



# Low Impact Development

## Case Study: Pennichuck Square

### Project History

Pennichuck Water Works (PWW) supplies drinking water to the communities of Nashua, Amherst, Merrimack and Milford, NH. Over the past 10 years, CEI has worked with PWW and the NH DES to protect the region's drinking water supply watershed and counter the impacts of urbanization on water quality.

This latest project is a demonstration project at Pennichuck Square in Merrimack, NH aimed to protect Pennichuck Brook (a source of water for PWW) and local groundwater from urban pollution.

### Project Goals

Project goals focus on the design and construction of stormwater Best Management Practices (BMPs) that demonstrate the use of Low Impact Development (LID) elements by retrofitting a commercial area. Individual LID goals included:

- ▶▶ Natural water quality treatment
- ▶▶ On-site infiltration
- ▶▶ Groundwater recharge
- ▶▶ Decrease onsite flooding
- ▶▶ Reduction in stormwater runoff
- ▶▶ Public awareness and education

### Design Features

Multiple elements were incorporated into this project in order to demonstrate the various LID elements that can be used to retrofit an already developed commercial site.

Design elements include:

- ▶▶ **Raingardens** - Slightly depressed planting beds that collect and treat stormwater
- ▶▶ **Biofilter/Bio-Retention Areas** - Depressions that collect and filter runoff from paved surfaces designed so that surface runoff is directed into a vegetated area
- ▶▶ **Leaching Catch Basins** - Designed to allow surface runoff to seep into the ground.
- ▶▶ **Permeable Pavers/Porous Asphalt** - Designed to intercept surface drainage in the parking lots and allow it to seep into the ground.



**Bioretention Area Before Construction**



**Bioretention Area After Plantings**



**Bioretention Area with Mature Plantings (1 year later)**

## Construction

Construction took place during the Summer of 2005 for approximately 5 weeks. CEI was able to design a construction schedule to meet the business owners' needs while completing the project on time and within budget.

## Challenges

An already developed site can lend certain challenges to a LID retrofit project, particularly when the site is actively used and must be functional throughout construction activity. Other challenges include:

- ▶▶ Convincing business owners of the merit of a LID retrofit project
- ▶▶ Designing LID elements that work within the existing design - in some cases working around aging/degrading site features
- ▶▶ Construction of elements without disruption of business
- ▶▶ Ensuring porous asphalt meets specifications and is successful
- ▶▶ Identifying unmarked utilities and subsurface features and designing around these constraints

CEI creatively designed solutions for the above challenges, resulting in a successful LID retrofit project.

## Summary

As a result of the above features, stormwater runoff from the site has been reduced by 88%, nearly eliminating pollution into the brook from the site and instead treating and recharging water through natural cleansing. Even more importantly, the site will provide a model for other commercial landowners, developers, engineers, contractors and water suppliers to view.



**Bioretention Area During Construction**



**Precipitation Entering Bioretention Area from Parking Lot**

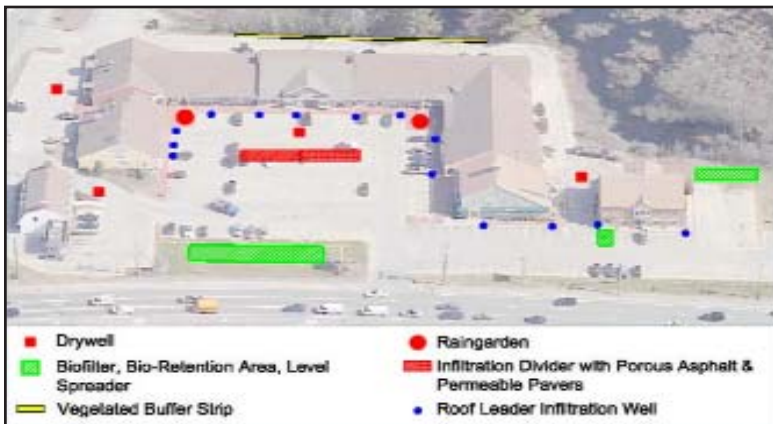


**Bioretention Area Filling During Storm Event**



**Porous Pavers**

**Porous Asphalt**



Contact: Eileen Pannetier, President  
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Site Owner: Redwood Companies & Pennichuck  
Square Limited Partnership

Funded By: Pennichuck Corporation and a grant  
from the NH Department of  
Environmental Services

Site Design: Comprehensive Environmental Inc.