge: NO Demo: NO Repair: NO Reuse:	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> -None Selected-	
<b>Benefits:</b> Storage: NO Water Quality: NO Recharge: NO Demo: NO Repair: NO Reuse:		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> -None Selected-					
<b>Soils:</b> Good for infiltration					
<b>Use in Retrofit DA:</b> -streets					
SIZING INFO					
<b>Drainage Area (ac):</b> 7.15					
<b>Impervious Area (ac):</b> 2.96					
<b>Practice Area Available (ft<sup>2</sup>):</b> --					
<b>Existing Head Available?</b> 0					

Date Assessed: May 16, 2013

Assessed by: ACK, BK



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community

Legend			
	Retrofit		Airport Properties
	Retrofit DA		Watershed
	Practice Area		Wetlands_SoBu
	Outfalls		Parcels
	Catch basins		Existing BMP DA
	Manholes		2ft_Contours
	Existing BMP		stream
			Storm
			Sanitary
			Combined
			Waterline

N

100 Feet

## Retrofit 203: Suburban Ave Green Infrastructure

ID#: Retrofit 204																			
<b>Name:</b> Greers at Dorset St./Williston Rd.																			
<b>Concept Description:</b> Install bioretention with underground storage in existing grassed area to capture roof and parking lot runoff. Runoff drains to this area already, but would need to divert from existing drain inlets and overflow back into existing drainage network.																			
<b>Notes/Feasibility:</b> Could get roof area from VT Gift barn and upper lot if needed.																			
GENERAL SITE INFORMATION	RETROFIT DETAILS																		
<b>Site Contact Info:</b> unknown	<b>Project Candidate:</b> Ok																		
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> New BMP																		
<b>Land Use 1:</b> Commercial/Industrial	<b>Proposed Retrofit Practice 1:</b> Bioretention																		
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> Underground storage chambers																		
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-																		
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-																		
<b>Sources/pollutants 1:</b> -None Selected-	<b>Maintenance Burden:</b> Medium																		
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><b>Benefits:</b></td> <td style="width: 50%;"><b>Conflicts:</b></td> </tr> <tr> <td>Storage: YES</td> <td>Soils: NO</td> </tr> <tr> <td>Water Quality: YES</td> <td>Access: NO</td> </tr> <tr> <td>Recharge: NO</td> <td>Land Use: NO</td> </tr> <tr> <td>Demo: YES</td> <td>Utilities: NO</td> </tr> <tr> <td>Repair: NO</td> <td>Polluted: NO</td> </tr> <tr> <td>Reuse:</td> <td>High WT: NO</td> </tr> <tr> <td></td> <td>Wetlands: NO</td> </tr> <tr> <td><b>Other:</b> -None Selected-</td> <td><b>Other:</b> -None Selected-</td> </tr> </table>	<b>Benefits:</b>	<b>Conflicts:</b>	Storage: YES	Soils: NO	Water Quality: YES	Access: NO	Recharge: NO	Land Use: NO	Demo: YES	Utilities: NO	Repair: NO	Polluted: NO	Reuse:	High WT: NO		Wetlands: NO	<b>Other:</b> -None Selected-	<b>Other:</b> -None Selected-
<b>Benefits:</b>		<b>Conflicts:</b>																	
Storage: YES		Soils: NO																	
Water Quality: YES		Access: NO																	
Recharge: NO	Land Use: NO																		
Demo: YES	Utilities: NO																		
Repair: NO	Polluted: NO																		
Reuse:	High WT: NO																		
	Wetlands: NO																		
<b>Other:</b> -None Selected-	<b>Other:</b> -None Selected-																		
<b>Soils:</b> Poor Infiltration																			
<b>Use in Retrofit DA:</b> small parking lot, roof																			
SIZING INFO																			
<b>Drainage Area (ac):</b> 0.45																			
<b>Impervious Area (ac):</b> 0.38																			
<b>Practice Area Available (ft<sup>2</sup>):</b> 1,650																			
<b>Existing Head Available?</b> N/A																			

Date Assessed: May 16, 2013, 4:01 PM

Assessed by: ACK, BK

ID#: Retrofit 205					
<b>Name:</b> Vermont Gift Barn					
<b>Concept Description:</b> Disconnect rooftop drainage onto parking lot by diverting downspouts into a bioretention in the existing grassed area in front of store. Tie underdrain and overflow into existing drain inlet.					
<b>Notes/Feasibility:</b> Would be an easy retrofit since grassed area already depressed with a yard inlet. Disconnect rooftop runoff going onto parking lot. Area is currently mowed and is lush grass.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> 0	<b>Project Candidate:</b> Ok				
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Commercial/Industrial	<b>Proposed Retrofit Practice 1:</b> Bioretention				
<b>Land Use 2:</b> None Selected-	<b>Proposed Retrofit Practice 2:</b> None Selected-				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> Disconnection				
<b>Is site a hotspot?</b> Possibly	<b>Non-Structural Other:</b> Dumpster and grease management				
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Medium				
<b>Sources/pollutants 2:</b> In rear lot, dumpsters and grease	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;"> <b>Benefits:</b>                      Storage: YES                      Water Quality: YES                      Recharge: NO                      Demo: YES                      Repair: NO                      Reuse:                 </td> <td style="vertical-align: top;"> <b>Conflicts:</b>                      Soils: YES                      Access: NO                      Land Use: NO                      Utilities: NO                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> None Selected-</td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: YES Repair: NO Reuse:	<b>Conflicts:</b> Soils: YES Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> None Selected-	
<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: YES Repair: NO Reuse:		<b>Conflicts:</b> Soils: YES Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> None Selected-					
<b>Soils:</b> Poor Infiltration					
<b>Use in Retrofit DA:</b> Individual Rooftop					
SIZING INFO					
<b>Drainage Area (ac):</b> 0.16					
<b>Impervious Area (ac):</b> 0.12					
<b>Practice Area Available (ft<sup>2</sup>):</b> 660					
<b>Existing Head Available?</b> N/A					

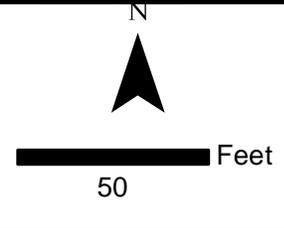
**Date Assessed:** May 16, 2013, 4:10 PM

**Assessed by:** ACK, BK



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend	
★ Retrofit	▲ Outfalls
▭ Retrofit DA	■ Catch basins
▭ PracticeArea	● Manholes
	● Existing BMP
▭ AirportProperties	▭ Watershed
▭ Wetlands_SoBu	▭ Parcels
▭ Existing BMP DA	
	— 2ft_Contours
	— stream
	— Storm
	— Sanitary
	— Combined
	— Waterline



## Retrofit #204/205: Greers/Vermont Gift Barn

ID#: Retrofit 206					
<b>Name:</b> Northfield Savings Bank					
<b>Concept Description:</b> Convert existing landscape island into a bioretention facility, overflow into existing drain inlet.					
<b>Notes/Feasibility:</b> Low feasibility considering private property, however could be relatively easy since there is an existing drain line for overflow. Could be a good green infrastructure demonstration.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> 0	<b>Project Candidate:</b> Ok				
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Commercial/Industrial	<b>Proposed Retrofit Practice 1:</b> Bioretention				
<b>Land Use 2:</b> Bank	<b>Proposed Retrofit Practice 2:</b> None Selected-				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> None Selected-				
<b>Sources/pollutants 1:</b> -None Selected-	<b>Maintenance Burden:</b> Medium				
<b>Sources/pollutants 2:</b> None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: NO                      Water Quality: YES                      Recharge: NO                      Demo: YES                      Repair: NO                      Reuse: NO                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: NO                      Access: NO                      Land Use: NO                      Utilities: NO                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> None Selected-</td> </tr> </table>	<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: NO Demo: YES Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> None Selected-	
<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: NO Demo: YES Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> None Selected-					
<b>Soils:</b> Poor Infiltration					
<b>Use in Retrofit DA:</b> Parking Lot					
SIZING INFO					
<b>Drainage Area (ac):</b> 0.17					
<b>Impervious Area (ac):</b> 0.15					
<b>Practice Area Available (ft<sup>2</sup>):</b> 950					
<b>Existing Head Available?</b> N/A					

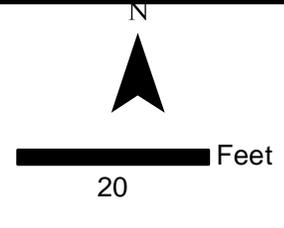
**Date Assessed:** May 16, 2013, 4:34 PM

**Assessed by:** ACK, BK



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend			
★ Retrofit	▲ Outfalls	□ AirportProperties	— 2ft_Contours
□ Retrofit DA	■ Catch basins	□ Watershed	— stream
■ PracticeArea	● Manholes	□ Wetlands_SoBu	— Storm
	● Existing BMP	□ Parcels	— Sanitary
		□ Existing BMP DA	— Combined
			— Waterline



**tce-TRUDELL**  
CONSULTING ENGINEERS

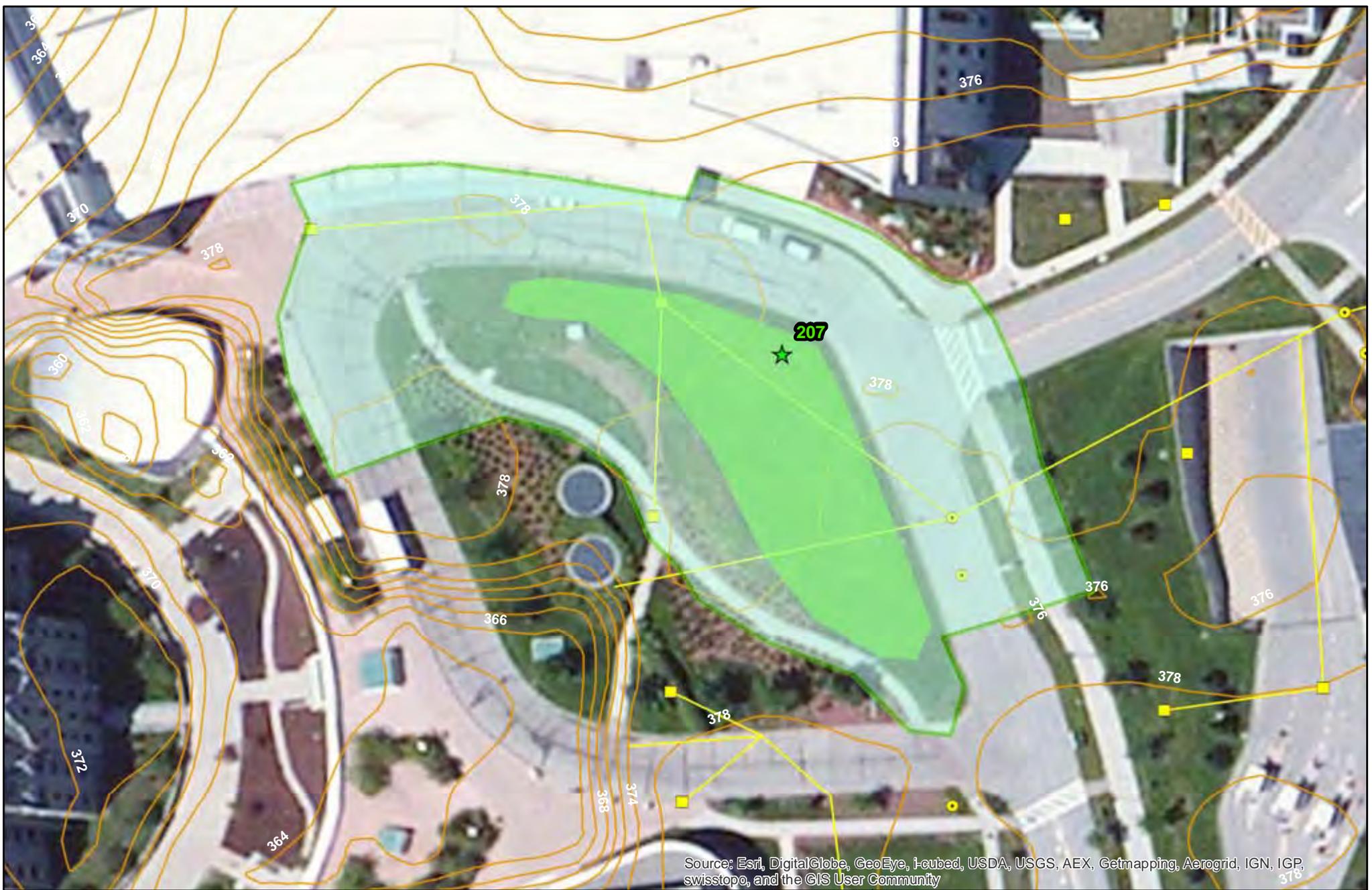
**Horsley Witten Group**  
Sustainable Environmental Solutions

## Retrofit #206: Northfield Savings Bank

ID#: Retrofit 207											
<b>Name:</b> Fletcher Allen green space											
<b>Concept Description:</b> Proposed bioretention area in green space near hospital entrance. Redirect existing roadway trench drains into practice. Site currently drains to the UVM East Campus Pond.											
<b>Notes/Feasibility:</b> Moderate feasibility. Trench drain outlets are shallow so daylighting is possible. Plenty of green space for practice area. High profile location.											
GENERAL SITE INFORMATION	RETROFIT DETAILS										
<b>Site Contact Info:</b> UVM/Burlington	<b>Project Candidate:</b> Ok										
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP										
<b>Land Use 1:</b> Institutional	<b>Proposed Retrofit Practice 1:</b> Bioretention										
<b>Land Use 2:</b> Street/Grass Landscape island	<b>Proposed Retrofit Practice 2:</b> -None Selected-										
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-										
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-										
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Medium										
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: NO                      Water Quality: YES                      Recharge: NO                      Demo: YES                      Repair: NO                      Reuse:                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: NO                      Access: NO                      Land Use: NO                      Utilities: YES                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> None</td> </tr> <tr> <td colspan="2"><b>Other:</b> Electric and irrigation in island.</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td colspan="2"> </td> </tr> </table>	<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: NO Demo: YES Repair: NO Reuse:	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> None		<b>Other:</b> Electric and irrigation in island.					
<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: NO Demo: YES Repair: NO Reuse:		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO									
<b>Other:</b> None											
<b>Other:</b> Electric and irrigation in island.											
<b>Soils:</b> Poor Infiltration											
<b>Use in Retrofit DA:</b> Street											
SIZING INFO											
<b>Drainage Area (ac):</b> 0.91											
<b>Impervious Area (ac):</b> 0.87											
<b>Practice Area Available (ft<sup>2</sup>):</b> 8,700											
<b>Existing Head Available?</b> --											

Date Assessed: May 17, 2013, 11:28 AM

Assessed by: KMH/AGM



<b>Legend</b>	Retrofit	AirportProperties	2ft_Contours
	Retrofit DA	Watershed	stream
	PracticeArea	Wetlands_SoBu	Storm
	Outfalls	Parcels	Sanitary
Catch basins	Existing BMP DA	Waterline	
Manholes			
Existing BMP			

N

50 Feet

**tce-TRUDELL**  
CONSULTING ENGINEERS

**Horsley Witten Group**  
Sustainable Environmental Solutions

**Retrofit #207: Fletcher Allen  
Green Space**

ID#: Retrofit 208					
<b>Name:</b> Fletcher Allen parking lot					
<b>Concept Description:</b> Proposed bioretention area in existing drainage feature. Site is currently managed by existing swales, curb cuts, and a drainage depression. Swales and depression are currently eroding. Raise existing catchbasin frame/grate to provide ponding for bioretention.					
<b>Notes/Feasibility:</b> Easy retrofit and aesthetic improvement. Parking lot already has features necessary directing drainage to the retrofit practice location.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> UVM/Burlington	<b>Project Candidate:</b> Ok				
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP				
<b>Land Use 1:</b> Institutional	<b>Proposed Retrofit Practice 1:</b> Bioretention				
<b>Land Use 2:</b> Parking Lot	<b>Proposed Retrofit Practice 2:</b> -None Selected-				
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Medium				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 50%;"> <b>Benefits:</b>                      Storage: NO                      Water Quality: YES                      Recharge: NO                      Demo: YES                      Repair: YES                      Reuse: NO                 </td> <td style="vertical-align: top; width: 50%;"> <b>Conflicts:</b>                      Soils: NO                      Access: NO                      Land Use: NO                      Utilities: NO                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> None</td> </tr> </table>	<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: NO Demo: YES Repair: YES Reuse: NO	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> None	
<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: NO Demo: YES Repair: YES Reuse: NO		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> None					
<b>Soils:</b> Poor Infiltration					
<b>Use in Retrofit DA:</b> Parking Lot					
SIZING INFO					
<b>Drainage Area (ac):</b> 0.85					
<b>Impervious Area (ac):</b> 0.53					
<b>Practice Area Available (ft<sup>2</sup>):</b> 6,400					
<b>Existing Head Available?</b> --					

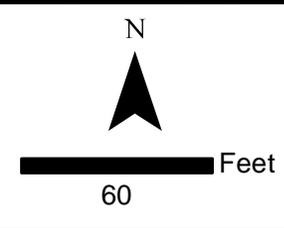
Date Assessed: May 17, 2013, 11:48 AM

Assessed by: KMH/AGM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend	
★ Retrofit	▲ Outfalls
□ Retrofit DA	■ Catch basins
■ PracticeArea	● Manholes
	● Existing BMP
□ AirportProperties	□ Watershed
□ Wetlands_SoBu	□ Parcels
□ Existing BMP DA	
— 2ft_Contours	— stream
— Storm	— Sanitary
— Combined	— Waterline



## Retrofit #208: Fletcher Allen Parking Lot

ID#: Retrofit M1A									
<b>Name:</b> Centennial Court Apartments									
<b>Concept Description:</b> Retrofit of existing dry basin to an infiltration basin. Increase contributing drainage area and add riser to outlet structure for improved flow control. Redirect road drainage from Centennial Court to basin. Site only takes runoff currently from a portion of the apartment roofs.									
<b>Notes/Feasibility:</b> Very good. Must adjust existing sewer manhole located with basin. This currently discharges to the UVM East Campus Pond.									
GENERAL SITE INFORMATION	RETROFIT DETAILS								
<b>Site Contact Info:</b> UVM / Art Shields (property manager)	<b>Project Candidate:</b> Yep, Love It								
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> Existing BMP								
<b>Land Use 1:</b> Multi-family Residential	<b>Proposed Retrofit Practice 1:</b> Pond								
<b>Land Use 2:</b> Campus Apartments	<b>Proposed Retrofit Practice 2:</b> -None Selected-								
<b>Existing BMP on site?</b> Yes	<b>Non-Structural Controls:</b> -None Selected-								
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-								
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Low								
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: YES                      Water Quality: YES                      Recharge: YES                      Demo: NO                      Repair: NO                      Reuse:                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: NO                      Access: NO                      Land Use: NO                      Utilities: YES                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> None</td> </tr> <tr> <td colspan="2"><b>Other:</b> Must raise frame/cover of sewer manhole near basin edge above ponding elevation.</td> </tr> <tr> <td colspan="2"></td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: NO Repair: NO Reuse:	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> None		<b>Other:</b> Must raise frame/cover of sewer manhole near basin edge above ponding elevation.			
<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: NO Repair: NO Reuse:		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO							
<b>Other:</b> None									
<b>Other:</b> Must raise frame/cover of sewer manhole near basin edge above ponding elevation.									
<b>Soils:</b> Good Infiltration									
<b>Use in Retrofit DA:</b> Roof									
SIZING INFO									
<b>Drainage Area (ac):</b> 6.45									
<b>Impervious Area (ac):</b> 2.85									
<b>Practice Area Available (ft<sup>2</sup>):</b> 13,000									
<b>Existing Head Available?</b> --									

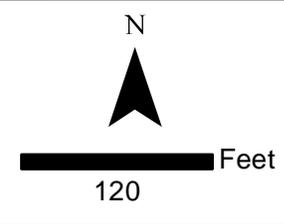
**Date Assessed:** May 17, 2013, 12:28 PM

**Assessed by:** KMH/AGM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend			
	Retrofit		Airport Properties
	Retrofit DA		Watershed
	Practice Area		Wetlands_SoBu
	Outfalls		Parcels
	Catch basins		Existing BMP DA
	Manholes		2ft_Contours
	Existing BMP		stream
			Storm
			Sanitary
			Combined
			Waterline



## Retrofit #M1A: Centennial Court

ID#: Retrofit M1B (revised)					
<b>Name:</b> East Campus Pond					
<b>Concept Description:</b> Retrofit of the existing East Campus Pond outlet structure to maximize storage and attenuation for to target design storm(s).					
<b>Notes/Feasibility:</b> Priority location with high feasibility. No significant space available for expansion of the facility. Low cost improvement.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> UVM	<b>Project Candidate:</b> Yep, Love It				
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> Existing BMP				
<b>Land Use 1:</b> Institutional	<b>Proposed Retrofit Practice 1:</b> Outlet structure modification				
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> --				
<b>Existing BMP on site?</b> Yes	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> No	<b>Maintenance Burden:</b> Low				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: YES                      Water Quality: YES                      Recharge: NO                      Demo: NO                      Repair: NO                      Reuse: NO                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: YES                      Access: NO                      Land Use: NO                      Utilities: NO                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> None</td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: YES Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> None	
<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: YES Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> None					
<b>Soils:</b> Poor Infiltration					
<b>Use in Retrofit DA:</b> -None Selected-					
SIZING INFO					
<b>Drainage Area (ac):</b> 69.80					
<b>Impervious Area (ac):</b> 43.67					
<b>Practice Area Available (ft<sup>2</sup>):</b> --					
<b>Existing Head Available?</b> --					

**Date Assessed:** May 16, 2013, 11:15 AM

**Assessed by:** KMH/AGM

ID#: Retrofit M3					
<b>Name:</b> Queensbury Pond					
<b>Concept Description:</b> Existing dry detention pond. Modify outlet to create an infiltration basin. Existing pond might predate subdivision (newer PVC outlet connects to older CMP barrel). Facility appears to have additional storage capacity to expand drainage area (level run confirmed this is feasible).					
<b>Notes/Feasibility:</b> Old CMP barrel New 15" PVC outlet Sink hole evidence – top of existing embankment Scour hole at barrel outlet Incoming 15" HDPE Eroded inflow channel					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> Queensbury HOA	<b>Project Candidate:</b> Yes.				
<b>Ownership:</b> Private	<b>Retrofit of new or existing BMP:</b> Existing BMP				
<b>Land Use 1:</b> Single Family Residential	<b>Proposed Retrofit Practice 1:</b> Infiltration Basin				
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> 0				
<b>Existing BMP on site?</b> Yes	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Low				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: NO Repair: NO Reuse: NO</td> <td style="width: 50%;"><b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO</td> </tr> <tr> <td><b>Other:</b> 0</td> <td><b>Other:</b> 0</td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> 0	<b>Other:</b> 0
<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: YES Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> 0		<b>Other:</b> 0			
<b>Soils:</b> Good Infiltration					
<b>Use in Retrofit DA:</b> Streets, single family res.					
SIZING INFO					
<b>Drainage Area (ac):</b> 7.67					
<b>Impervious Area (ac):</b> 3.05					
<b>Practice Area Available (ft<sup>2</sup>):</b> 8,930					
<b>Existing Head Available?</b> n/a					

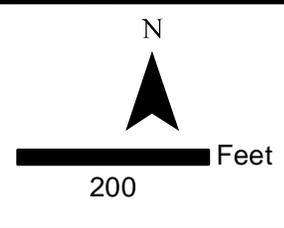
**Date Assessed:** May 16, 2013, 10:36 AM

**Assessed by:** RAC, NBP, SMM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend			
★ Retrofit	▲ Outfalls	Light Blue Outline	AirportProperties
Light Green Outline	Yellow Square	Pink Outline	Watershed
Green Fill	Yellow Circle	Blue Dotted	Wetlands_SoBu
	Red Circle	White Outline	Parcels
		Red Outline	Existing BMP DA
		Orange Line	2ft_Contours
		Blue Line	stream
		Yellow Line	Storm
		Brown Line	Sanitary
		Green Line	Combined
		Cyan Line	Waterline



## Retrofit #M3: Queensbury Court

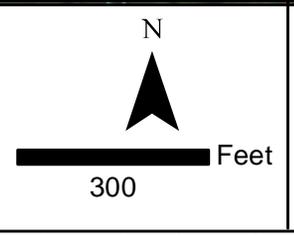
ID#: Retrofit M5A / M5A2 (revised)					
<b>Name:</b> Main St. Pond					
<b>Concept Description:</b> The Main Street Pond outlet structure is currently not functioning properly and must be repaired. Two potential retrofit options include: <b>M5A</b> involves converting the existing basin to a forebay for proposed Retrofit #24; <b>M5A2</b> involves expanding the existing Main St. Pond southward toward Williston Rd. and excavating to a deeper depth (see attached sketch). HW expanded upon the proposed K&L design of this facility to include a modified outlet structure and a concrete wall for additional storage and attenuation. The parking lot to the north (currently draining to M1 East Campus Pond, was rerouted here in the model).					
<b>Notes/Feasibility:</b> Priority location with high feasibility. Retrofit <b>M5A2</b> will likely require significant ledge removal for the proposed construction activities. Ledge removal is not anticipated for the <b>M5A/24</b> retrofit scenario.					
GENERAL SITE INFORMATION	RETROFIT DETAILS				
<b>Site Contact Info:</b> UVM	<b>Project Candidate:</b> Yep, Love It				
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> Existing BMP				
<b>Land Use 1:</b> Institutional	<b>Proposed Retrofit Practice 1:</b> Forebay for Retrofit 24 (M5A)				
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> Expand ex. basin (M5A2)				
<b>Existing BMP on site?</b> Yes	<b>Non-Structural Controls:</b> -None Selected-				
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-				
<b>Sources/pollutants 1:</b> No	<b>Maintenance Burden:</b> Low				
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                              Storage: YES                              Water Quality: YES                              Recharge: NO                              Demo: NO                              Repair: NO                              Reuse: NO                         </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                              Soils: YES                              Access: NO                              Land Use: NO                              Utilities: NO                              Polluted: NO                              High WT: NO                              Wetlands: NO                         </td> </tr> <tr> <td colspan="2" style="vertical-align: top;"> <b>Other:</b> None                         </td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: YES Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> None	
<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: YES Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO			
<b>Other:</b> None					
<b>Soils:</b> Poor Infiltration					
<b>Use in Retrofit DA:</b> -None Selected-					
SIZING INFO					
<b>Drainage Area (ac):</b> M5A/24 74.04; M5A2 67.93					
<b>Impervious Area (ac):</b> M5A/24 31.12; M5A2 29.04					
<b>Practice Area Available (ft<sup>2</sup>):</b> 61,000					
<b>Existing Head Available?</b> --	<b>Other:</b> Ledge at bottom of existing pond				



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend	
★ Retrofit	▲ Outfalls
▭ Retrofit DA	● Catch basins
▭ PracticeArea	● Manholes
	● Existing BMP
▭ AirportProperties	▭ Watershed
▭ Wetlands_SoBu	▭ Parcels
▭ Existing BMP DA	
— 2ft_Contours	— stream
— Storm	— Sanitary
— Combined	— Waterline



## Retrofit M5/24: Main St. Pond and Sheraton (rear open space)



ID#: Retrofit M7A / M7A2 (revised)							
<b>Name:</b> North Campus Pond							
<b>Concept Description:</b> This retrofit of the of existing North Campus Pond includes two proposed expansion options to over control existing runoff (M7A) and manage runoff from proposed future impervious cover (M7A2) . The retrofits include raising the existing embankment by either 3'+/- (M7A) or 6'+/- (M7A2) to provide additional attenuation capacity. May consider horizontal expansion to the north and/or south.							
<b>Notes/Feasibility:</b> UVM has provided an estimate of the additional proposed drainage area that will be redirected to the basin. UVM to complete a build-out analysis of the contributing drainage area for accommodation within the potential modified basin. An increased berm height of 6' may require elevating the existing high-tension electric lines.							
GENERAL SITE INFORMATION	RETROFIT DETAILS						
<b>Site Contact Info:</b> UVM	<b>Project Candidate:</b> Yep, Love It						
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> Existing BMP						
<b>Land Use 1:</b> Institutional	<b>Proposed Retrofit Practice 1:</b> 3' add. berm height (M7A)						
<b>Land Use 2:</b> -None Selected-	<b>Proposed Retrofit Practice 2:</b> 6' add. berm height (M7A2)						
<b>Existing BMP on site?</b> Yes	<b>Non-Structural Controls:</b> -None Selected-						
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-						
<b>Sources/pollutants 1:</b> No	<b>Maintenance Burden:</b> Low						
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO</td> <td style="width: 50%;"><b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO</td> </tr> <tr> <td colspan="2"><b>Other:</b> None</td> </tr> <tr> <td colspan="2"><b>Other:</b> Overhead utility lines may limit berm height.</td> </tr> </table>	<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> None		<b>Other:</b> Overhead utility lines may limit berm height.	
<b>Benefits:</b> Storage: YES Water Quality: YES Recharge: NO Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO					
<b>Other:</b> None							
<b>Other:</b> Overhead utility lines may limit berm height.							
<b>Soils:</b> Good Infiltration							
<b>Use in Retrofit DA:</b> Parking lots, streets, rooftop							
SIZING INFO							
<b>Drainage Area (ac):</b> 83.84 (M7A) / 2.28 (M7A2)							
<b>Impervious Area (ac):</b> 47.43 (M7A) / 1.36 (M7A2)							
<b>Practice Area Available (ft<sup>2</sup>):</b> 66,000							
<b>Existing Head Available?</b> --							

Date Assessed: May 16, 2013, 1:21 PM

Assessed by: KMH/AGM

ID#: Retrofit M7B											
<b>Name:</b> Open area east of Case Parkway											
<b>Concept Description:</b> Proposed underground recharge system to capture drainage from Bilodeau Court and Case Parkway. Add additional drainage lines to direct existing drainage networks to retrofit. Drainage area could also include areas directed to Retrofit #M7C and M7D.											
<b>Notes/Feasibility:</b> Site is located on UVM property so an agreement between MS4s would be needed. Site is currently partially wooded but existing trees are in poor health.											
GENERAL SITE INFORMATION	RETROFIT DETAILS										
<b>Site Contact Info:</b> Megan Moir, Burlington / UVM	<b>Project Candidate:</b> Ok										
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP										
<b>Land Use 1:</b> Institutional	<b>Proposed Retrofit Practice 1:</b> Infiltration										
<b>Land Use 2:</b> Green space east of Case Pkwy	<b>Proposed Retrofit Practice 2:</b> -None Selected-										
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> -None Selected-										
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-										
<b>Sources/pollutants 1:</b> No	<b>Maintenance Burden:</b> Medium										
<b>Sources/pollutants 2:</b> -None Selected-	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Benefits:</b>                      Storage: NO                      Water Quality: YES                      Recharge: YES                      Demo: NO                      Repair: NO                      Reuse: NO                 </td> <td style="width: 50%; vertical-align: top;"> <b>Conflicts:</b>                      Soils: NO                      Access: NO                      Land Use: NO                      Utilities: NO                      Polluted: NO                      High WT: NO                      Wetlands: NO                 </td> </tr> <tr> <td colspan="2"><b>Other:</b> None</td> </tr> <tr> <td colspan="2"><b>Other:</b> Existing trees, many in poor health</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td colspan="2"> </td> </tr> </table>	<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: YES Demo: NO Repair: NO Reuse: NO	<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO	<b>Other:</b> None		<b>Other:</b> Existing trees, many in poor health					
<b>Benefits:</b> Storage: NO Water Quality: YES Recharge: YES Demo: NO Repair: NO Reuse: NO		<b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: NO Polluted: NO High WT: NO Wetlands: NO									
<b>Other:</b> None											
<b>Other:</b> Existing trees, many in poor health											
<b>Soils:</b> Good Infiltration											
<b>Use in Retrofit DA:</b> -None Selected-											
SIZING INFO											
<b>Drainage Area (ac):</b> 7.05											
<b>Impervious Area (ac):</b> 3.24											
<b>Practice Area Available (ft<sup>2</sup>):</b> 9,300											
<b>Existing Head Available?</b> --											

Date Assessed: May 17, 2013, 9:56 AM

Assessed by: KMH/AGM

ID#: Retrofit M7C																			
<b>Name:</b> Case Parkway center island																			
<b>Concept Description:</b> Proposed bioretention area in center island on Case Parkway. Direct road drainage to bioretention using a speed bump across Case Parkway. The bioretention could underdrain/overflow to existing drainage system and outfall.																			
<b>Notes/Feasibility:</b> Site currently is within the drainage area for the UVM North Campus Pond.																			
GENERAL SITE INFORMATION	RETROFIT DETAILS																		
<b>Site Contact Info:</b> Megan Moir, Burlington	<b>Project Candidate:</b> Ok																		
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP																		
<b>Land Use 1:</b> Single Family Residential	<b>Proposed Retrofit Practice 1:</b> Bioretention																		
<b>Land Use 2:</b> Grass island	<b>Proposed Retrofit Practice 2:</b> optional green street bumpouts along Case Pkwy																		
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> Impervious Cover Removal																		
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-																		
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Medium																		
<b>Sources/pollutants 2:</b> None	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><b>Benefits:</b></td> <td style="width: 50%;"><b>Conflicts:</b></td> </tr> <tr> <td>Storage: NO</td> <td>Soils: NO</td> </tr> <tr> <td>Water Quality: YES</td> <td>Access: NO</td> </tr> <tr> <td>Recharge: YES</td> <td>Land Use: NO</td> </tr> <tr> <td>Demo: YES</td> <td>Utilities: YES</td> </tr> <tr> <td>Repair: NO</td> <td>Polluted: NO</td> </tr> <tr> <td>Reuse:</td> <td>High WT: NO</td> </tr> <tr> <td></td> <td>Wetlands: NO</td> </tr> <tr> <td><b>Other:</b> None</td> <td><b>Other:</b> Existing E/T/C in island along western edge</td> </tr> </table>	<b>Benefits:</b>	<b>Conflicts:</b>	Storage: NO	Soils: NO	Water Quality: YES	Access: NO	Recharge: YES	Land Use: NO	Demo: YES	Utilities: YES	Repair: NO	Polluted: NO	Reuse:	High WT: NO		Wetlands: NO	<b>Other:</b> None	<b>Other:</b> Existing E/T/C in island along western edge
<b>Benefits:</b>		<b>Conflicts:</b>																	
Storage: NO		Soils: NO																	
Water Quality: YES		Access: NO																	
Recharge: YES	Land Use: NO																		
Demo: YES	Utilities: YES																		
Repair: NO	Polluted: NO																		
Reuse:	High WT: NO																		
	Wetlands: NO																		
<b>Other:</b> None	<b>Other:</b> Existing E/T/C in island along western edge																		
<b>Soils:</b> Good Infiltration																			
<b>Use in Retrofit DA:</b> Street																			
SIZING INFO																			
<b>Drainage Area (ac):</b> 0.90																			
<b>Impervious Area (ac):</b> 0.51																			
<b>Practice Area Available (ft<sup>2</sup>):</b> 1,500																			
<b>Existing Head Available?</b> --																			

Date Assessed: May 17, 2013, 10:11 AM

Assessed by: KMH/AGM

ID#: Retrofit M7D	
<p><b>Name:</b> 140 East Ave. Residence</p> <p><b>Concept Description:</b> Construct a bioretention area in underutilized private green space. Divert drainage from existing drainage structure in Bilodeau Court. Alternative practice may include permeable pavement shoulders/parking lanes in the road ROW.</p> <p><b>Notes/Feasibility:</b> Proposed site location is on private property. Utilities may present conflicts for retrofit opportunities.</p>	
GENERAL SITE INFORMATION	RETROFIT DETAILS
<b>Site Contact Info:</b> Megan Moir, Burlington	<b>Project Candidate:</b> Ok
<b>Ownership:</b> Public	<b>Retrofit of new or existing BMP:</b> New BMP
<b>Land Use 1:</b> Single Family Residential	<b>Proposed Retrofit Practice 1:</b> Bioretention
<b>Land Use 2:</b> Backyard/ROW	<b>Proposed Retrofit Practice 2:</b> Permeable parking lanes on Bilodeau Ct
<b>Existing BMP on site?</b> No	<b>Non-Structural Controls:</b> Other
<b>Is site a hotspot?</b> No	<b>Non-Structural Other:</b> -None Selected-
<b>Sources/pollutants 1:</b> Sediment	<b>Maintenance Burden:</b> Low
<b>Sources/pollutants 2:</b> -None Selected-	<p><b>Benefits:</b> Storage: NO Water Quality: YES Recharge: YES Demo: NO Repair: NO Reuse: NO</p> <p><b>Conflicts:</b> Soils: NO Access: NO Land Use: NO Utilities: YES Polluted: NO High WT: NO Wetlands: NO</p> <p><b>Other:</b> Gas, fiber optics, and above ground electric in ROW</p>
<b>Soils:</b> Good Infiltration	
<b>Use in Retrofit DA:</b> Street	
SIZING INFO	
<b>Drainage Area (ac):</b> 0.67	<b>Other:</b> None
<b>Impervious Area (ac):</b> 0.37	
<b>Practice Area Available (ft<sup>2</sup>):</b> 2,240	
<b>Existing Head Available?</b> --	

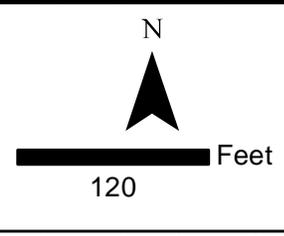
Date Assessed: May 17, 2013, 11:29 AM

Assessed by: KMH/AGM



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend			
★ Retrofit	▲ Outfalls	□ AirportProperties	— 2ft_Contours
□ Retrofit DA	■ Catch basins	□ Watershed	— stream
■ PracticeArea	● Manholes	□ Wetlands_SoBu	— Storm
	● Existing BMP	□ Parcels	— Sanitary
		□ Existing BMP DA	— Combined
			— Waterline



Retrofit #M7B: Case Pkwy (east)/  
 #M7C: Case PKWY Center Island/  
 #M7D: 140 East Ave

## **APPENDIX B**

### **FUTURE GROWTH MEMORANDUM**



**CHITTENDEN COUNTY RPC**  
*Communities Planning Together*

Date: July 18, 2013

To: Thomas J. DiPietro Jr., Stormwater Superintendent, City of South Burlington

Megan Moir, Plangineer, City of Burlington

From: Melanie Needle, Senior Planner, CCRPC

RE: Impervious Surface Analysis in the Centennial Brook Watershed

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This memo documents the process for quantifying additional non-jurisdictional impervious area in the Centennial Brook Watershed. Centennial Brook watershed is located in the City of Burlington and the City of South Burlington. Non-Jurisdictional growth is impervious surface that is less than one acre.

**Procedure**

1. Identify parcels that do not have a state storm water permit within the Centennial Brook Watershed study. Parcels that do not have a state stormwater permit are considered to be non-jurisdictional. Parcels with no potential for impervious growth (Centennial Woods and the Green Mount Cemetery) are removed. The S.D. Ireland parcel in Burlington was not included because it has over 1 acre of impervious area and any expansion greater than 5,000 sf of impervious area would require it to obtain a State stormwater permit.
2. Determine the annual rate of change of non-jurisdictional impervious area between two time periods. The formula for calculating the growth rate is  $(\text{Power}((\text{end value}/\text{start value}), (1/N)) - 1) * 100$ . The end value is the total impervious area for the watershed in each city. The start value is the total impervious area for the earliest year. **According to this method, impervious area has increased 3.37% per year in Burlington and .36% per year in South Burlington.**
3. Apply the impervious area growth rate from step 2 to each parcel within the study area to determine the acreage of non-jurisdictional impervious growth potential.
  - a. Parcels cannot exceed the lot coverage per municipal regulations. Determine if a parcel can add more impervious area by dividing existing impervious and the total parcel acreage. If existing lot coverage does not exceed lot coverage then estimate the total future impervious area in 2025. The formula for this is  $(1 + \text{growth rate})^{(\text{future year} - \text{recent year})} * \text{recent year's impervious area}$ .

- b. If the future potential impervious area is greater than the lot coverage, then use the remaining lot coverage percentage to estimate the growth. The formula is

$$(\text{lot coverage} - (\text{existing lot area}/\text{parcel area}) * \text{parcel} + \text{existing impervious area.}$$

4. Using the resulting impervious values for 2025 estimated in step 3, parcels are “jurisdictional” if the sum of the existing and projected future impervious growth is greater than 1 acre. If a parcel’s total future impervious area is less than 1 acre then the new impervious is considered “non-jurisdictional”. The increase in new impervious area on the parcels with build out potential is shown in the table 1 below and is an estimate of the likely non-jurisdictional impervious area growth for the watershed by 2025.

**Table 1 2025 Projected Impervious Area for Parcels  
that do not have a State Stormwater Permit**

	<b>Existing Impervious Area (acres)</b>	<b>2025 Total Impervious Area (acres)</b>	<b>New Non- Jurisdictional Additional Impervious Area (acres)</b>
<b>Burlington (Total)</b>			
Non Jurisdictional	4.61	6.11	1.50
<b>South Burlington (Total)</b>			
JURISDICTIONAL	16.46	17.23	0.76
NON JURISDICTIONAL	37.87	39.90	2.03
<b>Grand Total for Watershed</b>			
	<b>58.95</b>	<b>63.24</b>	<b>4.29</b>

5. Estimate the total impervious area potential on a parcel based on lot coverage. The formula for this is  $(\text{Lot Cov} - \text{Existing \% imp area}) * \text{parcel area} + \text{existing imp area}$ . The estimation of total impervious area will assist in the identification of parcels that could become jurisdictional if a large development is planned and developed all at once. Table 2 shows the amount of impervious area possible if every parcel built out to the maximum lot coverage independent of time.

Table 2 Total Impervious Area for Parcels that do not have a State Stormwater Permit

	Existing Impervious Area (acres)	Total Impervious Area (Remaining Lot Coverage)	Difference Between Total Imp Area & Existing
<b>Burlington (Total)</b>			
NON JURISDICTIONAL	4.61	7.97	3.36
<b>South Burlington (Total)</b>	<b>54.34</b>	<b>132.69</b>	<b>78.36</b>
JURISDICTIONAL	19.47	68.90	49.43
NON JURISDICTIONAL	34.87	63.79	28.92
<b>Grand Total for Watershed</b>	<b>58.95</b>	<b>140.66</b>	<b>81.72</b>

4. Roads were not included in this analysis because they are not built out in the same manner as parcels and are not subject to lot coverage requirements. Any new roads in this watershed are likely to be for access to large future developments on larger parcels. Also any new expansions or sidewalk additions will likely put the impervious area threshold over 1 acre making the road subject to state stormwater standards.

## **APPENDIX C**

### **CENTENNIAL BROOK FLOW RESTORATION PLAN PROPOSED BEST MANAGEMENT PRACTICES**

Centennial Brook Flow Restoration Plan

Table C-1: Final Proposed BMPs for the Centennial Brook FRP

Project ID	Project Name	BMP Address	BMP Landowner	MS4s with Impervious Area	New or Existing	BMP Type	Expired Permit	Drainage Area (acres)	Impervious Area Managed	Impervious %	CPv Managed (ac-ft)	Volume Infiltrated (ac-ft)	BMP Description
CB0001	140 East Ave Residence	Bilodeau Ct, Burlington	MS4 Owned	Burlington	New	Bio		0.63	0.18	28%	0.046	0.046	Construct a bioretention area in underutilized private green space. Divert drainage from existing drainage structure in Bilodeau Court. Alternative practice may include permeable pavement shoulders/parking lanes in the road ROW.
CB0002	Best Western Windjammer Infiltration Basin A	North of Williston Rd and east of Dorset St, South Burlington	Private	South Burlington	New	IB	6323-9030	29.42	21.82	74%	2.023	2.023	Site drainage area currently includes only Best Western property. Outfall is severely eroded and is headcutting to the east and may soon reach paved access road. Concept includes stabilizing outfall and constructing a detention basin within existing gully. Expand current drainage area to intercept runoff from Williston Road drainage network and redirect drainage from abutting commercial properties.
CB0003	Best Western Windjammer Infiltration Basin B	North of Williston Rd and east of Dorset St, South Burlington	Private	South Burlington	New	IB	6323-9030	4.09	1.33	33%	0.053	0.053	Outfall is located west of Best Western. Site drainage area currently includes only Best Western property. Moderate erosion occurring. Concept includes stabilizing outfalls and constructing a detention basin within existing gully. Expand current drainage area to intercept runoff from the Williston Road drainage network. A portion of this drainage area could be directed to Retrofit 22 if necessary.
CB0004	Case Parkway Center Island	Case Pkwy, South Burlington	MS4 Owned	Burlington	Existing	Bio		0.86	0.23	27%	0.042	0.042	Proposed bioretention area in center island on Case Parkway. Direct road drainage to bioretention using a speed bump across Case Parkway. The bioretention could underdrain/overflow to existing drainage system and outfall.
CB0005	Centennial Court Apartments Infiltration	Centennial Ct, Burlington	MS4 Owned	Burlington, UVM	Existing	IB	No Permit	6.54	2.74	42%	0.067	0.067	Retrofit of existing dry basin to an infiltration basin. Increase contributing drainage area and add riser to outlet structure for improved flow control. Redirect road drainage from Centennial Court to basin. Site only takes runoff currently from a portion of the apartment roofs.
CB0006	Chamberlin School	South of Hanover St and west of Airport Pkwy, South Burlington	MS4 Owned	South Burlington	New	IG	No Permit	31.49	9.69	31%	1.955	1.955	Underground detention in open space of school property. It seems possible to collect drainage off of White Street (and upgradient residential neighborhood) and connect to existing system via school entrance. Underground chambers could be designed as infiltration pending results of soils test pitting. (note HSG – D on east side of school property; HSG – B on west side of school property).
CB0007	Clover St GSI	Clover St and Berkley St, South Burlington	MS4 Owned/Private	South Burlington	New	IG	No Permit	3.82	1.40	37%	0.073	0.073	30-ft wide residential streets with direct outfalls to streams, flat terrain, and good soils offer green street and neighborhood-scale disconnection opportunities (e.g., dry wells, rain gardens, pervious driveways, bump outs).
CB0008	Dumont Ave Infiltration Chambers	Dumont Ave, South Burlington	MS4 Owned	South Burlington, BTV	New	IG	No Permit	3.93	0.86	22%	0.047	0.047	Divert flows from existing catchbasins and convey down Dumont Ave via pipe or swale to underground recharge chambers on empty lot. Options exist for practice type, siting and conveyance mechanism depending on depth to GW, existing inverts, and future use by Airport. Discharge to existing pipe outlet at Airport basin.
CB0009	Duval St GSI	Duval St, South Burlington	MS4 Owned/Private	South Burlington	New	IG	No Permit	3.57	0.99	28%	0.048	0.048	30-ft wide residential streets with direct outfalls to streams, flat terrain, and good soils offer green street and neighborhood-scale disconnection opportunities (e.g., dry wells, rain gardens, pervious driveways, bump outs).

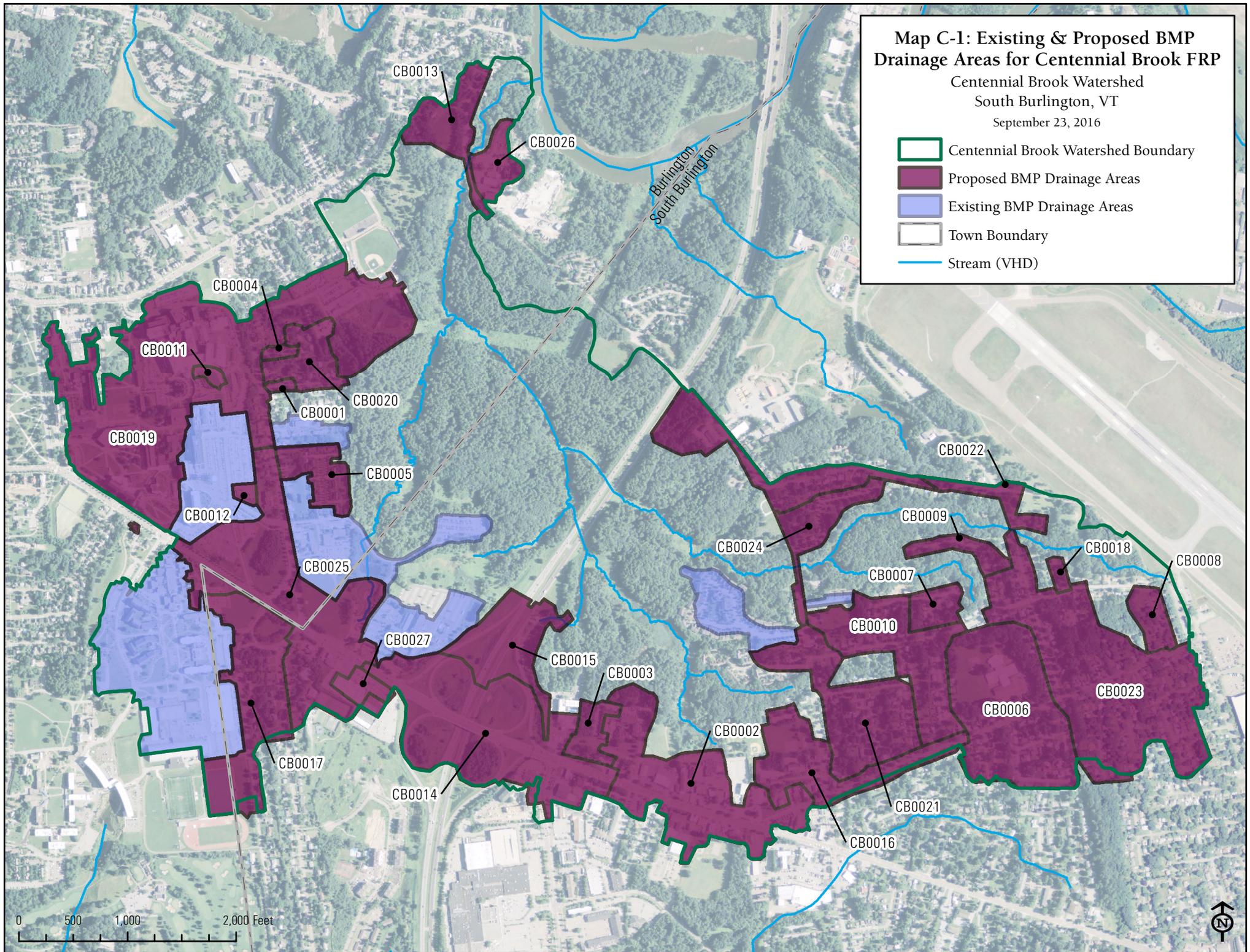
CB0010	Fielding Lane Condos Infiltration Gallery	Richard Terr and Clover St, South Burlington	Private	South Burlington	New	IG	No Permit	18.74	5.14	27%	0.148	0.148	Detention-retention facility. Open parcel adjacent to Fielding Lane Condos – seems to be owned by Fielding Lane Condos, existing surface storage available below outfall pipe. Would require access from Fielding Lane.
CB0011	Fletcher Allen Green Space	Carrigan Dr, Burlington	MS4 Owned	Burlington, UVM	Existing	Bio		0.89	0.53	59%	0.131	0.131	Proposed bioretention area in green space near hospital entrance. Redirect existing roadway trench drains into practice. Site currently drains to the UVM East Campus Pond.
CB0012	Fletcher Allen Parking Lot	Carrigan Dr, Burlington	MS4 Owned	Burlington	Existing	Bio		0.83	0.61	74%	0.097	0.097	Proposed bioretention area in existing drainage feature. Site is currently managed by existing swales, curb cuts, and a drainage depression. Swales and depression are currently eroding. Raise existing catchbasin frame/grate to provide ponding for bioretention.
CB0013	Grove Street Parking Lot	Grove St, Burlington	MS4 Owned	Burlington	New	IG	1-0811	8.82	2.33	26%	0.205	0.205	Divert existing drainage network and capture runoff from parking lot and direct to proposed underground recharge system. Low point in road drainage area is immediately south of the City parking lot. Consider replacing parking lot with permeable pavement.
CB0014	I-89 Cloverleaf Underground Detention	I-89 Exit 14 interchange, South Burlington	MS4 Owned	South Burlington, VTrans	Existing	UD	2-0126; 6323-9030; 2-0619	39.17	17.18	44%	2.354844	0	Detention structure bounded by northbound lanes and off-ramp (directing traffic to westbound Williston Rd). Existing culvert drains all upgradient area from interchange and Williston Rd. Modify outlet to install new control structure for Cpv storage.
CB0015	I-89 Exit 14 Detention Pond	I-89 Exit 14 interchange, South Burlington	Public or MS4 Owned (depending on option)	South Burlington, VTrans	New	DP	No Permit	13.07	3.58	27%	2.869972	0	Location flexible depending on evaluation. Most downstream location would be across from drainage outlet, below water main (best location for embankment – maximizes storage), but impact to water main R/W likely and partially on private property. Alternative is to move embankment upgradient to limit of I-89 R/W – would reduce available storage, but keep all work w/in VTrans jurisdiction.
CB0016	Jaycee Park	Patchen Rd north of White St, South Burlington	MS4 Owned	South Burlington	New	IG	No Permit	15.73	6.42	41%	0.898	0.898	Pretreatment tank to underground infiltration chambers. Pretreatment could be proprietary device (e.g. StormCeptor or equal) before underground chambers. Access would need to be coordinated with playing fields. Flow diversion structure would be in Patchen Road, with depth to drain pipe at approx 6.5 feet.
CB0017	Jug handle Underground Detention	East Terr and Main St, South Burlington	MS4 Owned	South Burlington, UVM	New	UD		22.01	8.60	39%	1.623737	0	Dry detention basin in existing green space to capture drainage from Spear Street and East Terrace. Modify existing drainage inlets to divert flows into basin. Drainage area is currently unmanaged and could be routed to Retrofit #MSA/24, alternatively. Retrofit includes the option of adding paved flumes from the roadways and risers to the outlet structures for the existing swales that run the perimeter of green space.
CB0018	N Henry Court	N Henry Ct, South Burlington	MS4 Owned	South Burlington, BTV	New	IG	No Permit	1.03	0.33	32%	0.024	0.024	Dead-end road with excess impervious cover. Currently, drainage comes down the road and flows directly down a steep slope to the stream/wetland area below. Install a rain garden/bio with an overflow to a leaching catch basin at end of road. Dumping of yard waste and debris was also observed down the slope. An old corrugated discharge pipe was found down in stream.
CB0019	North Campus Pond Retrofit	University Rd, Burlington	MS4 Owned	Burlington, UVM	Existing	DP		76.94	45.99	60%	4.719995	0	Proposed expansion of existing North Campus Pond to over control existing and future development. Raise existing embankment (10' +/-) to provide additional capacity. May consider horizontal expansion to the north and/or south.

CB0020	Open Area East of Case Parkway	Case Pkwy, Burlington	MS4 Owned	Burlington, UVM	New	IG		7.04	2.34	33%	0.27	0.27	Proposed underground recharge system to capture drainage from Bilodeau Court and Case Parkway. Add additional drainage lines to direct existing drainage networks to retrofit. Drainage area could also include areas directed to Retrofit #M7C and M7D.
CB0021	Patchen Rd & Pine St Infiltration Gallery	Pine St and Patchen Rd, South Burlington	Private	South Burlington	New	IG	No Permit	20.41	5.40	26%	0.913	0.913	Underground detention or infiltration (depending on soils). Diversion of flows from Patchen Road feasible, incoming pipe from open space/low point behind lots too deep to capture. Single lot also contains SF house (see photo). Would require diversion structure and pretreatment tank/structure.
CB0022	Patchen Road Kettle Hole	Patchen Rd south of I-89, South Burlington	MS4 Owned/Private	South Burlington, VTrans	New	IG	6292-9030	14.06	5.45	39%	0.268	0.268	Detention Pond (or infiltration basin if soils are acceptable). Directly convey runoff from contributing area off Patchen Road down slope to sediment forebay. Modify existing 30" culvert headwall (under I-89) to achieve required flow control. Could pick up Kirby Rd.
CB0023	Picard Circle Infiltration	Picard Cir, South Burlington	MS4 Owned	South Burlington, BTV	New	IG	No Permit	51.85	15.84	31%	0.682	0.682	Subsurface infiltration system. All houses within Picard Circle have been purchased by Airport and are now abandoned. Significant site area exists within yards and the road for major underground infiltration/ detention system. Constraints include depth of existing drainage pipe and depth above groundwater (adjacent brook approx 14 feet below existing ground).
CB0024	Queensbury Pond Retrofit	Queensbury Rd, South Burlington	Private	South Burlington	Existing	IB	1-0946	7.60	2.88	38%	0.16	0.16	Existing dry detention pond. Modify outlet to create an infiltration basin. Existing pond might predate subdivision (newer PVC outlet connects to older CMP barrel). Facility appears to have additional storage capacity to expand drainage area (level run confirmed this is feasible).
CB0025	Retrofit of Main Street UVM Pond	North of Williston Rd and East Terr, South Burlington	MS4 Owned	South Burlington, Burlington, UVM	Existing	DP		39.64	17.51	44%	3.894927	0	Repair outlet structure. Retrofit options include expanding the pond southward toward Williston Road or eastward as part of Retrofit #24 for additional storage, extended detention, and improved water quality. Site has the ability to capture drainage from Williston Road, adjacent commercial properties, and unmanaged UVM land.
CB0026	SD Ireland Property (20A)	Grove St, Burlington	Private	Burlington	New	IG		4.66	3.47	74%	0.613	0.613	SD Ireland proposed redevelopment to a housing complex. Site will reportedly be required to manage runoff on-site. Site currently drains to city drainage system in Grove St. Plans should address severe bank erosion at Centennial Brook culvert under SD Ireland driveway.
CB0027	Staples Plaza Underground Detention A	West of I-89 Exit 14 interchange, South Burlington	Private	South Burlington	New	UD	No Permit	2.50	2.50	100%	0.261065	0	Convert landscaped island to bioswale w/ UG storage to manage parking and small roof. Overflow to existing drain. Add trees for cover, shading, interception. Reduce width of one-way aisle for bioswale. Flat roof drains internally, discharges to drain inlet east of building. Modify internal roof drains, install trays, or use other blue roof design to provide temporary detention.

# Map C-1: Existing & Proposed BMP Drainage Areas for Centennial Brook FRP

Centennial Brook Watershed  
South Burlington, VT  
September 23, 2016

-  Centennial Brook Watershed Boundary
-  Proposed BMP Drainage Areas
-  Existing BMP Drainage Areas
-  Town Boundary
-  Stream (VHD)

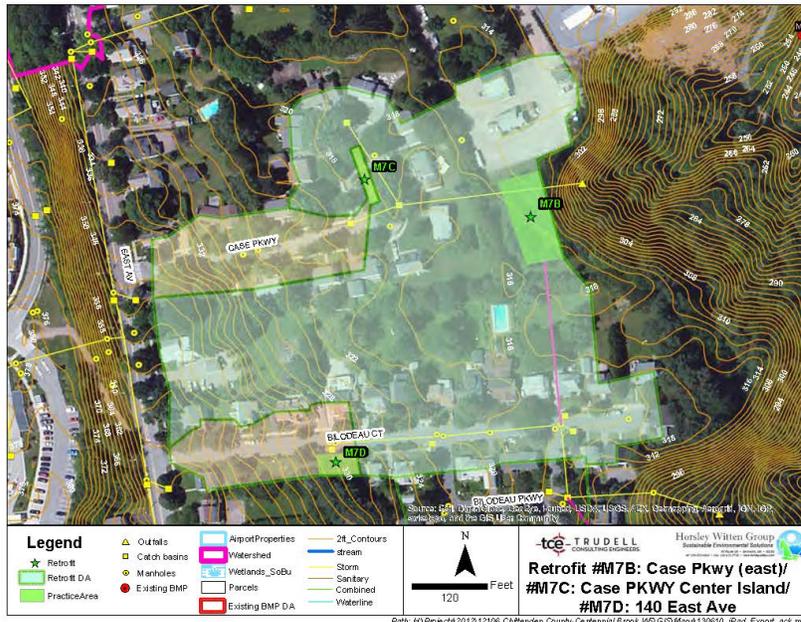


0 500 1,000 2,000 Feet



**Centennial Brook FRP BMP Summary Sheet**

<b>Site name:</b> 140 East Ave Residence		<b>South Burlington ID:</b> CB0001			
<b>Approximate address:</b>	Bilodeau Ct, Burlington	<b>MS4 where BMP is located:</b>	Burlington	<b>New or existing BMP?</b>	New
<b>Proposed BMP type:</b>	Bioretention				



Estimated project cost	\$44,000	MS4s contributing drainage to BMP	Burlington	
Drainage area (acres)	0.63		Primary land use in drainage	Residential
Impervious acres managed	0.18		2 or more landowners?	Yes
% Impervious	28%		CPv managed (ac-ft)	0.05
Land owner of BMP location	MS4 Owned		Volume infiltrated (ac-ft)	0.05
BMP Footprint Size (acres)			Primary or secondary BMP?	Secondary
BMP Depth (feet)			Expired permit(s)?	
Hydrologic soil group	A/B			

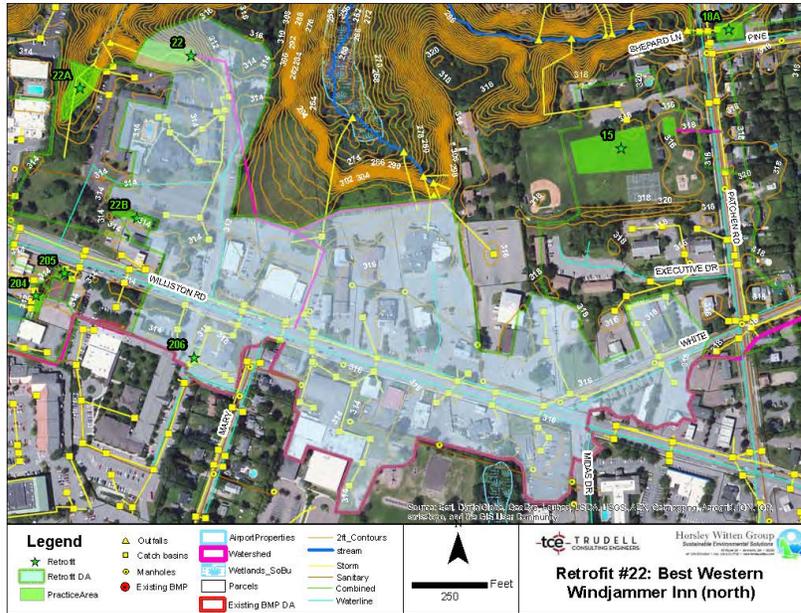
<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
Construct a bioretention area in underutilized private green space. Divert drainage from existing drainage structure in Bilodeau Court. Alternative practice may include permeable pavement shoulders/parking lanes in the road ROW.	Proposed site location is on private property. Utilities may present conflicts for retrofit opportunities.

## Centennial Brook FRP BMP Summary Sheet

<b>Site name:</b>	Best Western Windjammer Infiltration Basin A	<b>South Burlington ID:</b>	CB0002
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<b>Approximate address:</b>	North of Williston Rd and east of Dorset St, South Burlington	<b>MS4 where BMP is located:</b>	South Burlington	<b>New or existing BMP?</b>	New
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<b>Proposed BMP type:</b>	Infiltration Basin
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Estimated project cost	\$557,000	MS4s contributing drainage to BMP	South Burlington
Drainage area (acres)	29.42	Primary land use in drainage	Commercial/Industrial
Impervious acres managed	21.82	2 or more landowners?	Yes
% Impervious	74%	CPv managed (ac-ft)	2.02
Land owner of BMP location	Private	Volume infiltrated (ac-ft)	2.02
BMP Footprint Size (acres)		Primary or secondary BMP?	Primary
BMP Depth (feet)		Expired permit(s)?	6323-9030
Hydrologic soil group	A		

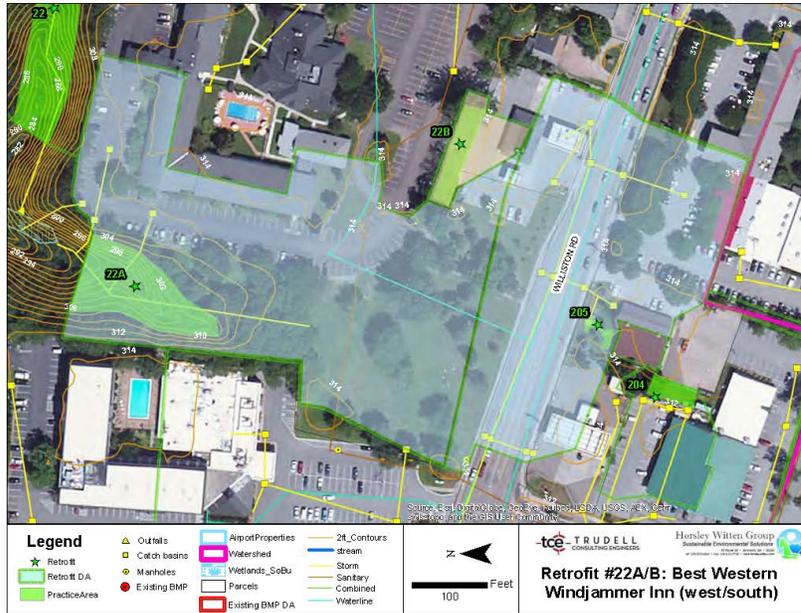
<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
<p>Site drainage area currently includes only Best Western property. Outfall is severely eroded and is headcutting to the east and may soon reach paved access road. Concept includes stabilizing outfall and constructing a detention basin within existing gully. Expand current drainage area to intercept runoff from Williston Road drainage network and redirect drainage from abutting commercial properties.</p>	<p>Priority project. The proposed site could manage a large drainage area that is unmanaged and unstable. Since the outfall is in need of immediate repair, feasibility is high. Planning considerations include the redirection of flow from abutting commercial properties.</p>

## Centennial Brook FRP BMP Summary Sheet

**Site name:** Best Western Windjammer Infiltration Basin B **South Burlington ID:** CB0003

<b>Approximate address:</b>	North of Williston Rd and east of Dorset St, South Burlington	<b>MS4 where BMP is located:</b>	South Burlington	<b>New or existing BMP?</b>	New
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**Proposed BMP type:** Infiltration Basin

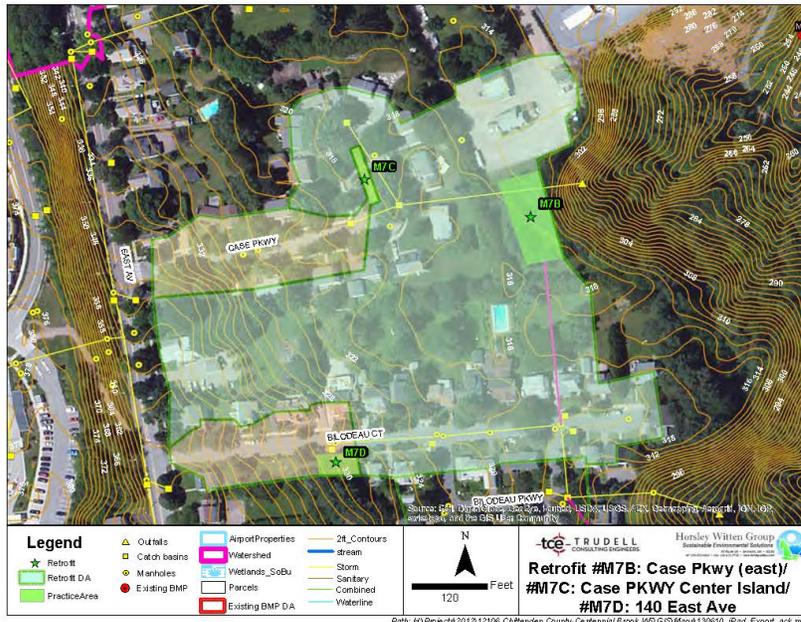


Estimated project cost	\$81,000	MS4s contributing drainage to BMP	South Burlington
Drainage area (acres)	4.09	Primary land use in drainage	Commercial/Industrial
Impervious acres managed	1.33	2 or more landowners?	No
% Impervious	33%	CPv managed (ac-ft)	0.05
Land owner of BMP location	Private	Volume infiltrated (ac-ft)	0.05
BMP Footprint Size (acres)		Primary or secondary BMP?	Primary
BMP Depth (feet)		Expired permit(s)?	6323-9030
Hydrologic soil group	A/B		

<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
<p>Outfall is located west of Best Western. Site drainage area currently includes only Best Western property. Moderate erosion occurring. Concept includes stabilizing outfalls and constructing a detention basin within existing gully. Expand current drainage area to intercept runoff from the Williston Road drainage network. A portion of this drainage area could be directed to Retrofit 22 if necessary.</p>	<p>Good. May make economic sense to divert some or all of this area to Retrofit site #22.</p>

**Centennial Brook FRP BMP Summary Sheet**

<b>Site name:</b> Case Parkway Center Island		<b>South Burlington ID:</b> CB0004			
<b>Approximate address:</b>	Case Pkwy, South Burlington	<b>MS4 where BMP is located:</b>	Burlington	<b>New or existing BMP?</b>	Existing
<b>Proposed BMP type:</b>	Bioretention				



Estimated project cost	\$25,000	MS4s contributing drainage to BMP	Burlington	
Drainage area (acres)	0.86		Primary land use in drainage	Residential
Impervious acres managed	0.23		2 or more landowners?	Yes
% Impervious	27%		CPv managed (ac-ft)	0.04
Land owner of BMP location	MS4 Owned		Volume infiltrated (ac-ft)	0.04
BMP Footprint Size (acres)			Primary or secondary BMP?	Secondary
BMP Depth (feet)			Expired permit(s)?	
Hydrologic soil group	A			

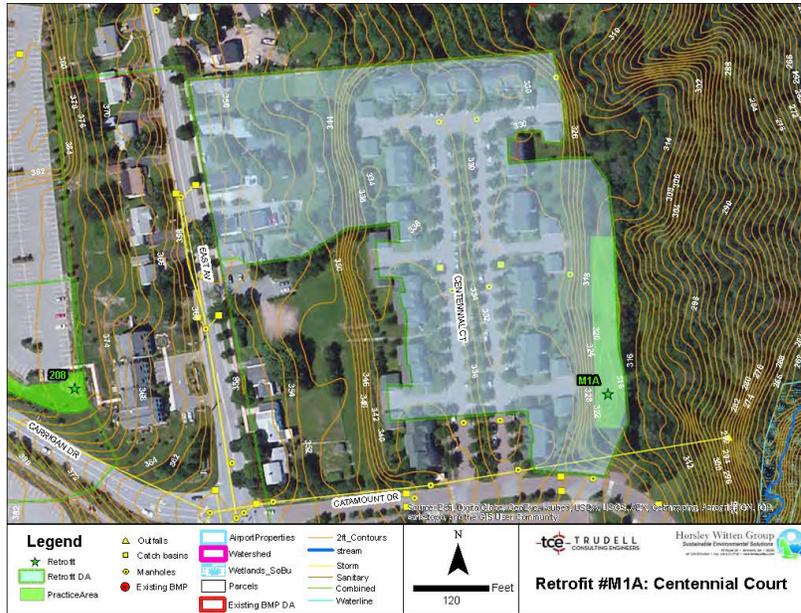
<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
Proposed bioretention area in center island on Case Parkway. Direct road drainage to bioretention using a speed bump across Case Parkway. The bioretention could underdrain/overflow to existing drainage system and outfall.	Site currently is within the drainage area for the UVM North Campus Pond.

## Centennial Brook FRP BMP Summary Sheet

<b>Site name:</b>	Centennial Court Apartments Infiltration	<b>South Burlington ID:</b>	CB0005
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<b>Approximate address:</b>	Centennial Ct, Burlington	<b>MS4 where BMP is located:</b>	UVM	<b>New or existing BMP?</b>	Existing
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<b>Proposed BMP type:</b>	Infiltration Basin
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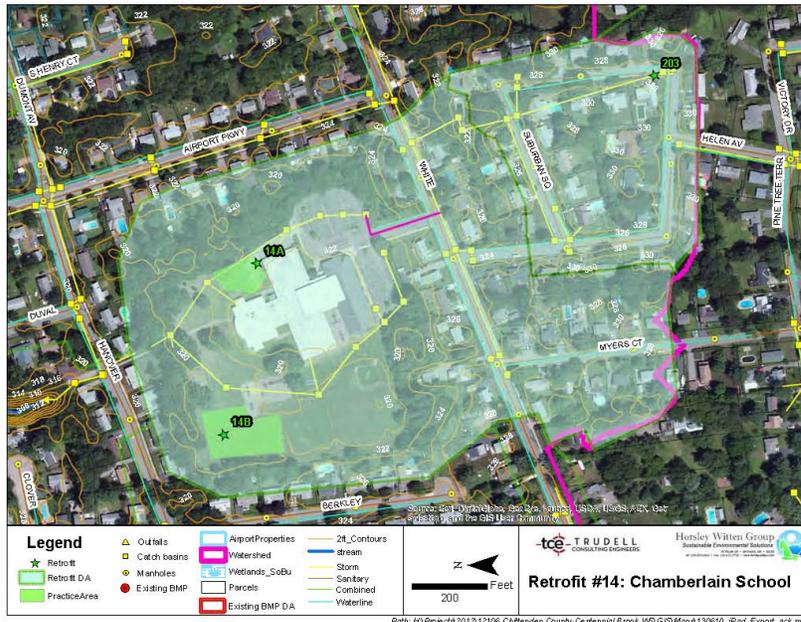


Estimated project cost	\$167,000	MS4s contributing drainage to BMP	Burlington, UVM
Drainage area (acres)	6.54	Primary land use in drainage	Residential
Impervious acres managed	2.74	2 or more landowners?	Yes
% Impervious	42%	CPv managed (ac-ft)	0.07
Land owner of BMP location	MS4 Owned	Volume infiltrated (ac-ft)	0.07
BMP Footprint Size (acres)		Primary or secondary BMP?	Secondary
BMP Depth (feet)		Expired permit(s)?	No Permit
Hydrologic soil group	B		

<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
<p>Retrofit of existing dry basin to an infiltration basin. Increase contributing drainage area and add riser to outlet structure for improved flow control. Redirect road drainage from Centennial Court to basin. Site only takes runoff currently from a portion of the apartment roofs.</p>	<p>Very good. Must adjust existing sewer manhole located with basin. This currently discharges to the UVM East Campus Pond.</p>

## Centennial Brook FRP BMP Summary Sheet

<b>Site name:</b> Chamberlin School		<b>South Burlington ID:</b> CB0006			
<b>Approximate address:</b>	South of Hanover St and west of Airport Pkwy, South Burlington	<b>MS4 where BMP is located:</b>	South Burlington	<b>New or existing BMP?</b>	New
<b>Proposed BMP type:</b>	Infiltration Gallery				

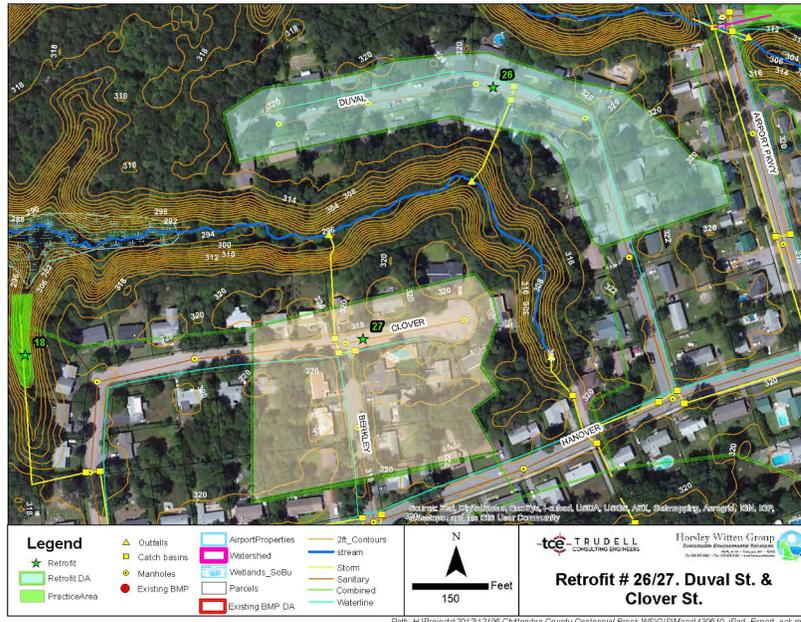


Estimated project cost	\$1,216,000	MS4s contributing drainage to BMP	South Burlington
Drainage area (acres)	31.49	Primary land use in drainage	Institutional
Impervious acres managed	9.69	2 or more landowners?	Yes
% Impervious	31%	CPv managed (ac-ft)	1.96
Land owner of BMP location	MS4 Owned	Volume infiltrated (ac-ft)	1.96
BMP Footprint Size (acres)		Primary or secondary BMP?	Primary
BMP Depth (feet)		Expired permit(s)?	No Permit
Hydrologic soil group	B/Not Rated		

Proposed BMP description:	Feasibility concerns:
<p>Underground detention in open space of school property. It seems possible to collect drainage off of White Street (and upgradient residential neighborhood) and connect to existing system via school entrance. Underground chambers could be designed as infiltration pending results of soils test pitting. (note HSG – D on east side of school property; HSG – B on west side of school property).</p>	<p>Existing drainage system (12" cmp) drains building and parking lot. Would need to verify capacity to add addition upgradient lands – only need to be sized for 1- YR. Cpv.</p>

## Centennial Brook FRP BMP Summary Sheet

<b>Site name:</b> Clover St GSI		<b>South Burlington ID:</b> CB0007			
<b>Approximate address:</b>	Clover St and Berkley St, South Burlington	<b>MS4 where BMP is located:</b>	South Burlington	<b>New or existing BMP?</b>	New
<b>Proposed BMP type:</b>	Infiltration Gallery				



Estimated project cost	\$72,000	MS4s contributing drainage to BMP	South Burlington						
Drainage area (acres)	3.82		Primary land use in drainage	Residential					
Impervious acres managed	1.40			2 or more landowners?	Yes				
% Impervious	37%				CPv managed (ac-ft)	0.07			
Land owner of BMP location	MS4 Owned/ Private					Volume infiltrated (ac-ft)	0.07		
BMP Footprint Size (acres)							Primary or secondary BMP?	Primary	
BMP Depth (feet)								Expired permit(s)?	No Permit
Hydrologic soil group	A								

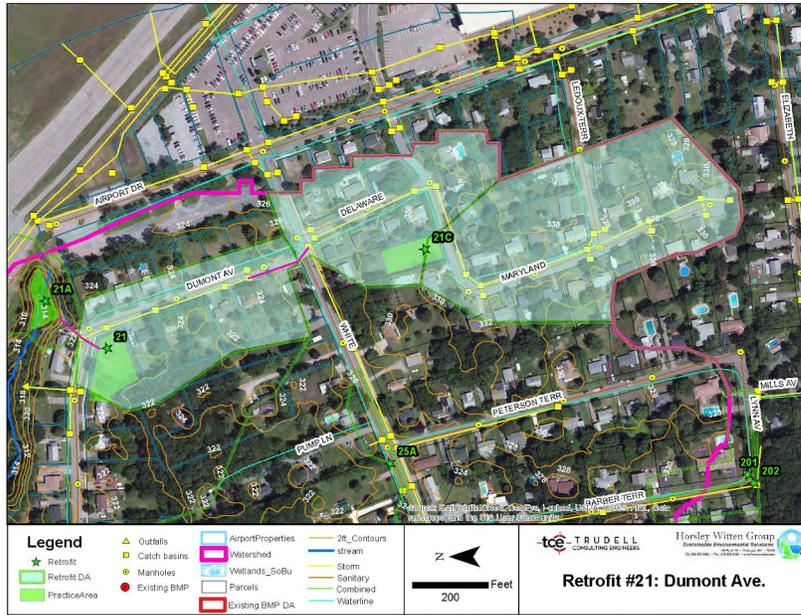
<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
<p>30-ft wide residential streets with direct outfalls to streams, flat terrain, and good soils offer green street and neighborhood-scale disconnection opportunities (e.g., dry wells, rain gardens, pervious driveways, bump outs).</p>	<p>Small drainage area; requires participation by homeowners.</p>

## Centennial Brook FRP BMP Summary Sheet

<b>Site name:</b>	Dumont Ave Infiltration Chambers	<b>South Burlington ID:</b>	CB0008
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<b>Approximate address:</b>	Dumont Ave, South Burlington	<b>MS4 where BMP is located:</b>	BTV	<b>New or existing BMP?</b>	New
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<b>Proposed BMP type:</b>	Infiltration Gallery
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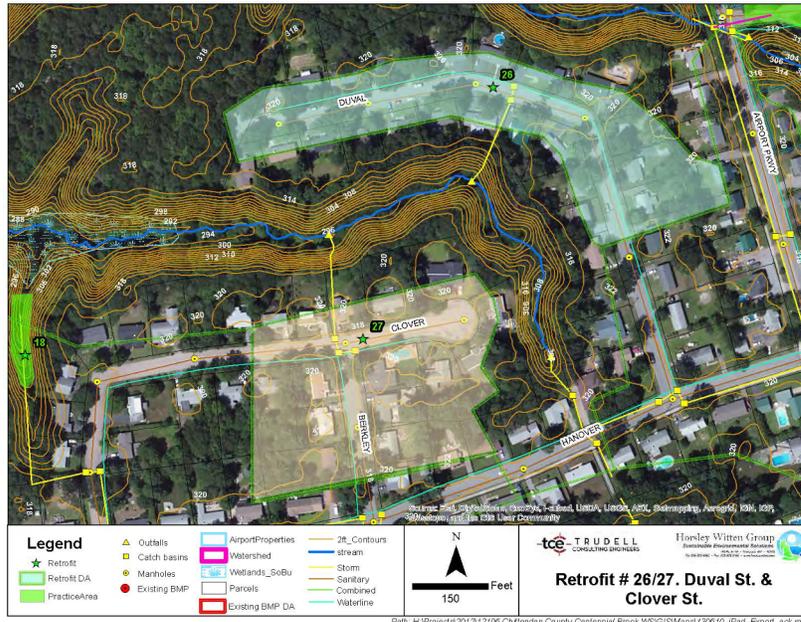


Estimated project cost	\$27,000	MS4s contributing drainage to BMP	South Burlington, BTV
Drainage area (acres)	3.93	Primary land use in drainage	Residential
Impervious acres managed	0.86	2 or more landowners?	Yes
% Impervious	22%	CPv managed (ac-ft)	0.05
Land owner of BMP location	MS4 Owned	Volume infiltrated (ac-ft)	0.05
BMP Footprint Size (acres)		Primary or secondary BMP?	Primary
BMP Depth (feet)		Expired permit(s)?	No Permit
Hydrologic soil group	A		

<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
Divert flows from existing catchbasins and convey down Dumont Ave via pipe or swale to underground recharge chambers on empty lot. Options exist for practice type, siting and conveyance mechanism depending on depth to GW, existing inverts, and future use by Airport. Discharge to existing pipe outlet at Airport basin.	Invert at White St. 321.40. Distance to vacant lot on corner – approx. 580' @ .005 slope; pipe outlets at 318.5'. Storage would be below grade. Depth to GW could be an issue and eliminate infiltration option. For above grade system inverts at White/Delaware would need to be raised. May be possible by resetting pipe inverts. Possible to create sand filter on top of UG chambers or shallow infiltration basin.

## Centennial Brook FRP BMP Summary Sheet

<b>Site name:</b> Duval St GSI		<b>South Burlington ID:</b> CB0009	
<b>Approximate address:</b>	Duval St, South Burlington	<b>MS4 where BMP is located:</b>	South Burlington
<b>Proposed BMP type:</b>	Infiltration Gallery	<b>New or existing BMP?</b>	New



Estimated project cost	\$79,000	MS4s contributing drainage to BMP	South Burlington						
Drainage area (acres)	3.57		Primary land use in drainage	Residential					
Impervious acres managed	0.99			2 or more landowners?	Yes				
% Impervious	28%				CPv managed (ac-ft)	0.05			
Land owner of BMP location	MS4 Owned/ Private					Volume infiltrated (ac-ft)	0.05		
BMP Footprint Size (acres)							Primary or secondary BMP?	Primary	
BMP Depth (feet)								Expired permit(s)?	No Permit
Hydrologic soil group	A								

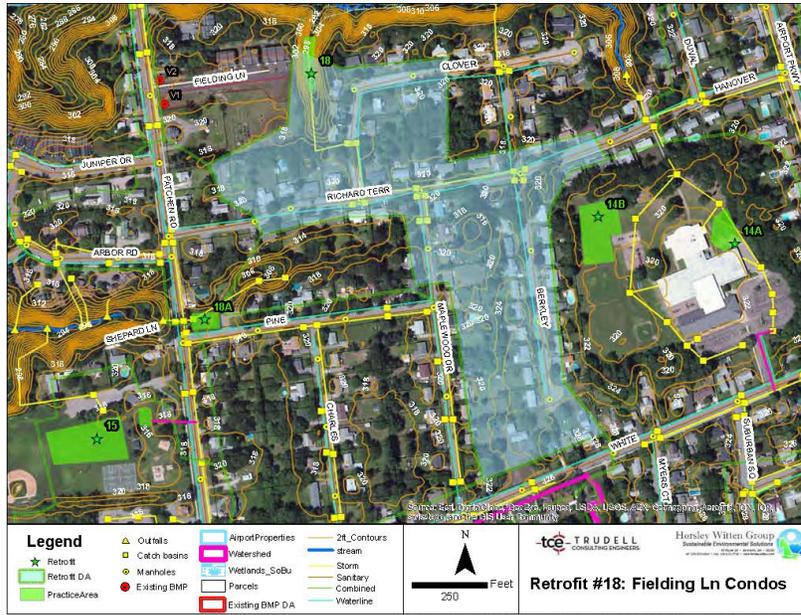
<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
<p>30-ft wide residential streets with direct outfalls to streams, flat terrain, and good soils offer green street and neighborhood-scale disconnection opportunities (e.g., dry wells, rain gardens, pervious driveways, bump outs).</p>	<p>Small drainage area; requires participation by homeowners.</p>

## Centennial Brook FRP BMP Summary Sheet

<b>Site name:</b>	Fielding Lane Condos Infiltration Gallery	<b>South Burlington ID:</b>	CB0010
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<b>Approximate address:</b>	Richard Terr and Clover St, South Burlington	<b>MS4 where BMP is located:</b>	South Burlington	<b>New or existing BMP?</b>	New
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<b>Proposed BMP type:</b>	Infiltration Gallery
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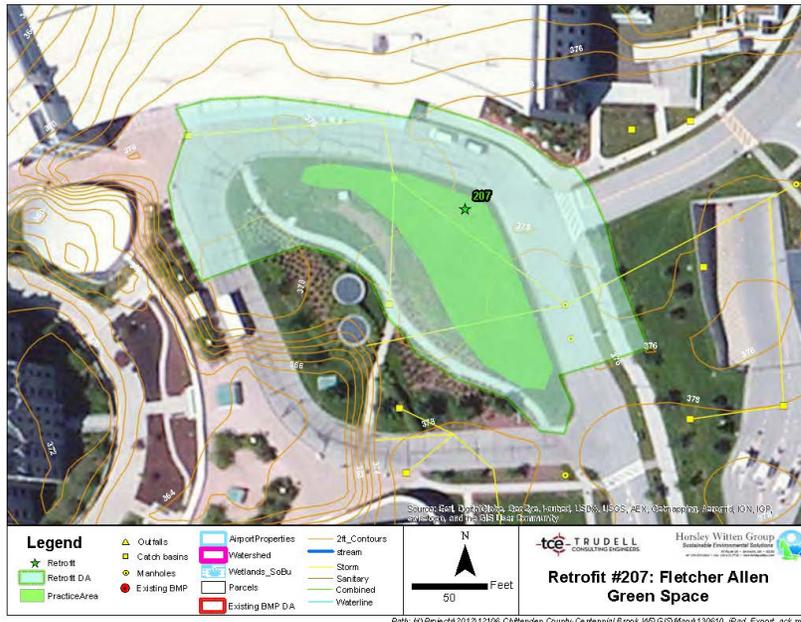


Estimated project cost	\$208,000	MS4s contributing drainage to BMP	South Burlington	
Drainage area (acres)	18.74		Primary land use in drainage	Residential
Impervious acres managed	5.14		2 or more landowners?	Yes
% Impervious	27%		CPv managed (ac-ft)	0.15
Land owner of BMP location	Private		Volume infiltrated (ac-ft)	0.15
BMP Footprint Size (acres)			Primary or secondary BMP?	Primary
BMP Depth (feet)			Expired permit(s)?	No Permit
Hydrologic soil group	A			

<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
Detention-retention facility. Open parcel adjacent to Fielding Lane Condos – seems to be owned by Fielding Lane Condos, existing surface storage available below outfall pipe. Would require access from Fielding Lane.	Likely private land - Major constraint is construction and maintenance access. Homeowners on Clover Street most impacted. Downgradient wetlands/stream below outfall pipe.

**Centennial Brook FRP BMP Summary Sheet**

<b>Site name:</b> Fletcher Allen Green Space		<b>South Burlington ID:</b> CB0011			
<b>Approximate address:</b>	Carrigan Dr, Burlington	<b>MS4 where BMP is located:</b>	Burlington	<b>New or existing BMP?</b>	Existing
<b>Proposed BMP type:</b>	Bioretention				



Estimated project cost	\$50,000	MS4s contributing drainage to BMP	Burlington, UVM	
Drainage area (acres)	0.89		Primary land use in drainage	Institutional
Impervious acres managed	0.53		2 or more landowners?	No
% Impervious	59%		CPv managed (ac-ft)	0.13
Land owner of BMP location	MS4 Owned		Volume infiltrated (ac-ft)	0.13
BMP Footprint Size (acres)			Primary or secondary BMP?	Secondary
BMP Depth (feet)			Expired permit(s)?	
Hydrologic soil group	Not Rated			

<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
Proposed bioretention area in green space near hospital entrance. Redirect existing roadway trench drains into practice. Site currently drains to the UVM East Campus Pond.	Moderate feasibility. Trench drain outlets are shallow so daylighting is possible. Plenty of green space for practice area. High profile location.

**Centennial Brook FRP BMP Summary Sheet**

<b>Site name:</b> Fletcher Allen Parking Lot		<b>South Burlington ID:</b> CB0012			
<b>Approximate address:</b>	Carrigan Dr, Burlington	<b>MS4 where BMP is located:</b>	Burlington	<b>New or existing BMP?</b>	Existing
<b>Proposed BMP type:</b>	Bioretention				

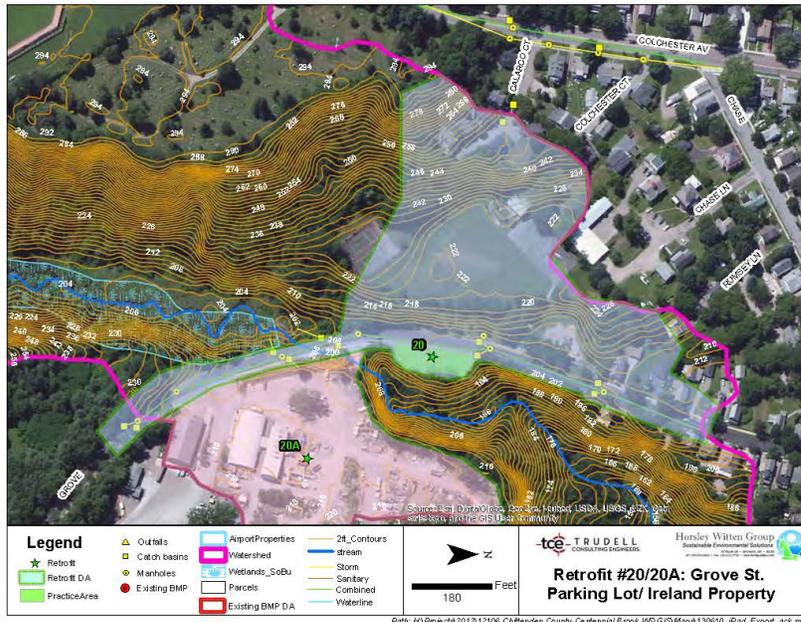


Estimated project cost	\$37,000	MS4s contributing drainage to BMP	Burlington						
Drainage area (acres)	0.83		Primary land use in drainage	Institutional					
Impervious acres managed	0.61			2 or more landowners?	No				
% Impervious	74%				CPv managed (ac-ft)	0.10			
Land owner of BMP location	MS4 Owned					Volume infiltrated (ac-ft)	0.10		
BMP Footprint Size (acres)							Primary or secondary BMP?	Secondary	
BMP Depth (feet)								Expired permit(s)?	
Hydrologic soil group	D								

<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
<p>Proposed bioretention area in existing drainage feature. Site is currently managed by existing swales, curb cuts, and a drainage depression. Swales and depression are currently eroding. Raise existing catchbasin frame/grate to provide ponding for bioretention.</p>	<p>Easy retrofit and aesthetic improvement. Parking lot already has features necessary directing drainage to the retrofit practice location.</p>

**Centennial Brook FRP BMP Summary Sheet**

<b>Site name:</b> Grove Street Parking Lot		<b>South Burlington ID:</b> CB0013			
<b>Approximate address:</b>	Grove St, Burlington	<b>MS4 where BMP is located:</b>	Burlington	<b>New or existing BMP?</b>	New
<b>Proposed BMP type:</b>	Infiltration Gallery				



Estimated project cost	\$156,000	MS4s contributing drainage to BMP	Burlington	
Drainage area (acres)	8.82		Primary land use in drainage	Road
Impervious acres managed	2.33		2 or more landowners?	Yes
% Impervious	26%		CPv managed (ac-ft)	0.20
Land owner of BMP location	MS4 Owned		Volume infiltrated (ac-ft)	0.20
BMP Footprint Size (acres)			Primary or secondary BMP?	Primary
BMP Depth (feet)			Expired permit(s)?	1-0811
Hydrologic soil group	B			

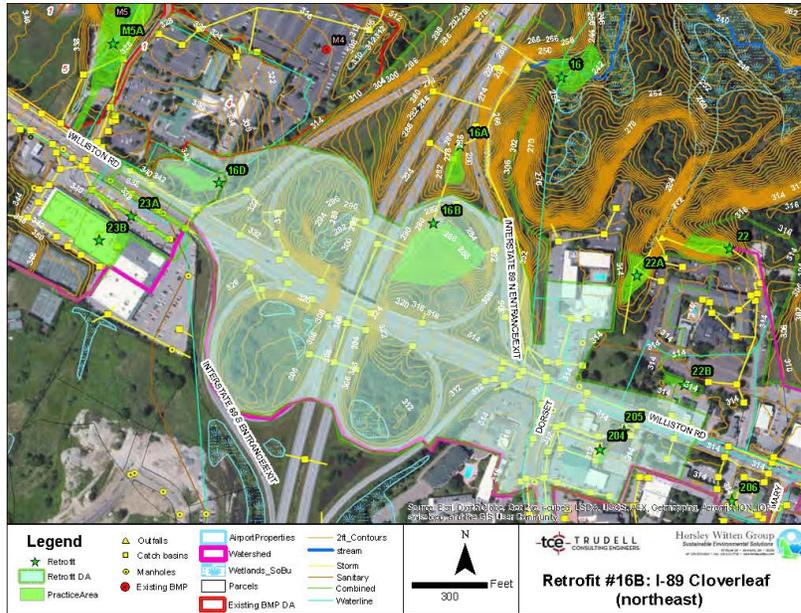
<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
Divert existing drainage network and capture runoff from parking lot and direct to proposed underground recharge system. Low point in road drainage area is immediately south of the City parking lot. Consider replacing parking lot with permeable pavement.	High feasibility since parking lot is currently in poor condition. Adequate head to capture roadway drainage. Test pits or borings needed to confirm soils and depth to groundwater.

**Centennial Brook FRP BMP Summary Sheet**

<b>Site name:</b>	I-89 Cloverleaf Underground Detention	<b>South Burlington ID:</b>	CB0014
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<b>Approximate address:</b>	I-89 Exit 14 interchange, South Burlington	<b>MS4 where BMP is located:</b>	VTrans	<b>New or existing BMP?</b>	Existing
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<b>Proposed BMP type:</b>	Underground Detention
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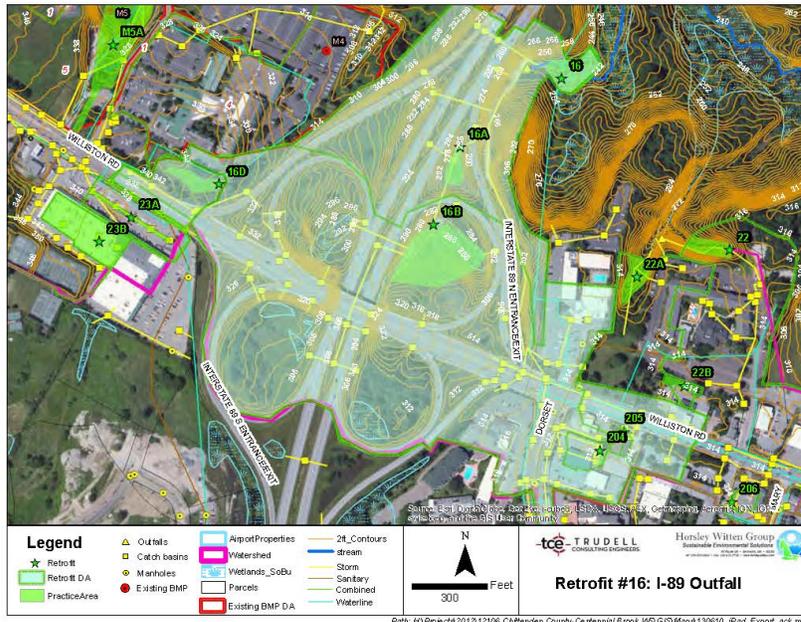


Estimated project cost	\$432,000	MS4s contributing drainage to BMP	South Burlington, VTrans	
Drainage area (acres)	39.17		Primary land use in drainage	Transportation
Impervious acres managed	17.18		2 or more landowners?	Yes
% Impervious	44%		CPv managed (ac-ft)	2.35
Land owner of BMP location	MS4 Owned		Volume infiltrated (ac-ft)	0.00
BMP Footprint Size (acres)			Primary or secondary BMP?	Secondary
BMP Depth (feet)			Expired permit(s)?	2-0126; 6323-9030; 2-0610
Hydrologic soil group	Not Rated			

<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
Detention structure bounded by northbound lanes and off-ramp (directing traffic to westbound Williston Rd). Existing culvert drains all upgradient area from interchange and Williston Rd. Modify outlet to install new control structure for Cpv storage.	Good location for retrofit. Existing outlet pipe (48" CMP) is easily accessible. Constraints: safety considerations from highway and existing wetlands (though mapped- all areas appear to be phrag dominated and isolated). Approx 14 of grade from invert to low point on off-ramp.

**Centennial Brook FRP BMP Summary Sheet**

<b>Site name:</b> I-89 Exit 14 Detention Pond		<b>South Burlington ID:</b> CB0015			
<b>Approximate address:</b>	I-89 Exit 14 interchange, South Burlington	<b>MS4 where BMP is located:</b>	VTrans	<b>New or existing BMP?</b>	New
<b>Proposed BMP type:</b>	Detention Pond				

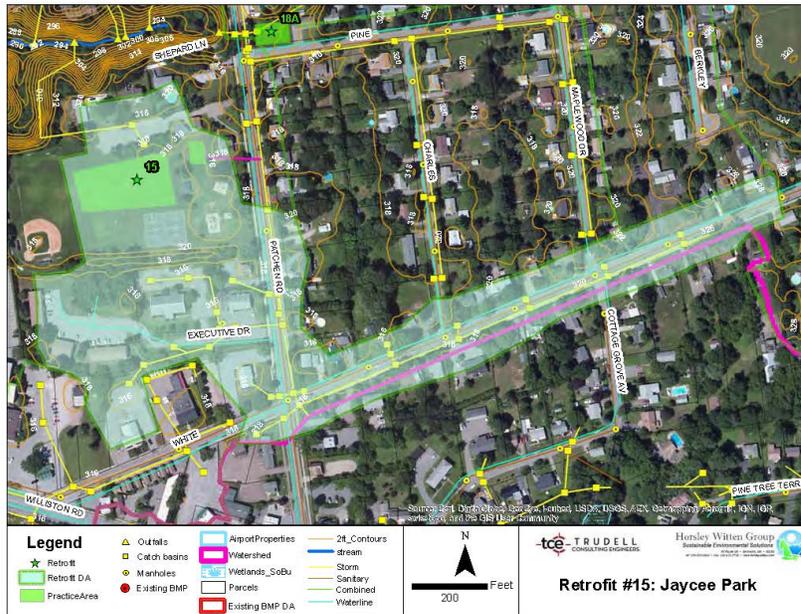


Estimated project cost	\$1,419,000	MS4s contributing drainage to BMP	South Burlington, VTrans						
Drainage area (acres)	13.07		Primary land use in drainage	Highway R/W					
Impervious acres managed	3.58			2 or more landowners?	No				
% Impervious	27%				CPv managed (ac-ft)	2.87			
Land owner of BMP location	Public or MS4 Owned (depending on location)					Volume infiltrated (ac-ft)	0.00		
BMP Footprint Size (acres)							Primary or secondary BMP?	Primary	
BMP Depth (feet)								Expired permit(s)?	No Permit
Hydrologic soil group	Not Rated								

<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
Location flexible depending on evaluation. Most downstream location would be across from drainage outlet, below water main (best location for embankment – maximizes storage), but impact to water main R/W likely and partially on private property. Alternative is to move embankment upgradient to limit of I-89 R/W – would reduce available storage, but keep all work w/in VTrans jurisdiction.	Feasible, but constraints need to be quantified, including property ownership, wetlands impacts (see Phrag in photo), water main. Construction and maintenance access good, via water mail R/W. VTrans noted that prior rip rap work was NOT a permitting issues with COE or DEC.

## Centennial Brook FRP BMP Summary Sheet

<b>Site name:</b> Jaycee Park		<b>South Burlington ID:</b> CB0016			
<b>Approximate address:</b>	Patchen Rd north of White St, South Burlington	<b>MS4 where BMP is located:</b>	South Burlington	<b>New or existing BMP?</b>	New
<b>Proposed BMP type:</b>	Infiltration Gallery				



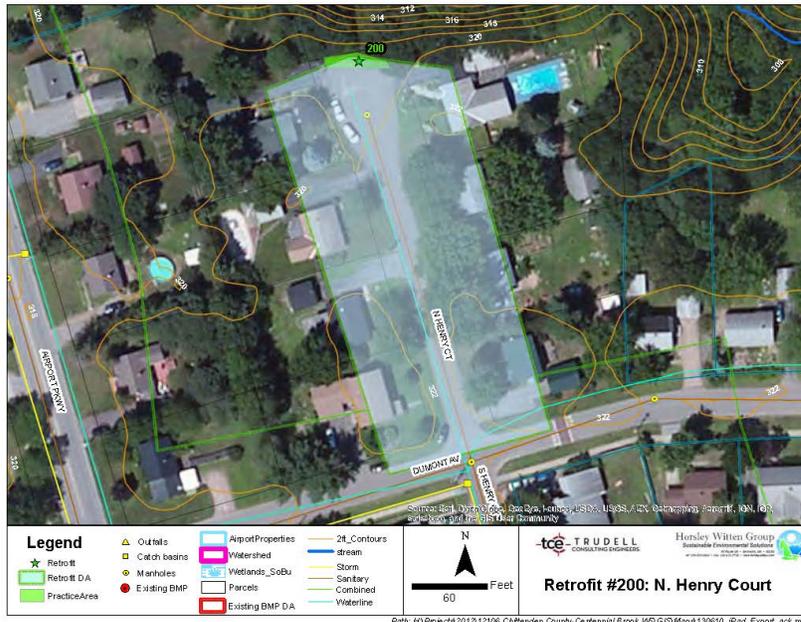
Estimated project cost	\$418,000	MS4s contributing drainage to BMP	South Burlington						
Drainage area (acres)	15.73		Primary land use in drainage	Park					
Impervious acres managed	6.42			2 or more landowners?	Yes				
% Impervious	41%				CPv managed (ac-ft)	0.90			
Land owner of BMP location	MS4 Owned					Volume infiltrated (ac-ft)	0.90		
BMP Footprint Size (acres)							Primary or secondary BMP?	Primary	
BMP Depth (feet)								Expired permit(s)?	No Permit
Hydrologic soil group	A								

Proposed BMP description:	Feasibility concerns:
<p>Pretreatment tank to underground infiltration chambers.                  Pretreatment could be proprietary device (e.g, StormCeptor or equal) before underground chambers.                  Access would need to be coordinated with playing fields.                  Flow diversion structure would be in Patchen Road, with depth to drain pipe at approx 6.5 feet.</p>	<p>Flow diversion from Patchen Road drives depth of inflow approx 10.5 feet below grade (bottom of chambers 12-13 feet). Existing trees in park, reconstruction of fields Soils at design depth, unknown.</p>



**Centennial Brook FRP BMP Summary Sheet**

<b>Site name:</b> N Henry Court		<b>South Burlington ID:</b> CB0018			
<b>Approximate address:</b>	N Henry Ct, South Burlington	<b>MS4 where BMP is located:</b>	South Burlington	<b>New or existing BMP?</b>	New
<b>Proposed BMP type:</b>	Infiltration Gallery				



Estimated project cost	\$27,000	MS4s contributing drainage to BMP	South Burlington, BTV	
Drainage area (acres)	1.03		Primary land use in drainage	Residential
Impervious acres managed	0.33		2 or more landowners?	Yes
% Impervious	32%		CPv managed (ac-ft)	0.02
Land owner of BMP location	MS4 Owned		Volume infiltrated (ac-ft)	0.02
BMP Footprint Size (acres)			Primary or secondary BMP?	Primary
BMP Depth (feet)			Expired permit(s)?	No Permit
Hydrologic soil group	A			

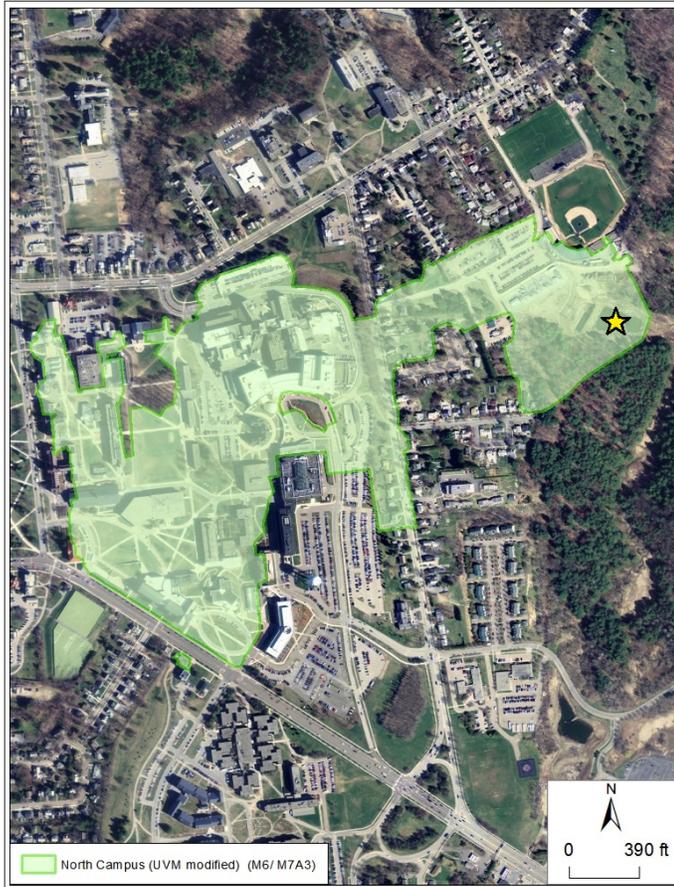
<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
Dead-end road with excess impervious cover. Currently, drainage comes down the road and flows directly down a steep slope to the stream/wetland area below. Install a rain garden/bio with an overflow to a leaching catch basin at end of road. Dumping of yard waste and debris was also observed down the slope. An old corrugated discharge pipe was found down in stream.	Small project, but could be a good GI demonstration.

**Centennial Brook FRP BMP Summary Sheet**

**Site name:** North Campus Pond Retrofit      **South Burlington ID:** CB0019

<b>Approximate address:</b>	University Rd, Burlington	<b>MS4 where BMP is located:</b>	UVM	<b>New or existing BMP?</b>	Existing
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**Proposed BMP type:** Detention Pond



Estimated project cost	\$725,000	MS4s contributing drainage to BMP	Burlington, UVM
Drainage area (acres)	76.94		Primary land use in drainage
Impervious acres managed	45.99	2 or more landowners?	Yes
% Impervious	60%	CPv managed (ac-ft)	4.72
Land owner of BMP location	MS4 Owned	Volume infiltrated (ac-ft)	0.00
BMP Footprint Size (acres)		Primary or secondary BMP?	Primary
BMP Depth (feet)		Expired permit(s)?	
Hydrologic soil group	B		

<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
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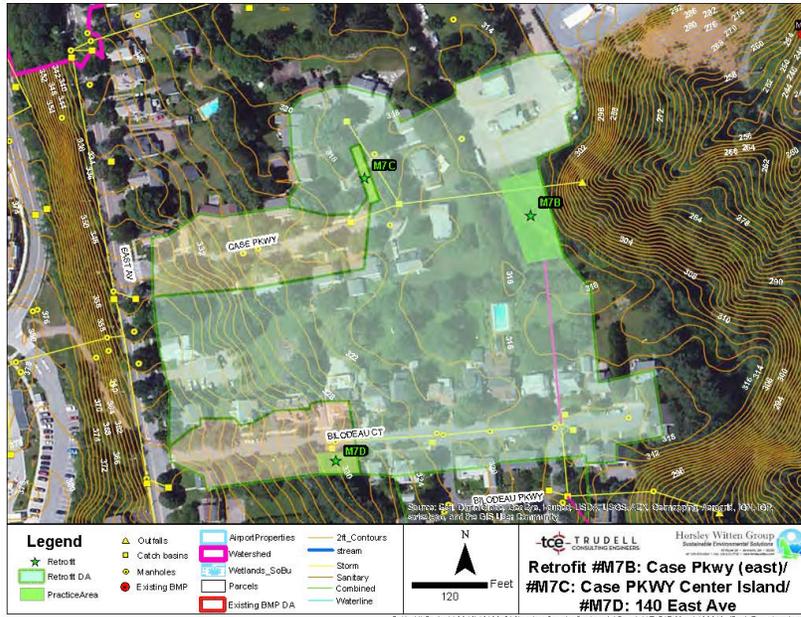
<p>Proposed expansion of existing North Campus Pond to over control existing and future development. Raise existing embankment (10' +/-) to provide additional capacity. May consider horizontal expansion to the north and/or south.</p>	<p>Prior to advancing design, UVM will provide a build-out analysis of the contributing drainage area. Drainage area to be updated to reflect the additional portion of UVM that will be redirected to the North Campus Pond.</p>
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## Centennial Brook FRP BMP Summary Sheet

**Site name:** Open Area East of Case Parkway **South Burlington ID:** CB0020

<b>Approximate address:</b>	Case Pkwy, Burlington	<b>MS4 where BMP is located:</b>	Burlington	<b>New or existing BMP?</b>	New
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**Proposed BMP type:** Infiltration Gallery



Estimated project cost	\$153,000	MS4s contributing drainage to BMP	Burlington, UVM
Drainage area (acres)	7.04	Primary land use in drainage	Institutional
Impervious acres managed	2.34	2 or more landowners?	Yes
% Impervious	33%	CPv managed (ac-ft)	0.27
Land owner of BMP location	MS4 Owned	Volume infiltrated (ac-ft)	0.27
BMP Footprint Size (acres)		Primary or secondary BMP?	Secondary
BMP Depth (feet)		Expired permit(s)?	
Hydrologic soil group	A/B		

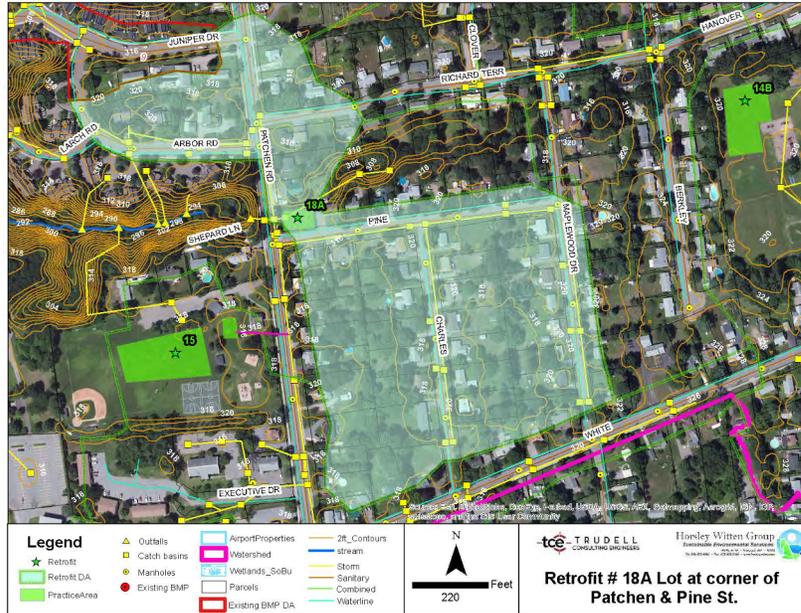
Proposed BMP description:	Feasibility concerns:
<p>Proposed underground recharge system to capture drainage from Bilodeau Court and Case Parkway. Add additional drainage lines to direct existing drainage networks to retrofit. Drainage area could also include areas directed to Retrofit #M7C and M7D.</p>	<p>Site is located on UVM property so an agreement between MS4s would be needed. Site is currently partially wooded but existing trees are in poor health.</p>

## Centennial Brook FRP BMP Summary Sheet

<b>Site name:</b>	Patchen Rd & Pine St Infiltration Gallery	<b>South Burlington ID:</b>	CB0021
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<b>Approximate address:</b>	Pine St and Patchen Rd, South Burlington	<b>MS4 where BMP is located:</b>	South Burlington	<b>New or existing BMP?</b>	New
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<b>Proposed BMP type:</b>	Infiltration Gallery
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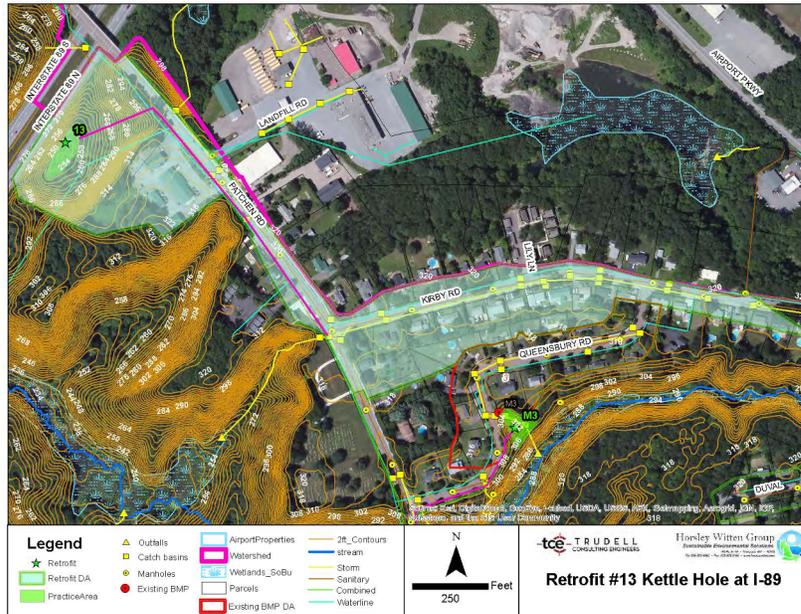


Estimated project cost	\$427,000	MS4s contributing drainage to BMP	South Burlington
Drainage area (acres)	20.41	Primary land use in drainage	Residential
Impervious acres managed	5.40	2 or more landowners?	Yes
% Impervious	26%	CPv managed (ac-ft)	0.91
Land owner of BMP location	Private	Volume infiltrated (ac-ft)	0.91
BMP Footprint Size (acres)		Primary or secondary BMP?	Primary
BMP Depth (feet)		Expired permit(s)?	No Permit
Hydrologic soil group	A		

<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
<p>Underground detention or infiltration (depending on soils). Diversion of flows from Patchen Road feasible, incoming pipe from open space/low point behind lots too deep to capture. Single lot also contains SF house (see photo). Would require diversion structure and pretreatment tank/structure.</p>	<p>Pipe inverts in Patchen Rd. feasible to divert to underground storage, except west side of road would require crossing water and sewer. Depth of construction ~8 to 10 ft. Private ownership of parcel biggest constraint.</p>

**Centennial Brook FRP BMP Summary Sheet**

<b>Site name:</b> Patchen Road Kettle Hole		<b>South Burlington ID:</b> CB0022			
<b>Approximate address:</b>	Patchen Rd south of I-89, South Burlington	<b>MS4 where BMP is located:</b>	South Burlington	<b>New or existing BMP?</b>	New
<b>Proposed BMP type:</b>	Infiltration Gallery				

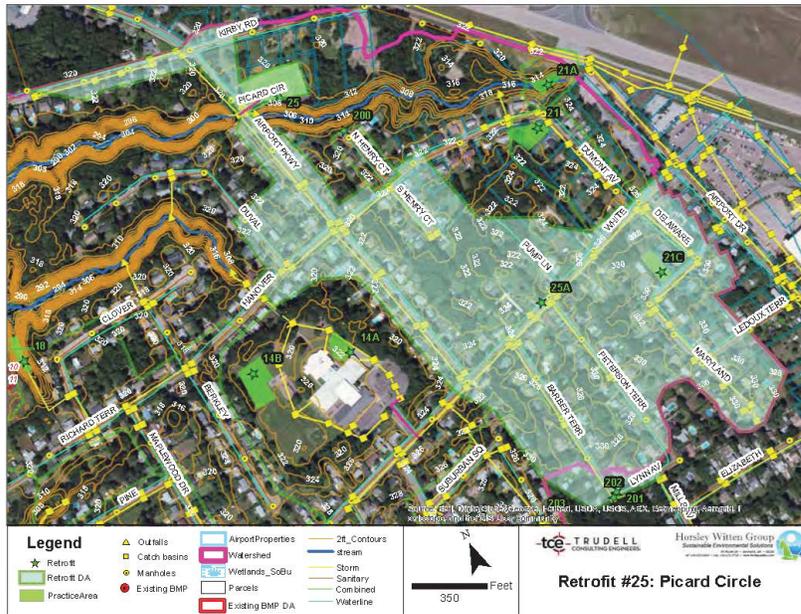


Estimated project cost	\$275,000	MS4s contributing drainage to BMP	South Burlington, VTrans	
Drainage area (acres)	14.06		Primary land use in drainage	Forest
Impervious acres managed	5.45		2 or more landowners?	Yes
% Impervious	39%		CPv managed (ac-ft)	0.27
Land owner of BMP location	MS4 Owned/ Private		Volume infiltrated (ac-ft)	0.27
BMP Footprint Size (acres)			Primary or secondary BMP?	Primary
BMP Depth (feet)			Expired permit(s)?	6292-9030
Hydrologic soil group	A			

<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
Detention Pond (or infiltration basin if soils are acceptable). Directly convey runoff from contributing area off Patchen Road down slope to sediment forebay. Modify existing 30" culvert headwall (under I-89) to achieve required flow control. Could pick up Kirby Rd.	Good site; final feasibility will require verification of wetland limits (soils generally upland), assessment of impacts to existing water main (runs through parcel, see blow-off valve in photo), and coordination with VTrans for ponding against I-89 R/W.

## Centennial Brook FRP BMP Summary Sheet

<b>Site name:</b> Picard Circle Infiltration		<b>South Burlington ID:</b> CB0023	
<b>Approximate address:</b>	Picard Cir, South Burlington	<b>MS4 where BMP is located:</b>	South Burlington
		<b>New or existing BMP?</b>	New
<b>Proposed BMP type:</b>	Infiltration Gallery		

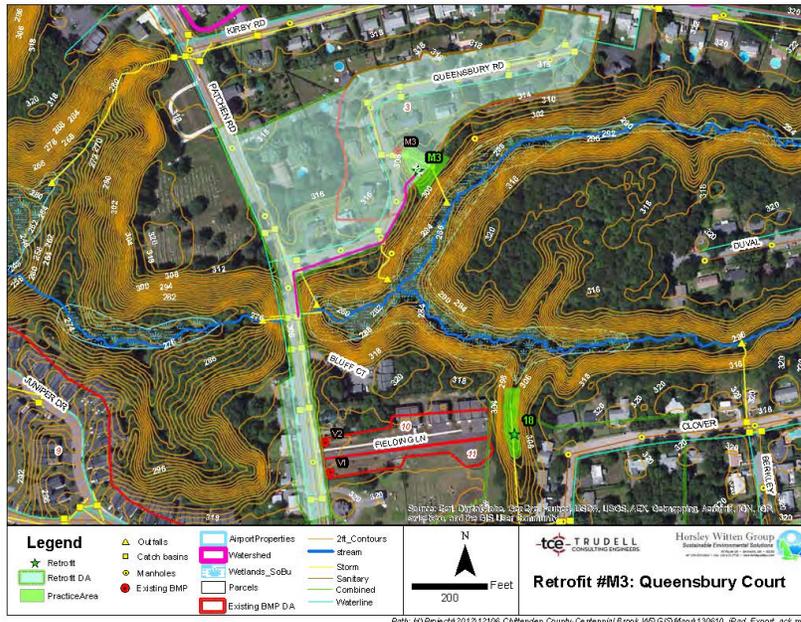


Estimated project cost	\$318,000	MS4s contributing drainage to BMP	South Burlington, BTV
Drainage area (acres)	51.85	Primary land use in drainage	Residential
Impervious acres managed	15.84	2 or more landowners?	Yes
% Impervious	31%	CPv managed (ac-ft)	0.68
Land owner of BMP location	MS4 Owned	Volume infiltrated (ac-ft)	0.68
BMP Footprint Size (acres)		Primary or secondary BMP?	Primary
BMP Depth (feet)		Expired permit(s)?	No Permit
Hydrologic soil group	A		

<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
<p>Subsurface infiltration system. All houses within Picard Circle have been purchased by Airport and are now abandoned. Significant site area exists within yards and the road for major underground infiltration/ detention system.</p> <p>Constraints include depth of existing drainage pipe and depth above groundwater (adjacent brook approx 14 feet below existing ground).</p>	<p>Depth of existing drainage line in Airport Pkwy may preclude piping from existing infrastructure to new system. One option would be to install diversion structure and partially submerge existing piping system.</p>

**Centennial Brook FRP BMP Summary Sheet**

<b>Site name:</b> Queensbury Pond Retrofit		<b>South Burlington ID:</b> CB0024			
<b>Approximate address:</b>	Queensbury Rd, South Burlington	<b>MS4 where BMP is located:</b>	South Burlington	<b>New or existing BMP?</b>	Existing
<b>Proposed BMP type:</b>	Infiltration Basin				



Estimated project cost	\$110,000	MS4s contributing drainage to BMP	South Burlington	
Drainage area (acres)	7.60		Primary land use in drainage	Residential
Impervious acres managed	2.88		2 or more landowners?	Yes
% Impervious	38%		CPv managed (ac-ft)	0.16
Land owner of BMP location	Private		Volume infiltrated (ac-ft)	0.16
BMP Footprint Size (acres)			Primary or secondary BMP?	Primary
BMP Depth (feet)			Expired permit(s)?	1-0946
Hydrologic soil group	A			

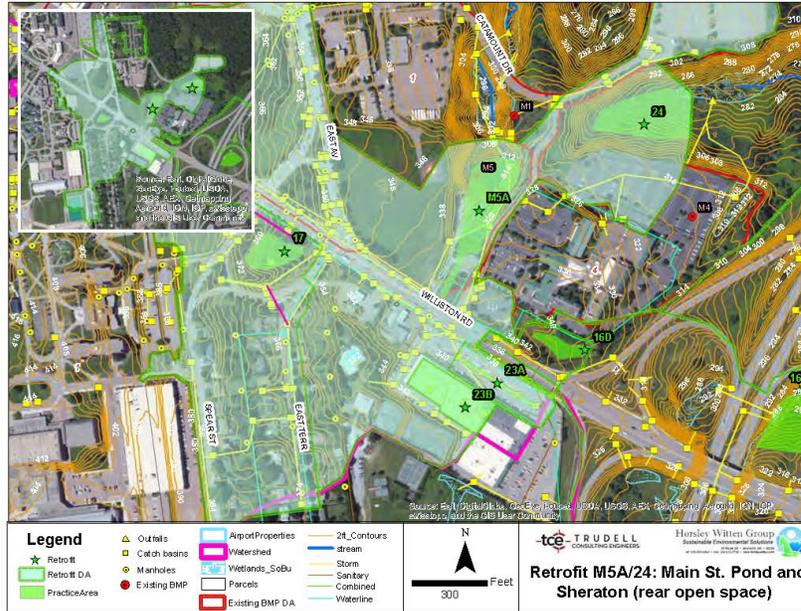
<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
Existing dry detention pond. Modify outlet to create an infiltration basin. Existing pond might predate subdivision (newer PVC outlet connects to older CMP barrel). Facility appears to have additional storage capacity to expand drainage area (level run confirmed this is feasible).	Old CMP barrel, new 15" PVC outlet, sink hole evidence – top of existing embankment, scour hole at barrel outlet, Incoming 15" HDPE, eroded inflow channel

## Centennial Brook FRP BMP Summary Sheet

<b>Site name:</b>	Retrofit of Main Street UVM Pond	<b>South Burlington ID:</b>	CB0025
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<b>Approximate address:</b>	North of Williston Rd and East Terr, South Burlington	<b>MS4 where BMP is located:</b>	UVM	<b>New or existing BMP?</b>	Existing
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<b>Proposed BMP type:</b>	Detention Pond
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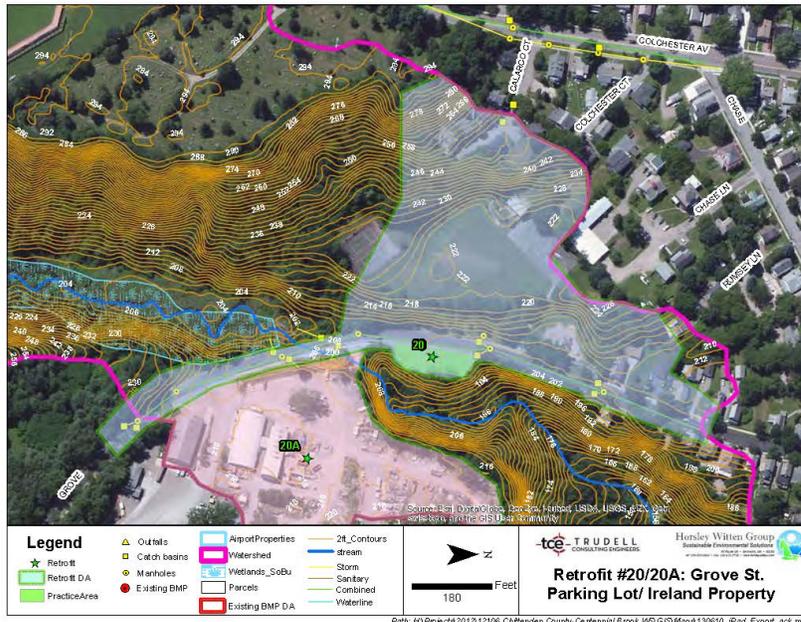


Estimated project cost	\$566,000	MS4s contributing drainage to BMP	South Burlington, Burlington, UVM
Drainage area (acres)	39.64		
Impervious acres managed	17.51		
% Impervious	44%		
Land owner of BMP location	MS4 Owned		
BMP Footprint Size (acres)			
BMP Depth (feet)			
Hydrologic soil group	C		
		Primary land use in drainage	Institutional
		2 or more landowners?	Yes
		CPv managed (ac-ft)	3.89
		Volume infiltrated (ac-ft)	0.00
		Primary or secondary BMP?	Primary
		Expired permit(s)?	

<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
Repair outlet structure. Retrofit options include expanding the pond southward toward Williston Road or eastward as part of Retrofit #24 for additional storage, extended detention, and improved water quality. Site has the ability to capture drainage from Williston Road, adjacent commercial properties, and unmanaged UVM land.	Priority location with high feasibility. Additional storage volume can be added by excavating southward toward the adjacent dirt parking lot and Williston Road.

**Centennial Brook FRP BMP Summary Sheet**

<b>Site name:</b> SD Ireland Property (20A)		<b>South Burlington ID:</b> CB0026			
<b>Approximate address:</b>	Grove St, Burlington	<b>MS4 where BMP is located:</b>	Burlington	<b>New or existing BMP?</b>	New
<b>Proposed BMP type:</b>	Infiltration Gallery				



Estimated project cost	\$558,000	MS4s contributing drainage to BMP	Burlington
Drainage area (acres)	4.66	Primary land use in drainage	Commercial/Industrial
Impervious acres managed	3.47	2 or more landowners?	No
% Impervious	74%	CPv managed (ac-ft)	0.61
Land owner of BMP location	Private	Volume infiltrated (ac-ft)	0.61
BMP Footprint Size (acres)		Primary or secondary BMP?	Primary
BMP Depth (feet)		Expired permit(s)?	
Hydrologic soil group	Not Rated		

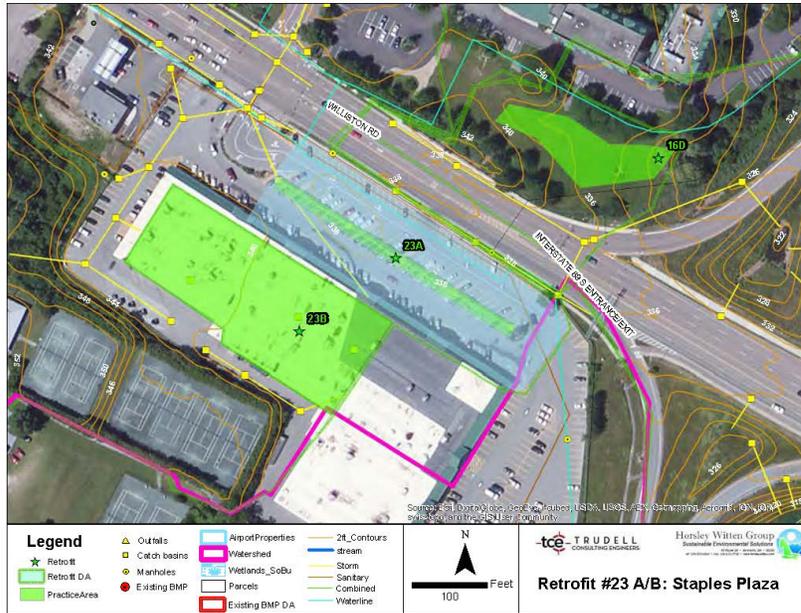
<b>Proposed BMP description:</b>	<b>Feasibility concerns:</b>
SD Ireland proposed redevelopment to a housing complex. Site will reportedly be required to manage runoff on-site. Site currently drains to city drainage system in Grove St. Plans should address severe bank erosion at Centennial Brook culvert under SD Ireland driveway.	Centennial Brook runs between property and Grove St.

## Centennial Brook FRP BMP Summary Sheet

**Site name:** Staples Plaza Underground Detention A **South Burlington ID:** CB0027

<b>Approximate address:</b>	West of I-89 Exit 14 interchange, South Burlington	<b>MS4 where BMP is located:</b>	South Burlington	<b>New or existing BMP?</b>	New
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**Proposed BMP type:** Underground Detention



Estimated project cost	\$334,000	MS4s contributing drainage to BMP	South Burlington
Drainage area (acres)	2.50	Primary land use in drainage	Commercial/Industrial
Impervious acres managed	2.50	2 or more landowners?	No
% Impervious	100%	CPv managed (ac-ft)	0.26
Land owner of BMP location	Private	Volume infiltrated (ac-ft)	0.00
BMP Footprint Size (acres)		Primary or secondary BMP?	Secondary
BMP Depth (feet)		Expired permit(s)?	No Permit
Hydrologic soil group	Not Rated		

Proposed BMP description:	Feasibility concerns:
<p>Convert landscaped island to bioswale w/ UG storage to manage parking and small roof. Overflow to existing drain. Add trees for cover, shading, interception. Reduce width of one-way aisle for bioswale. Flat roof drains internally, discharges to drain inlet east of building. Modify internal roof drains, install trays, or use other blue roof design to provide temporary detention.</p>	<p>This area could be managed in a larger retrofit downstream (Site # 24_M5). Primary outlet in catchbasin at lot entrance/exit. Rim to invert = 5.05'. Stalls are 18'x8', with a 27' drive aisle (60' and 57' curb to curb on the north and south side of island, respectively).</p>

**APPENDIX D**  
**PROJECT RANKING**

Centennial Brook Flow Restoration Plan  
Table D-1: BMP Ranking Criteria Key

Category	ID	Criteria	Technical Description	Description
Cost/Operations	A	Project Cost	The project costs were grouped into categories from >\$50,000 to \$1,000,000 based on the range of projects proposed. Cost estimates were developed using the latest unit costs from VTrans as well as local experience. More expensive projects are ranked lower.	Project Costs include additional engineering, permitting, and construction. Transportation and utility conflicts, as well as overall constructability is also reflected in the cost.
Project Design Metrics	B	Impervious Acres Managed (ac)	Natural groupings within the range of impervious managed for the proposed projects were identified. More impervious managed receives a higher score.	The more impervious managed by a project, the higher the potential pollutant reduction. Additionally, the goal of the FRP is to manage existing impervious surfaces.
	C	Channel Protection Volume (CPv) Mitigated, (i.e.. 1-year Storm)	Groupings within the range of CPv volume storage were identified. The largest grouping receives the highest score. The CPv was estimated in HydroCAD, using local rainfall data.	The Channel Protection Volume (CPv) is the volume of stormwater runoff generated from the 1-year design storm (1.98" in Burlington). A BMP which provides CPv storage was determined to reduce the High-flow (Q0.3%), which is the flow rate exceeded 0.3% of the time (output from the State's BMPDSS model). Mitigating the CPv reduces channel erosion and excessive
	D	Volume Infiltrated (ac-ft)	Natural groupings within the range of volumes infiltrated for the BMPs were identified to which relative points were be assigned. The largest volume infiltrated was assigned the highest score. Volumes were calculated in HydroCAD.	The Volume Infiltrated indicates the amount of stormwater runoff that is infiltrated into the groundwater, and provides baseflow for the stream. The TMDL flow targets include a low-flow target, which is addressed by an infiltration-based BMP.
Project Implementation	E	Permitability	Permitability is simplified into two categories to reflect the common scenarios in permitting, as 1) minimal permitting, versus 2) Complex permitting issues. An itemized list of permits was included to inform the ranking, but was not used in the scoring.	Permitability is a measure of the expected level of effort to permit the project, based on knowledge that each type of permit takes varying amounts of time. Some common permits include Stormwater Construction, Local Zoning, Act 250 amendments, VTRANS ROW, etc.
	F	Land Availability	Public land is preferred, followed by regulated private land, and private land where the owners are known to be open to participate. Private land, in which participation of the owner is unknown is lower priority.	Land availability is critical for BMPs requiring open space for detention and access for the City. Properties owned by the City are ranked the highest, followed by privately owned land that has an expired permit, which provides leverage for owner participation.
Other Project Benefits	G	Flood Mitigation	Flood mitigation is categorized by the scale of the impact.	Flood mitigation is categorized by the scale of the impact. A neighborhood flooding issue is weighed more heavily than a localized drainage issue.
	H	TMDL Flow Target Addressed (Q03, Q95)	More weight is on BMPs that address both TMDL targets- the high-flow (Q0.3%) and low-flow targets (Q95%). The high-flow target is addressed by detention BMPs which storage the CP volume.	The goal of the FRP is to implement projects which address the TMDL flow targets. The high-flow target is measured as a <b>reduction</b> in the stream flow rate exceeded 0.3% of the time, while the low-flow target is an <b>increase</b> in the stream flow rate exceeded 95% of the time (baseflow). Projects which address both targets through storage or infiltration of the 1-year design storm are weighted the highest, followed by projects which address just the high-flow. Projects which do not address the full 1-year storm volume are weighted the lowest.
	I	Lake Champlain Phosphorus TMDL	Yes or no whether the proposed practice will provide benefit toward the Lake Champlain Phosphorus TMDL. This will be determined once the TMDL compliance metrics are released.	The Lake Champlain Phosphorus TMDL has been developed in the effort to reduce nutrient loading and consequential toxic algal blooms in Lake Champlain. The TMDL will require stormwater BMPs to meet a certain level of Total Phosphorus reduction. Each BMP will be evaluated against the TMDL compliance metrics, and scored yes or no if the project meets the TMDL standards.
	J	Other Project Benefits/Constraints	This criteria is to account for indirect project benefits like infrastructure improvements (e.g. aging culvert replacement, wetlands enhancement, and if it addresses an expired permit), or potential constraints (e.g. utility issues encountered during construction).	This criteria is to account for indirect project benefits like infrastructure improvements, community benefits, habitat creation, etc., as well as things that might constrain the project such as the potential of encountering utilities during construction.

Centennial Brook Flow Restoration Plan  
 Table D-2: BMP Ranking Scoring Key

Category	ID	Criteria	Quality	Score	
Cost/Operations	A	Relative Project Cost	\$1.00 - \$24,999	4	
			\$25,000 - \$49,999	3	
			\$49,999 - \$99,999	2	
			\$100,000 - \$199,999	1	
			\$200,000 - \$499,999	0	
			\$500,000 +	-1	
Project Design Metrics	B	Impervious Acres Managed (ac)	>10 acres	6	
			>5-10 acres	5	
			>4-5 acres	4	
			>2-4 acres	3	
			>1-2 acres	2	
			< 1 acre	1	
				0 acres	0
	C	Channel Protection Volume (CPv) Mitigated, (ie. 1-year Storm)	0.6-1.0 ac-ft	5	
			0.4-0.6 ac-ft	4	
			0.2-0.4 ac-ft	3	
			0.05-0.2 ac-ft	2	
			>0-0.05 ac-ft	1	
0 ac-ft			0		
D	Volume Infiltrated (ac-ft)	>2 ac-ft	5		
		1 - 2 ac-ft	4		
		0.5-1 ac-ft	3		
		0.1- 0.5 ac-ft	2		
		>0.01 - 0.1 ac-ft	1		
		no infiltration	0		
Project Implementation	E	Permitability	Minimal Issues/Concerns or no permits	2	
			Complex issues/Potential permit denial	0	
	F	Land Availability	MS4 owned	4	
			Non MS4 owned regulated (expire permit)	3	
			Non MS4 owned/Participatory Owner	2	
			Unknown	0	
			Not MS4 owned/Non participatory owner	-2	
Other Project Benefits	G	Flood Mitigation (Is existing flooding issue mitigated by project?)	Neighborhood Wide Flooding Issue	3	
			Infrastructure damage (e.g. Wet Basement)	2	
			Nuisance Issue (ie. ponding, puddles, etc).	1	
			None	0	
	H	TMDL Flow Target Addressed (Q03, Q95)	High and Low Flow Targets	3	
			High Flow Target	2	
				No target addressed in BMPDSS (just WQ treatment)	1
	I	Lake Champlain Phosphorus TMDL	Addressed TMDL	1	
Does not address TMDL			0		
J	Other Project Benefits	Infrastructure Improvement (e.g. Culvert Replacement)	1		
		Educational/Functional Benefit	1		
		Recreational Benefit	1		
		Natural Habitat Creation/Protection	1		
		Outfall Erosion Control	1		
			Utility Issues/Uncertainty	-1	

## **APPENDIX E**

### **PROPOSED COST ESTIMATES, PRIORITIZATION RANKING, AND IMPLEMENTATION SCHEDULE**

**Centennial Brook Flow Restoration Plan**  
**Table E-1: Project Cost Estimates**

BMP ID	Project Name	Retrofit Description	Impervious Area Mangaged (acres)	Design Control Volume (ft3)	Base Unit Cost (\$/cu.ft.)	Site Adjust Factor	Site Specific Cost	Base Constr. Cost	Permits & Eng.	Land Cost	Summed Project Cost	Minimum Project Cost	Final Project Cost	Cost/ Imp. Acre	O&M
CB0001	140 East Ave Residence	Bio	0.18	1,800	\$10	1.5	\$0	\$27,000	\$10,000	\$7,200	\$44,200	\$25,000	\$44,200	\$249,000	\$1,300
CB0002	Best Western Windjammer Infiltration Basin A	IB	21.82	181,000	\$4	0.5	\$50,000	\$412,000	\$145,000	\$0	\$557,000	\$25,000	\$557,000	\$26,000	\$10,000
CB0003	Best Western Windjammer Infiltration Basin B	IB	1.33	30,000	\$4	0.5	\$0	\$60,000	\$21,000	\$0	\$81,000	\$25,000	\$81,000	\$61,000	\$2,400
CB0004	Case Parkway Center Island	Bio	0.23	1,000	\$10	1.5	\$0	\$15,000	\$6,000	\$0	\$21,000	\$25,000	\$25,000	\$110,000	\$800
CB0005	Centennial Court Apartments Infiltration	IB	2.74	30,800	\$4	1	\$0	\$123,200	\$44,000	\$0	\$167,200	\$25,000	\$167,200	\$61,000	\$5,000
CB0006	Chamberlin School	IG	9.69	60,473	\$12	1.5	\$0	\$1,088,514	\$127,000	\$0	\$1,215,514	\$25,000	\$1,215,514	\$125,000	\$10,000
CB0007	Clover St GSI	IG	1.40	1,700	\$12	1.5	\$0	\$30,600	\$11,000	\$30,000	\$71,600	\$25,000	\$71,600	\$51,000	\$2,100
CB0008	Dumont Ave Infiltration Chambers	IG	0.86	1,100	\$12	1.5	\$0	\$19,800	\$7,000	\$0	\$26,800	\$25,000	\$26,800	\$31,000	\$800
CB0009	Duval St GSI	IG	0.99	1,100	\$22	1.5	\$0	\$36,300	\$13,000	\$30,000	\$79,300	\$25,000	\$79,300	\$80,000	\$2,400
CB0010	Fielding Lane Condos Infiltration Gallery	IG	5.14	21,700	\$4	1	\$0	\$86,800	\$31,000	\$90,000	\$207,800	\$25,000	\$207,800	\$40,000	\$6,200
CB0011	Fletcher Allen Green Space	Bio	0.53	3,700	\$10	1	\$0	\$37,000	\$13,000	\$0	\$50,000	\$25,000	\$50,000	\$94,000	\$1,500
CB0012	Fletcher Allen Parking Lot	Bio	0.61	2,700	\$10	1	\$0	\$27,000	\$10,000	\$0	\$37,000	\$25,000	\$37,000	\$60,000	\$1,100
CB0013	Grove Street Parking Lot	IG	2.33	4,800	\$12	2	\$0	\$115,200	\$41,000	\$0	\$156,200	\$25,000	\$156,200	\$67,000	\$4,700
CB0014	I-89 Cloverleaf Underground Detention	UD	17.18	320,000	\$2	0.5	\$0	\$320,000	\$112,000	\$0	\$432,000	\$25,000	\$432,000	\$25,000	\$10,000
CB0015	I-89 Exit 14 Detention Pond	DP	3.58	566,000	\$2	1	\$0	\$1,132,000	\$227,000	\$60,000	\$1,419,000	\$25,000	\$1,419,000	\$397,000	\$10,000
CB0016	Jaycee Park	IG	6.42	19,211	\$12	1.5	\$0	\$345,798	\$72,000	\$0	\$417,798	\$25,000	\$417,798	\$65,000	\$10,000
CB0017	Jug handle Underground Detention	UD	8.60	73,000	\$12	1.5	\$0	\$1,314,000	\$263,000	\$0	\$1,577,000	\$25,000	\$1,577,000	\$183,000	\$10,000
CB0018	N Henry Court	IG	0.33	600	\$22	1.5	\$0	\$19,800	\$7,000	\$0	\$26,800	\$25,000	\$26,800	\$82,000	\$800
CB0019	North Campus Pond Retrofit	DP	45.99	1,008,000	\$2	0.25	\$100,000	\$604,000	\$121,000	\$0	\$725,000	\$25,000	\$725,000	\$16,000	\$10,000
CB0020	Open Area East of Case Parkway	IG	2.34	6,300	\$12	1.5	\$0	\$113,400	\$40,000	\$0	\$153,400	\$25,000	\$153,400	\$65,000	\$4,600
CB0021	Patchen Rd & Pine St Infiltration Gallery	IG	5.40	8,600	\$12	1.5	\$0	\$353,970	\$55,000	\$18,000	\$426,970	\$25,000	\$426,970	\$79,000	\$10,000
CB0022	Patchen Road Kettle Hole	IG	5.45	66,800	\$4	0.25	\$25,000	\$91,800	\$33,000	\$150,000	\$274,800	\$25,000	\$274,800	\$50,000	\$8,200
CB0023	Picard Circle Infiltration	IG	15.84	14,700	\$12	1.5	\$0	\$264,600	\$53,000	\$0	\$317,600	\$25,000	\$317,600	\$20,000	\$9,500
CB0024	Queensbury Pond Retrofit	IB	2.88	26,700	\$4	0.25	\$25,000	\$51,700	\$19,000	\$39,600	\$110,300	\$25,000	\$110,300	\$38,000	\$3,300
CB0025	Main Street UVM Pond	DP	17.51	370,900	\$2	0.5	\$100,000	\$470,900	\$95,000	\$0	\$565,900	\$25,000	\$565,900	\$32,000	\$10,000
CB0026	SD Ireland Property (20A)	IG	3.47	28,700	\$12	1.5	\$0	\$516,600	\$41,000	\$0	\$557,600	\$25,000	\$557,600	\$161,000	\$10,000
CB0027	Staples Plaza Underground Detention A	UD	2.50	11,600	\$12	2	\$0	\$278,400	\$56,000	\$0	\$334,400	\$25,000	\$334,400	\$134,000	\$10,000

Centennial Brook Flow Restoration Plan

Table E-2: Centennial Brook Watershed BMP Project Scoring

Project ID	Project Name	Expired Permit	MS4	BMP Type	Project Cost Estimate	BMP Description	Total Score
CB0023	Picard Circle Infiltration	No Permit	South Burlington	IG	\$318,000	Subsurface infiltration system. All houses within Picard Circle have been purchased by Airport and are now abandoned. Significant site area exists within yards and the road for major underground infiltration/ detention system. Constraints include depth of existing drainage pipe and depth above groundwater (adjacent brook approx 14 feet below existing ground).	27
CB0002	Best Western Windjammer Infiltration Basin A	6323-9030	South Burlington	IB	\$557,000	Site drainage area currently includes only Best Western property. Outfall is severely eroded and is headcutting to the east and may soon reach paved access road. Concept includes stabilizing outfall and constructing a detention basin within existing gully. Expand current drainage area to intercept runoff from Williston Road drainage network and redirect drainage from abutting commercial properties.	27
CB0025	Retrofit of Main Street UVM Pond		UVM	DP	\$566,000	Repair outlet structure. Retrofit options include expanding the pond southward toward Williston Road or eastward as part of Retrofit #24 for additional storage, extended detention, and improved water quality. Site has the ability to capture drainage from Williston Road, adjacent commercial properties, and unmanaged UVM land.	24
CB0016	Jaycee Park	No Permit	South Burlington	IG	\$418,000	Pretreatment tank to underground infiltration chambers. Pretreatment could be proprietary device (e.g. StormCeptor or equal) before underground chambers. Access would need to be coordinated with playing fields. Flow diversion structure would be in Patchen Road, with depth to drain pipe at approx 6.5 feet.	24
CB0019	North Campus Pond Retrofit		UVM	DP	\$1,216,000	Proposed expansion of existing North Campus Pond to over control existing and future development. Raise existing embankment (10' +/-) to provide additional capacity. May consider horizontal expansion to the north and/or south.	23
CB0006	Chamberlin School	No Permit	South Burlington	IG	\$725,000	Underground detention in open space of school property. It seems possible to collect drainage off of White Street (and upgradient residential neighborhood) and connect to existing system via school entrance. Underground chambers could be designed as infiltration pending results of soils test pitting. (note HSG – D on east side of school property; HSG – B on west side of school property).	22
CB0014	I-89 Cloverleaf Underground Detention	2-0126; 6323-9030; 2-0619	VTrans	UD	\$432,000	Detention structure bounded by northbound lanes and off-ramp (directing traffic to westbound Williston Rd). Existing culvert drains all upgradient area from interchange and Williston Rd. Modify outlet to install new control structure for Cpv storage.	21
CB0024	Queensbury Pond Retrofit	1-0946	South Burlington	IB	\$110,000	Existing dry detention pond. Modify outlet to create an infiltration basin. Existing pond might predate subdivision (newer PVC outlet connects to older CMP barrel). Facility appears to have additional storage capacity to expand drainage area (level run confirmed this is feasible).	20
CB0020	Open Area East of Case Parkway		Burlington	IG	\$153,000	Proposed underground recharge system to capture drainage from Bilodeau Court and Case Parkway. Add additional drainage lines to direct existing drainage networks to retrofit. Drainage area could also include areas directed to Retrofit #M7C and M7D.	20
CB0013	Grove Street Parking Lot	1-0811	Burlington	IG	\$156,000	Divert existing drainage network and capture runoff from parking lot and direct to proposed underground recharge system. Low point in road drainage area is immediately south of the City parking lot. Consider replacing parking lot with permeable pavement.	19
CB0005	Centennial Court Apartments Infiltration	No Permit	UVM	IB	\$167,000	Retrofit of existing dry basin to an infiltration basin. Increase contributing drainage area and add riser to outlet structure for improved flow control. Redirect road drainage from Centennial Court to basin. Site only takes runoff currently from a portion of the apartment roofs.	18

CB0021	Patchen Rd & Pine St Infiltration Gallery	No Permit	South Burlington	IG	\$427,000	Underground detention or infiltration (depending on soils). Diversion of flows from Patchen Road feasible, incoming pipe from open space/low point behind lots too deep to capture. Single lot also contains SF house (see photo). Would require diversion structure and pretreatment tank/structure.	18
CB0022	Patchen Road Kettle Hole	6292-9030	South Burlington	IG	\$275,000	Detention Pond (or infiltration basin if soils are acceptable). Directly convey runoff from contributing area off Patchen Road down slope to sediment forebay. Modify existing 30" culvert headwall (under I-89) to achieve required flow control. Could pick up Kirby Rd.	18
CB0010	Fielding Lane Condos Infiltration Gallery	No Permit	South Burlington	IG	\$208,000	Detention-retention facility. Open parcel adjacent to Fielding Lane Condos – seems to be owned by Fielding Lane Condos, existing surface storage available below outfall pipe. Would require access from Fielding Lane.	18
CB0026	SD Ireland Property (20A)		Burlington	IG	\$558,000	SD Ireland proposed redevelopment to a housing complex. Site will reportedly be required to manage runoff on-site. Site currently drains to city drainage system in Grove St. Plans should address severe bank erosion at Centennial Brook culvert under SD Ireland driveway.	16
CB0011	Fletcher Allen Green Space		Burlington	Bio	\$50,000	Proposed bioretention area in green space near hospital entrance. Redirect existing roadway trench drains into practice. Site currently drains to the UVM East Campus Pond.	16
CB0012	Fletcher Allen Parking Lot		Burlington	Bio	\$37,000	Proposed bioretention area in existing drainage feature. Site is currently managed by existing swales, curb cuts, and a drainage depression. Swales and depression are currently eroding. Raise existing catchbasin frame/grate to provide ponding for bioretention.	16
CB0015	I-89 Exit 14 Detention Pond	No Permit	VTrans	DP	\$1,419,000	Location flexible depending on evaluation. Most downstream location would be across from drainage outlet, below water main (best location for embankment – maximizes storage), but impact to water main R/W likely and partially on private property. Alternative is to move embankment upgradient to limit of I-89 R/W – would reduce available storage, but keep all work w/in VTrans jurisdiction.	16

Centennial Brook Flow Restoration Plan

Table E-3: Centennial Brook Watershed BMP Project Implementation Schedule

Project ID	Project Name	Expired Permit	MS4	BMP Type	BMP Description	Implementation Year	Project Cost Estimate	Project Cost Estimate w/ Inflation
CB0026	SD Ireland Property (20A)		Burlington	IG	SD Ireland proposed redevelopment to a housing complex. Site will reportedly be required to manage runoff on-site. Site currently drains to city drainage system in Grove St. Plans should address severe bank erosion at Centennial Brook culvert under SD Ireland driveway.	2017	\$558,000	\$610,000
CB0005	Centennial Court Apartments Infiltration	No Permit	UVM	IB	Retrofit of existing dry basin to an infiltration basin. Increase contributing drainage area and add riser to outlet structure for improved flow control. Redirect road drainage from Centennial Court to basin. Site only takes runoff currently from a portion of the apartment roofs.	2019	\$167,000	\$194,000
CB0008	Dumont Ave Infiltration Chambers	No Permit	BTV	IG	Divert flows from existing catchbasins and convey down Dumont Ave via pipe or swale to underground recharge chambers on empty lot. Options exist for practice type, siting and conveyance mechanism depending on depth to GW, existing inverts, and future use by Airport. Discharge to existing pipe outlet at Airport basin.	2020	\$27,000	\$32,000
CB0023	Picard Circle Infiltration	No Permit	South Burlington	IG	Subsurface infiltration system. All houses within Picard Circle have been purchased by Airport and are now abandoned. Significant site area exists within yards and the road for major underground infiltration/ detention system. Constraints include depth of existing drainage pipe and depth above groundwater (adjacent brook approx 14 feet below existing ground).	2020	\$318,000	\$380,000
CB0027	Staples Plaza Underground Detention A	No Permit	South Burlington	UD	Convert landscaped island to bioswale w/ UG storage to manage parking and small roof. Overflow to existing drain. Add trees for cover, shading, interception. Reduce width of one-way aisle for bioswale. Flat roof drains internally, discharges to drain inlet east of building. Modify internal roof drains, install trays, or use other blue roof design to provide temporary detention.	2021	\$334,000	\$411,000
CB0002	Best Western Windjammer Infiltration Basin A	6323-9030	South Burlington	IB	Site drainage area currently includes only Best Western property. Outfall is severely eroded and is headcutting to the east and may soon reach paved access road. Concept includes stabilizing outfall and constructing a detention basin within existing gully. Expand current drainage area to intercept runoff from Williston Road drainage network and redirect drainage from abutting commercial properties.	2022	\$557,000	\$706,000
CB0003	Best Western Windjammer Infiltration Basin B	6323-9030	South Burlington	IB	Outfall is located west of Best Western. Site drainage area currently includes only Best Western property. Moderate erosion occurring. Concept includes stabilizing outfalls and constructing a detention basin within existing gully. Expand current drainage area to intercept runoff from the Williston Road drainage network. A portion of this drainage area could be directed to Retrofit 22 if necessary.	2022	\$81,000	\$103,000
CB0019	North Campus Pond Retrofit		UVM	DP	Proposed expansion of existing North Campus Pond to over control existing and future development. Raise existing embankment (10' +/-) to provide additional capacity. May consider horizontal expansion to the north and/or south.	2023	\$1,216,000	\$1,587,000
CB0006	Chamberlin School	No Permit	South Burlington	IG	Underground detention in open space of school property. It seems possible to collect drainage off of White Street (and upgradient residential neighborhood) and connect to existing system via school entrance. Underground chambers could be designed as infiltration pending results of soils test pitting. (note HSG – D on east side of school property; HSG – B on west side of school property).	2023	\$725,000	\$946,000

CB0024	Queensbury Pond Retrofit	1-0946	South Burlington	IB	Existing dry detention pond. Modify outlet to create an infiltration basin. Existing pond might predate subdivision (newer PVC outlet connects to older CMP barrel). Facility appears to have additional storage capacity to expand drainage area (level run confirmed this is feasible).	2024	\$110,000	\$148,000
CB0025	Retrofit of Main Street UVM Pond		UVM	DP	Repair outlet structure. Retrofit options include expanding the pond southward toward Williston Road or eastward as part of Retrofit #24 for additional storage, extended detention, and improved water quality. Site has the ability to capture drainage from Williston Road, adjacent commercial properties, and unmanaged UVM land.	2025	\$566,000	\$783,000
CB0011	Fletcher Allen Green Space		Burlington	Bio	Proposed bioretention area in green space near hospital entrance. Redirect existing roadway trench drains into practice. Site currently drains to the UVM East Campus Pond.	2026	\$50,000	\$71,000
CB0012	Fletcher Allen Parking Lot		Burlington	Bio	Proposed bioretention area in existing drainage feature. Site is currently managed by existing swales, curb cuts, and a drainage depression. Swales and depression are currently eroding. Raise existing catchbasin frame/grate to provide ponding for bioretention.	2026	\$37,000	\$53,000
CB0013	Grove Street Parking Lot	1-0811	Burlington	IG	Divert existing drainage network and capture runoff from parking lot and direct to proposed underground recharge system. Low point in road drainage area is immediately south of the City parking lot. Consider replacing parking lot with permeable pavement.	2026	\$156,000	\$222,000
CB0021	Patchen Rd & Pine St Infiltration Gallery	No Permit	South Burlington	IG	Underground detention or infiltration (depending on soils). Diversion of flows from Patchen Road feasible, incoming pipe from open space/low point behind lots too deep to capture. Single lot also contains SF house (see photo). Would require diversion structure and pretreatment tank/structure.	2026	\$427,000	\$609,000
CB0022	Patchen Road Kettle Hole	6292-9030	South Burlington	IG	Detention Pond (or infiltration basin if soils are acceptable). Directly convey runoff from contributing area off Patchen Road down slope to sediment forebay. Modify existing 30" culvert headwall (under I-89) to achieve required flow control. Could pick up Kirby Rd.	2026	\$275,000	\$392,000
CB0015	I-89 Exit 14 Detention Pond	No Permit	VTrans	DP	Location flexible depending on evaluation. Most downstream location would be across from drainage outlet, below water main (best location for embankment – maximizes storage), but impact to water main R/W likely and partially on private property. Alternative is to move embankment upgradient to limit of I-89 R/W – would reduce available storage, but keep all work w/in VTrans jurisdiction.	2027	\$1,419,000	\$2,084,000
CB0007	Clover St GSI	No Permit	South Burlington	IG	30-ft wide residential streets with direct outfalls to streams, flat terrain, and good soils offer green street and neighborhood-scale disconnection opportunities (e.g., dry wells, rain gardens, pervious driveways, bump outs).	2028	\$72,000	\$109,000