GREEN INFRASTRUCTURE CONCEPT PLAN FOR SOUTHERN LANE

Project type: Residential Street Retrofit
Proposed practices: 1- Street width reduction/planting area expansion
2- Bioretention area

DECEMBER 2011

This project has been funded by the American Recovery and Reinvestment Act with support from the New York State Department of Environmental Conservation and New York State Economic Recovery and Reinvestment Cabinet. For more information, please visit www.recovery.gov, www.dan.ny.gov or www.recovery.gov.
The following report describes a schematic landscape design proposal using green infrastructure practices for stormwater management. The illustrated plan, report and appendices combined are intended to give practical guidance for the owner, design professionals, contractors, and other interested parties to use in developing a final design. They are not intended to be used as final design and construction documents.

OVERVIEW

In initial discussions with local leaders and stakeholders in Warwick to identify potential green infrastructure sites and practices that would provide useful demonstration projects, a GI plan for reducing the width of an existing street in the Village was suggested and supported by the Mayor. An engineering firm based in the Village, Lehman & Getz P.C., which has designed several GI projects nearby in Greenwood Lake, later volunteered to help prepare a concept plan. Southern Lane was selected because it is approximately 38’ wide. Site visits and a review of maps identified a Village-owned parcel of land near the downhill end of this street that provides a potential area for a bioretention system. Topographic mapping was reviewed and used as background information in the development of the schematic below. The contributions of Dave Getz, P.E., in developing this plan are greatly appreciated.

The concept plan shows pavement removal to create a 26-foot wide road, and also the construction of a bioretention basin within the Village’s 2.8 acre property at the intersection of Southern Lane and Robert Drive.

The new green strip would be an extension of the lawn areas, with street tree plantings and other additional landscaping at some locations. Long-term benefits of pavement reduction would include:

* reduced runoff rates and volumes
* reduced water quality impacts
* reduced road area to plow and salt in the winter
* reduced road area to repave in the future
* reduced heat island effect
* improved safety (traffic calming)
* Aesthetic benefits from the additional vegetation.
**LOCATION**
Street Address: Southern Lane between Robert Drive and Grove Street
Section 217, Block 3, Lot 1

**OWNERSHIP**
The Village of Warwick

**EXISTING CONDITIONS**

**SURFACE COVER/CONTRIBUTING AREA**
This plan involves one section of the street as an example. The length of the project is about 1000 feet, and it would involve the removal of approximately 10,000 square feet of pavement. If the concept would be applied to additional areas further up the road, the green strip could be constructed on alternating sides of the road, providing some meandering of the roadway.

**SOILS AND TOPOGRAPHY**
The Web Soil Survey Report of the area proposed for the bioretention garden indicates Hoosic gravelly sandy loam and Castile gravelly silt loam.¹ These are classified in hydrological soil groups A and B respectively, suggesting that the area is well suited for bioretention. Actual soil conditions in the areas of the proposed practices would need to be determined through onsite testing.

**VEGETATION**
The Village-owned parcel includes a large area of open lawn at the north end, at the corner of Robert Drive, and is wooded on the southern end.

**SITE CONSTRAINTS**
The overhead wires are on the west side of the street.

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CONCEPT PLAN

The illustrations below show a view of the street with a simple green strip and shade trees at regular intervals. Street trees and other plantings would be installed according a plan developed in collaboration with the residents. The driveway locations shown on the plan are schematic. Existing catch basins are not shown. The project would include retrofitting these catch basins to extend the inlet to the new edge of the pavement. The elevations of the grates would be adjusted as appropriate to fit with the final grade, and could be replaced with solid covers if this is appropriate. Runoff reduction would be accomplished by reducing the amount of impervious surfaces, using the new green strip to absorb some runoff, and by re-directing runoff captured in the existing stormwater conveyance system to the proposed bioretention area. In addition to water quality benefits, this project can also incorporate measures designed for traffic calming for increased safety. Narrowing the roadway itself will probably tend to encourage drivers to reduce their speed. Additionally, if this green street retrofit plan is extended up the length of Southern Lane, as noted above, the new green strip can be planned for alternating sides of the road, leading to a more meandering traffic pattern as compared to the existing, very straight layout.

Figure 3 Concept sketch  Dave Getz, P.E., Lehman & Getz Consulting Engineers, P.C.
TREE PLANTING

Trees could be planted along the street and in the proposed bioretention area and at locations in front of residences where they would be compatible with existing landscaping. The large size of the extension would provide the soil volume for large canopy trees, which would provide the greatest runoff reduction benefits.

Large healthy trees benefit water resources and the landscape in many ways. The NYS DEC lists the following benefits:

- Tree planting can reduce stormwater volumes and velocities discharging from impervious areas through rainfall interception and evapotranspiration.
• Planting trees can increase nutrient uptake, reduce runoff, aid infiltration, provide wildlife habitat, provide shading, discourage geese and reduce mowing costs.
• Trees contribute to the processes of air purification and oxygen regeneration.
• Mature trees can reduce urban heat island impacts, decrease heating and cooling costs, and block UV radiation.
• Mature trees buffer wind and noise.
• Tree planting can increase property values.

BIORETENTION GARDEN

Bioretention gardens capture and treat runoff on site. They are slightly depressed below the surrounding grade and allow runoff to pond temporarily, providing detention and pollutant removal benefits. Depending on the underlying soil type, water can infiltrate or exit the system through an underdrain to the storm sewer. Water above the ponding limit exits through the catch basin inlet.

The proposed bioretention garden would be located portion of the site that is currently open lawn. Runoff from the storm sewer would be channeled into the garden through a pipe under the sidewalk and discharge onto attractive stones. The planting could include low maintenance trees, shrubs, grasses and perennial plants that are suited for the alternating wet and dry conditions of the garden, and native plants would be preferred.
**SIZING**

The potential drainage area to the bioretention basin was not calculated, but it would include a large part of the residential development nearby. The drainage area would exceed the 5-acre limit that the DEC recommends for bioretention in new construction site, but this restriction may not apply in the case of a retrofit. The 2.8 acre lot is expected to provide more than adequate area to capture and treat the WQv from the drainage area.

**A WORD ON COSTS**

Green infrastructure costs for retrofits are hard to state accurately. In new construction there is often considerably lower cost up front using green infrastructure practices and planning versus conventional, big pipe systems. But where that “gray infrastructure” is already in place, assessing the value of adding a GI practice requires a fuller accounting. A recent report by the Center for Clean Air Policy states:

> The value of green infrastructure actions is calculated by comparison to the cost of “hard” infrastructure alternatives, the value of avoided damages, or market preferences that enhance value (e.g. property value). Green infrastructure benefits generally can be divided into five categories of environmental protection:

1. Land-value,
2. Quality of life,
3. Public health,
4. Hazard mitigation, and
5. Regulatory compliance.

The report sites, for example, New York City’s 2010 Green Infrastructure Plan, “which aims to reduce the city’s sewer management costs by $2.4 billion over 20 years. The plan estimates that every fully vegetated acre of green infrastructure would provide total annual benefits of $8,522 in reduced energy demand, $166 in reduced CO2 emissions, $1,044 in improved air quality, and $4,725 in increased property value. It estimates that the city can reduce CSO volumes by 2 billion gallons by 2030, using green practices at a total cost of $1.5 billion less than traditional methods.²

**Sources of Cost Data**

For installation, maintenance costs and lifespan data for the practices discussed here, the Cost Sheet developed by the Center for Neighborhood Technology (CNT) in collaboration with the US EPA Office of Wetlands, Oceans, and Watersheds (OWOW), Assessment and Watershed Protection Division, Non-Point Source Branch, provides useful information based on examples from various locations. It may be found at their website.  [http://greenvalues.cnt.org/national/cost_detail.php](http://greenvalues.cnt.org/national/cost_detail.php)

Another useful source of cost data can be found in the Center of Watershed Protection’s *Urban Subwatershed Restoration Manual Series. Manual 3: Urban Stormwater Retrofit Practices*, pages E-1 through 14, includes a discussion of costs in terms of the amount of stormwater treated. The information was compiled in 2006, so an increase about 10 percent should be factored in to account of cost of living increases.  [http://www.cwp.org/categoryblog/92-urban-subwatershed-restoration-manual-series.html](http://www.cwp.org/categoryblog/92-urban-subwatershed-restoration-manual-series.html)

In the Warwick area, the local engineering and planning firm Lehman & Getz P.C. has experience with designing and implementing bioretention and other GI practices and may be a good source of advice about local costs for this type of project. The Orange County Soil and Water Conservation District, which

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has designed a number of rain gardens, is another good source. The Cornell Cooperative Extension of Orange County is actively involved in some related training and demonstration projects and may be a useful contact point as well.

COMMUNITY INVOLVEMENT & RESOURCES
The Village of Warwick has implemented a number of initiatives in support of sustainability, including a Trees for Tribs planting begun in late 2011 and several energy-related projects. Warwick also has a strong focus on landscaping and beautification and one local program, Warwick in Bloom, was recognized with an award in 2010 from the international Communities in Bloom program. Through the Creek Plan project, some initial outreach and education about riparian restoration has begun. More broadly, Warwick has an active focus on environmental goals, sustainability, beautification, agriculture and gardening, making it a promising area for finding the resources and capacity for implementing innovative practices like green infrastructure (this is true throughout the Town of Warwick as well as in the Village itself). Organizations working in the community on related initiatives and that may be instrumental in helping to plan, implement, and maintain green infrastructure practices include the Sustainable Warwick citizens organization; several different organizations that focus on landscaping and beautification including Warwick in Bloom, the Warwick Valley Gardeners, and the Garden Club of Dutchess and Orange Counties; the locally-based land trust, the Warwick Conservancy; and very importantly for the downtown business district around the South Street parking lot, the Warwick Valley Chamber of Commerce and especially its committee of Village business owners, the Merchant’s Guild. The Warwick Valley Central School District has an active agriculture program (perhaps the last of its kind in any school district in Orange County) and with the Town and Sustainable Warwick, the school district is leading a community initiative to implement energy efficiency measures in homes and other buildings. The involvement of these organizations will be an important asset for implementing and maintaining green infrastructure practices over time.