

# Precipitation and Streamflow Monitoring for Vermont MS4 Communities



## Services / Expertise

Watershed Planning  
MS4 General Permit  
TMDL Compliance  
Stormwater Flow Monitoring  
Precipitation Monitoring  
Urban Hydrologic Systems  
Application Development

## Project Location

South Burlington, Vermont

## Date Completed

2016-present

## Project Owner

Vermont Department of Environmental Conservation

## Project ID#

15-200

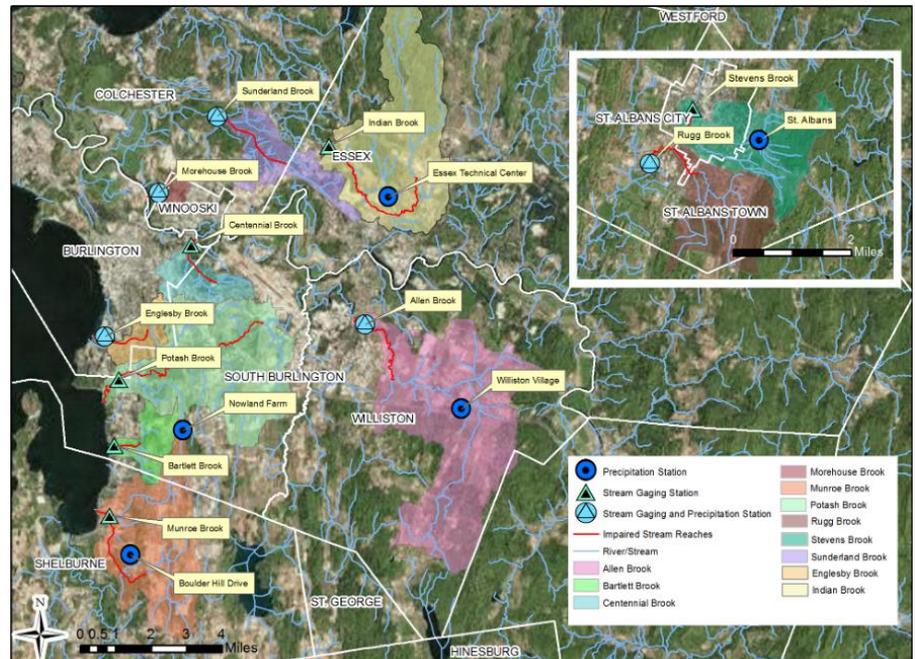
## Project Manager

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## Link to Monitoring Data

<http://vt-ms4-flow.stone-env.com/FlowDev/index.html>



*Continuous (5-minute) measurements of stream stage and water temperature are transmitted to a computer server at Stone's headquarters and are displayed in near real-time online.*

SINCE the summer of 2016, Stone has worked with the Vermont Department of Environmental Conservation (Vermont DEC) and many of Vermont's Municipal Separate Storm Sewer Systems (MS4) General Permit holders to conduct precipitation and streamflow monitoring. Section IV.C.1.e(7)(a) of the MS4 General Permit requires certain permittees—namely Burlington, Colchester, Essex, Essex Junction, Shelburne, South Burlington, St Albans City, St Albans Town, Williston, Winooski, the Burlington Airport, the University of Vermont, and the Vermont Agency of Transportation—to implement, or otherwise fund, a flow and precipitation monitoring program, subject to approval by the Secretary, in their respective stormwater impaired watersheds.

The stormwater impaired watersheds requiring monitoring are Allen, Bartlett, Centennial, Englesby, Indian, Morehouse, Munroe, Potash, Rugg, Stevens, and Sunderland Brooks. Biomonitoring data have indicated that portions of each of these streams do not fully support designated aquatic uses (aquatic life), and that the biological impairment results from multiple impacts associated with excess stormwater runoff. Monitoring of the flow, the primary stressor, is necessary to reveal if practices intended to improve the hydrologic regime of these streams are having or will have the desired impact.

The Stone team developed and implemented a rigorous monitoring plan that will enable Vermont DEC and the MS4s to evaluate progress towards attainment of flow targets specified in the total maximum daily load (TMDL) document promulgated for

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each stream. These TMDLs provide modeled flow duration curves (FDCs) —plots of the percentage of daily mean streamflow observations that equal or exceed a given magnitude or quantile—with high-flow (0.3% exceedance) and low-flow (95% exceedance) hydrologic targets. The data generated by this monitoring program will be used to compute FDCs of measured streamflows, which may be compared to the flow duration curves upon which the TMDL targets are based.

Streamflow gauging stations were installed at approved locations on each impaired stream in the fall of 2016. Continuous (5-minute) measurements of stream stage and water temperature are transmitted to a computer server at Stone’s headquarters in Montpelier and are displayed in near real-time on the project website (<http://vt-ms4-flow.stone-env.com/FlowDev/index.html>). Through manual measurement of discharge over the range of stream stages, stage-discharge relations were developed to derive continuous streamflow records from the 5-minute stage measurements. A network of 10 tipping bucket rain gauges was also installed to measure precipitation across the study area. This monitoring program is being run for an initial 5-year term. Ultimately, the duration of monitoring should depend on the rate at which best management practices identified in the flow restoration plans are implemented by the MS4s and how quickly responses are observed in the aquatic biota at the designated compliance point in each stream.



*Left: Streamflow gauging station on Sunderland Brook, Colchester, VT. Right: Monitoring station on Centennial Brook.*