A Study in Green Building:

LID and LEED Practices at Work at Wetland Studies and Solutions, Inc.

When NVBIA member Wetland Studies and Solutions, Inc (WSSI) was looking for new office space for their growing company, they knew they wanted to build a space that reflected their core belief, stated in the Chesapeake Bay Preservation Act, that "healthy state and local economies and a healthy Chesapeake Bay are integrally related; balanced economic development and water quality protection are not mutually exclusive." To meet this goal, they needed to develop a hydrologically, technologically and ecologically advanced building and site that was also economically feasible. What followed became a practical application case study for implementing Low Impact Development (LID) and Leadership in Energy and Environmental Design (LEED) practices in development.

Low Impact Development

Although no onsite storm water management was required as the site was already serviced by a regional storm water management pond, for WSSI, implementing LID practices and creating an integrated plan rather than using a haphazard approach to LID implementation was the "right

thing to do." Implementing LID practices allowed WSSI to study and determine the actual maintenance requirements of a LID project, the real costs, and implementation barriers, while also seeing how the various types of pervious pavement systems perform relative to cost. It also allowed WSSI to become a working laboratory for the study of LID performance.

The basic principals of LID are to conserve and protect resources with storm water control, minimize impact to the natural area, direct runoff to slow down and capture water for reuse, use multiple small-scale controls that mimic the natural process, and prevent pollution through erosion and sediment control. Using a combination of green roof, cistern, rain garden, natural vegetation, pervious parking, underground gravel detention and bio-swale, the WSSI site meets the basic goals. The site successfully traps, slows, infiltrates and reuses storm water runoff the same way an undisturbed site would. The buildings are covered with high-reflectance roofs to reduce the amount of sunlight converted to heat, minimizing its impact on the problem of "urban heat island."

A green roof—with a combination of extensive (3-4 inches of soil) and intensive (4-9 inches of soil) planting areas, pathways, walls, seating patios, and two small wetland areas—covers a portion of the building's roof. This increases the amount of green area on the property while reducing impervious area and runoff, and provides an additional amenity for the building's staff. Runoff from the roof flows into an 8,000 gallon cistern and is then used for drip irrigation water, with overflow going into the rain garden and gravel bed detention. The rain garden is designed to mimic natural hydrologic processes; it collects cistern overflow, as well as runoff, from more than 10,000 square feet of impervious parking lot. Underdrains then take the water to the gravel bed detention area, which detains the one-year storm and releases it during a twenty-four hour period.

To reduce runoff in the parking area, WSSI used three types of pervious parking surfaces, which allow water to infiltrate into gravel layers beneath the driving surface: pervious concrete pavers, GravelPave2, and gravel. The pervious concrete pavers are similar to standard concrete paving blocks except that they are made with spaces at the joints. Water is able to run through these spaces, which are filled with gap-graded gravel, and is captured in the gravel substrate. GravelPave2 is a product that holds gravel in a grid of plastic rings fused to a filter fabric backing, which keeps the gravel stationary so it does not spread or form ruts and ensures that the permeability does not degrade over time. The gravel surface, used in low-traffic areas, is a simple layer of gravel on top of a filter fabric and Tensar.

Leadership in Energy and Environmental Design (LEED)

WSSI's environmentally-advanced design did not stop at the building's walls; they also extended the "green" design into the building's interior. But why create a green building? And why become LEED certified?

Green buildings are efficient and economical to operate. They are healthy to work in and are the environmentally-friendly without sacrificing human comfort or needs. As with the site design, WSSI feels it was the "right thing to do." In order to validate the achievement of creating a green building and to learn what is involved in building and certifying a green building, WSSI decided to become LEED certified.

LEED certification is a voluntary, consensus-based certification process begun by the U.S. Green Building Council. LEED covers different types of projects, from commercial interiors to residential homes, though different rating systems. A LEED-CI (commercial interiors) certification met the scope of WSSI's project.

To achieve this certification, WSSI had to meet a variety of categories: sustainable sites, indoor environmental quality, water efficiency, energy and atmosphere, materials and resources, and innovation and design process. The sustainable sites category was addressed through the low-impact development plan used on the grounds. Water efficiency and water use reduction was met through the use of low-flow toilets and

faucets, sensor based faucet controls and waterless urinals, reducing the building's water consumption by an estimated 53 percent.

The energy efficient building utilizes motion and daylight sensors to maintain florescent lighting at levels near 0.9 Watts per square foot; R-30 insulation in the roof; R-19 insulation in the walls; windows with a U value of 0.47; and 92 percent of Energy Star® electronics and appliances. All of these measures provide and estimated 17 percent reduction in electricity usage over the ASHRAE 90.1-2004 standard and approximately 35 percent energy savings versus a typical building of the same size in the region.

Recycled materials were used extensively throughout the building's interior. The carpet, linoleum, metal doors, steel studs, drywall, ceiling tile, ceramic tile, concrete block, systems furniture and seating, and resin and wheat board panels all contain recycled material. Additionally, rapidly-renewable materials, such as polylactic acid products and wheat board, were used throughout the building. Polylactic acid (PLA) is a corn-derived polymer that has properties similar to plastic and can be spun to produce fabric. PLA is cleaner to produce than typical plastic, recyclable at the end of its lifespan and contains no petroleum products. Wheat board is a type of particle board made from resin-bonded pressed wheat. It is formaldehyde-free and not producing harmful emissions. These materials were used throughout the building in workstation fabrics, work surfaces and backdrops throughout, creating a healthy and functional environment.

So what did they learn?

In their efforts to design, construct, and bring to life an environmentally-advanced building, WSSI helped blaze the trail for other green projects in Virginia. The process was not always easy, and they learned many things along the way about low-impact development, the LEED process and green building in general. Here are a few things they learned.

Communication and a good team are essential. Everyone involved, from the designers to the builders to the consultants,

play an important role in achieving certification.

LEED certification requires minimal submittals with audits after the initial submission. It is import to keep all relevant information well-organized and easily accessible to make the audit process stress-free.

Purchasing "green energy" credits to supply the electric grid with organic, sustainable energy to offset the building's energy use for two years is one of the most economical ways to obtain LEED points.

Use of low-flow water fixtures and waterless urinals reduces potable water demands by 50 percent, is an economical way to gain LEED points and can be applied to both commercial and residential projects.

Contrary to initial estimates and published data indicating otherwise, concrete pavers and the GravelPave2 system were comparable in cost once installed. If WSSI had this portion of the project to do over, they would choose to use more concrete pavers due to durability concerns.

While a beautiful and functional component of the building, the green roof was not cost-effective as a LID measure.

The underground gravel bed storage is a cost-effective method of storing runoff, particularly when situated beneath a pervious pavement system.

An underground cistern, which supplies irrigation water in the summer, remains full throughout the winter and thus only provides benefits half the year.

For more information on methods or products mentioned in this article visit.

General Information:
www.lowimpactdevelopment.org
www.epa.org
www.wetlandstudies.com

U.S. Green Building Council:
www.usgbc.org

Pervious Pavement Systems:
www.uni-groupusa.org
www.invisiblestructures.com

Green Roofing:
www.greenroofs.com
www.greenroofs.org

Cistern:
www.xerxescorp.com

American Society of Heating, Refrigerating, and Air-conditioning Engineers:
www.ashrae.org

Illuminating Engineering Society of North America for night-time lighting recommendations:
www.iesna.org

Energy Star program:
www.energystar.gov

Green Label Plus requirements from the Carpet and Rug Institute:
www.carpet-rug.org

The Greenguard Environmental Institute for indoor air quality certification:
www.greenguard.org

Green Energy Credits from Sterling Planet:
www.sterlingplanet.com

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