

A Green Street for Watertown

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While a tremendous success story, the improvements that have been made on the Charles River in the last 25 years are now threatened by pollutants such as phosphorus that are carried in stormwater runoff. In aquatic ecosystems, phosphorus acts as a fertilizer, encouraging excessive growth of invasive plants and algae.

The majority of stormwater runoff from Watertown's 4.2-square miles land area flows into the Charles River, which flows easterly along the town's border. The Charles River is a valuable amenity to the Town, providing recreational boating, public parklands, aquatic habitat, natural aesthetics, and floodwater storage. As a part of the Charles River Reservation, the 17-mile long parkland adjacent to the river managed by the Department of Conservation and Recreation, protecting this resource is important not just to the Town, but regionally.

One method of reducing stormwater impacts to the river is through the use of green infrastructure (GI). GI is a form of stormwater management that mimics natural processes, using surface and/or subsurface storage, engineered soils, and planting of specific vegetation, to control, filter, and treat runoff from surrounding impervious surfaces. GI techniques promote infiltration of stormwater into the underlying soils and mimic natural nutrient filtering processes, treating stormwater as close to the source as possible. In this way, pollutants are retained on land rather than being discharged into the river. GI also reduces the volume of stormwater that is discharged into receiving bodies of water by slowly infiltrating and storing water in the ground. Not only does this help prevent stormwater catch basins from being overwhelmed and backing up onto streets, it is also better for rivers, because it maintains a balanced, more natural flow of water.

Where to start?

Recent replacement of two gas mains and a water main on Edenfield Avenue had left the roadway surface severely deteriorated. Although located in a residential neighborhood, the street was excessively wide (32-feet), lacked curbing, street trees, and green space that all provide "curb appeal". Additionally, the street acts as a cut-through for vehicles traveling between Route 20 in Watertown and Belmont Center.

As part of road resurfacing, the Town typically installs granite curbing, new concrete sidewalks, and restores grass borders to improve pedestrian safety and experience. On Edenfield Ave., the Town also proposed to reduce the width of the roadway surface to provide traffic calming and

then use the additional reclaimed impervious area for the inclusion of GI.

The goal of this project was to use the GI techniques to reduce the volume and improve the quality of stormwater directed to the Charles River from surrounding impervious surfaces.

Project Design

The Charles River Watershed Association (CRWA) and the Town of Watertown Department of Public Works (DPW) secured a grant to fund GI construction as part of the larger road reconstruction project under the Massachusetts Department of Environmental Protection's 2016 Section 319 Non-Point Source Pollution Grant Program. Horsley Witten Group, Inc. designed the GI components for the project and World Tech Engineering provided overall street reconstruction design.

As part of the design, the roadway width was reduced from 32-feet to 26-feet, allowing a 6.5-foot grass border area on each side of the street within the 50-foot right-of-way, in addition to 5-foot sidewalks.

Due to the roadway narrowing, new catch basins and drainage connections needed to be installed. Each proposed catch basin location was evaluated for GI suitability. Many issues were considered, including sub-surface soil suitability, location of existing utility services, presence of mature street trees, as well as proximity to driveways, walls, and other conflicts.

The final design included four stormwater tree trenches and seven bioretention systems. The tree trenches function very much like a subsurface infiltration system. Within each catch basin, a perforated pipe is set at an elevation lower than the outlet to the Town's drainage system. The perforated pipe is then laid underneath the grass border and surrounded in crushed stone, with a tree planted in the border. During a precipitation event, stormwater runoff is directed towards the perforated pipe, where it can infiltrate into the native soils. Only in large events, when the capacity of the tree trench is exceeded, will stormwater runoff discharge from the catch basin to the Town's drainage system through the outlet.

The bioretention systems are located at the ground surface within the grass border area upstream of catch basins. They consist of shallow depressions that contain an engineered soil fill, drought and flood tolerant plantings, and check dams to create stormwater storage cells. Openings in the road curbing direct stormwater runoff into the bioretention areas, where it is detained



Curbed inlets allow water to enter the constructed bio-retention systems (photo courtesy of Horsley Witten Group).



Tree trench underlain by gravel to enhance subsurface storage and increase rate of infiltration (photo courtesy of Horsley Witten Group)

within each storage cell and slowly infiltrated. Overflow outlets from the systems are provided so that in large storms, runoff can reenter the roadway and reach the downstream catch basin.

The GI built on Edenfield Avenue treats runoff from a drainage area of 2.3 acres. Together, these systems prevent approximately 1.4 kilograms of phosphorus, 0.79 kilograms of zinc, and 468 kilograms of suspended solids from entering the Charles River every year.

Where do we go from here?

The Town learned a lot from the Edenfield Avenue GI project that it has already put to use in other roadway reconstruction projects. Installed in spring 2018, both the tree trenches and bioretention areas have functioned well and have required minimal maintenance. Although the installation costs were similar, the tree trenches were easier to install than the bioretention areas, with fewer design constraints and greater adaptability to field changes. The Town is installing tree trenches as part of two other projects currently under construction and anticipates continuing the program in the future.

For more information about the project, visit the [Watertown Department of Public Works](#) and [Charles River Watershed Association](#) websites.