Chestnut Hill Stormwater Mitigation Design, Montpelier, Vermont

STONE ENVIRONMENTAL

Services / Expertise
Stormwater Management
BMP & GSI Design
Developed Lands Erosion Solutions
Topographic Surveying
Hydrology & Hydraulic (HEC-RAS) Modeling
Flood Assessment
Flood Mitigation Design
Alternatives Analysis
Environmental Impact Assessment
Cost-Benefit Analysis
Development of Design, Specification, and Opinion of Probable Cost

Markets
Local Government
Watershed Organizations

Project Location
Montpelier, Vermont

Date Completed
2018-2019

Project Owner
City of Montpelier
Friends of the Winooski River

Project ID#
18-075

Project Manager
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Project Team
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Photographs from Montpelier's Chestnut Hill neighborhood display a lack of adequate drainage and significant sediment load that resulted in flooding.

As part of a stormwater master planning project for the City of Montpelier between 2015—2016, Stone identified and prioritized stormwater issues that threatened public infrastructure and water quality in the area around Chestnut Hill Road. In the fall of 2017, Stone rejoined the Montpelier Department of Public Works (DPW) staff and Friends of the Winooski River (FWR) in response to a complaint from a landowner on Chestnut Hill Road. Storms during the spring and summer of 2017 destabilized the channel around a cross-culvert, dramatically increasing channel erosion and sediment loading to Blanchard Brook. This resulted in cross-culvert plugging, over-topping at the culvert, and substantial channel erosion and bank instability down-stream from the culvert outfall to the northern extent of a previously restored channel.

In 2018, Stone and City staff wrote and were awarded a Pollution Prevention grant from the Lake Champlain Basin Program. The City and FWR hired Stone to further assess the 42-acre drainage area and develop design plans for stormwater mitigation, proper culvert sizing, and improved stability and resilience of the downstream drainage channel, while maximizing the use of green infrastructure practices. The FWR provided outreach to Chestnut Hill residents to explain the problem and potential solutions and developed a list of landowners willing to allow mitigation practices on their property.

Stone conducted field surveys on the watershed in October 2018 to identify potential stormwater retrofit practices in the area contributing flow to the Chestnut Hill outfall. However, soils in the project area were generally poorly drained, and existing underground utilities and narrow rights-of-way severely limited the available space for retrofit practices that would reduce peak storm flows.

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Stone used site-specific topographic information coupled with LiDAR data to delineate the full drainage area to the head of the gully at the Chestnut Hill Road cross-culvert, as well as sub-drainages within the watershed, to support hydrologic and hydraulic (H&H) modeling. We ran an existing conditions model and a preliminary proposed model, the results of which were used to determine pipe and catch basin sizes, size steps and pools for a regenerative storm conveyance design, and estimate armor stone sizing in the downstream channel. The Stone team also assessed alternatives for culvert upgrade, as well as stabilization and restoration measures in the downstream reach of the drainage to mitigate bank instability and improve water quality. The final design holistically addressed stormwater issues across the contributing drainage area and downstream to the design boundary of the previously restored channel.

Stone developed 100% designs which, when implemented, will reduce flooding of residential properties and eliminate roadway overtopping at up to the 100-year storm event. Channel stabilization included a series of steps and pools to improve water quality, dissipate energy, and reduce erosion risks. Construction of the cross-culvert and downstream improvements was awarded a Better Roads grant and will be implemented during the 2020 construction season.