

Spray-Applied Geomembranes Have a Big Impact on Low Impact Development



The site efficiently incorporates a range of readily available green technologies, including the bio-mod units, two tree filters, a living wall, the bioswale, and the SEMSWA rain garden. Collectively, these systems form a “treatment train” to treat runoff.

Low impact development (LID) has become a major influence on new storm-water, water quality, and affiliated projects throughout the United States. The recent International Low Impact Development Symposium (August 2013, Saint

Paul, Minnesota) proved as much with more than 800 attendees in just the event’s 6th installment. The attendance level is even more impressive when one considers that the LID conference was scheduled during the same window as the long-

successful StormCon conference (August 2013, South Carolina). That both events could flourish underscores how influential LID practices and water quality issues have become.

A Centennial, Colorado project has

brought these issues together to demonstrate exemplary green infrastructure approaches. An eco-friendly, spray-applied geomembrane played a huge role.

Promoting Water Quality

The Colorado Department of Public Health and Environment’s (CDPHE) Water Quality Improvement Fund (WQIF) offers grants to improve education and training resources for a variety of water-impacting practices. The City of Centennial’s Southeast Metro Stormwater Authority (SEMSWA) received a \$15,000 education grant to highlight green, low impact development practices for infrastructure at SEMSWA’s Water Quality LID Demonstration Campus in Centennial. The grant would enable SEMSWA to train others on the campus after the new green engineering basins were installed.

The City of Centennial, located in the Denver-Aurora Metropolitan Area, is interesting in that it was not officially formed and incorporated until 2001—but it is not small. With more than 100,000 residents and healthy growth, it must address plenty of urban water quality challenges. Locally-based SEMSWA is charged with providing

the stormwater management, drainage, and flood control services for Centennial, Arapahoe County, and part of Douglas County. These services include capital con-

struction, floodplain management, master planning, water quality, system maintenance, and more.

The WQIF grant that SEMSWA re-



The complete “vault” installation fuses newer engineering and construction approaches with traditional infrastructure.

ceived was further supported by strong donations of materials and labor, providing an ideal opportunity to show how LID designs, properly implemented, can have a big, beneficial impact on water quality while generating strong goodwill between the community and the companies demonstrating the work.

Colorado Lining International (CLI) became part of the new LID campus development out of both direct interest and activity in the related markets, and familiarity with the area. CLI's global headquarters is located in Parker, Colorado in Douglas County.

A Smarter Mix Of Materials

The Water Quality LID Demonstration Campus has been designed to provide education and training for all levels of stormwater management personnel, including private sector design engineers, construction contractors, and public sector review agencies. It's part of a dedicated effort to promote green infrastructure practices in semi-arid climates.

To help underscore the options available to communities, SEMSWA incorporated a broad range of materials in the project.

A centerpiece of design on the campus involves an armored, extended detention basin. While not large, the retrofitted basin provides an exceptional project demonstration opportunity, as it utilizes a suite of green infrastructure Best Management Practices (BMPs). It showcases the applicability and functionality of green stormwater management techniques, and it provides a clear example of how communities can incorporate LID strategies with just as much success through retrofitting as through new construction.

Overall, the demonstration design focuses on reducing the impact of development by increasing the infiltration and treatment of stormwater as it flows over vegetated surfaces, a process that closely mimics natural conditions.

Common principles and materials from rain garden designs have played a central role.



An underdrain was added to this rain garden, as well as infiltration and growing media, and native plants. Inset: The spray-applied membrane decrease stormwater runoff volume as the garden removes pollutants in runoff through natural vegetative processes.

For the containment solution, the facility has utilized two approaches, one drawn from newer lining technology (an eco-friendly spray-applied liner) and one from a more traditional lining solution (a polymeric liner delivered on prefabricated roll).

Much in the way the project has demonstrated how retrofitting and new construction can use these techniques, the contrast in liner solutions has shown how old and new methods are effective and green, given the right project and material knowledge.

This portion of the project—the lining—was where CLI contributed its expertise.

Phase One work included:

- Providing 179 yd² of 8 oz. geotextile separator fabric
- Providing 49 yd² of spray-applied waterproof coating
- Installing 130 yd² of the waterproof coating for work on the pond outlet structure

Phase Two involved:

- 640 yd² of 8 oz. geotextile separator fabric
- 320 yd² geomembrane liner (30-mil PVC) with connections

The spray-applied membrane (Ecodur) is unique in that it is a solvent-free spray-on liner system comprised completely of natural products. It is even manufactured without creating emissions, given the project a carbon footprint reduction even before the product arrived on site.

With construction and related activities producing up to 40% of global carbon emissions, small shifts in the product chain and on site can have a huge impact.

The spray-applied membrane is a newer product in these types of designs, but SEMSWA was sufficiently interested with the results that the organization is now considering a revision in its specifications for future rain garden installations.

Other LID approaches used in conjunction with the retrofit and affiliated vegetation and green installations included:

- Stormwater separation system
- A biofiltration box
- Tree filters
- A vegetated green wall
- Bioswales

Stormwater separation systems come in a variety of orientations, sizes, and price points, but their function is simple: the removal of total suspended solids (TSS) and debris (such as floating litter). Many systems also filter oils from runoff, which is



A closer look at the bio-mod unit. SEMSWA's grant supports its use of systems like this in educating stormwater professionals from the public and private sectors.

extremely important in urban zones. These systems provide a strong level of treatment ahead of any runoff into underground infrastructure, as well as help provide cleaner water flow on the surface.

Biofiltration boxes are, essentially, en-

gineered rain gardens. They utilize natural vegetative and soil filtering processes to redirect and treat runoff. Low-set and often installed in conjunction with stormwater structures such as inlets in urban areas or as breaks between parking lot rows, runoff

can flow into the biofilter and be retained by the soil and used by the vegetation. Depending on the variety of plants, the microbial activity in the soil, and the type of pollutants in the runoff, the biofilter may actually cleanse the runoff—ultimately keeping the runoff out of the underground stormwater management system.

Tree filters are another form of biofiltration. These systems, like biofilter boxes, are constructed with enough space to support tree root development. When runoff enters the tree box, it is taken up or detained by the soil, affiliated vegetation and tree root system. Excess runoff may flow into a catch basin. As with the other bio-retention structures, the tree filter system is designed to minimize how much runoff may escape the system into underground stormwater pipes.

Bioswales are common landscaping techniques that attempt to “interfere” with runoff by creating gentle slopes, dips and turns. This helps disrupt the direct flow of runoff and, combined with vegetation and engineered BMP materials (e.g., check dams) the bioswale can increase infiltration, vegetative uptake of water/pollutants, and the deposit of sediment within the swale rather than in the stormwater system.

Looking Forward

These green infrastructure approaches were chosen for how they decrease maintenance costs, reduce permit fees and collateral deposits, lower infrastructure costs, and create community amenities.

They provide a ready-to-adopt strategy for more efficiently using an urban landscape, disturbing less land and decreasing stormwater sedimentation runoff and other detrimental aspects of traditional urban hardscapes.

For the semi-arid communities found throughout Colorado and which must think more carefully about how to responsibly and economically manage their water resources, the SEMSWA demonstration campus is making low impact development more visual and ultimately more accessible.

The LID field remains relatively young, but it is steadily finding its way into the discussions of municipalities, land use agencies, developers, and engineers. This is true within the Denver metropolitan area. Increasing community awareness and tougher stormwater and sediment control regulations are having a beneficial impact on LID acceptance, and the SEMSWA campus contributes positively to this dialogue.

The mix of materials on the demonstration campus, including the eco-friendly, spray-applied, water-tight liner, demonstrates the large range of options that LID designs may incorporate on their path to smarter, more sustainable development.

L&W

by Patrick Elliott, GM – Colorado Lining, International, Inc.

Project Details

SEMSWA: Demolition, erosion and sediment control, earthworks

Contech: CDS System and Urban Green Bio Filter Box

Colorado Lining International, Inc.: Membrane and Spray Liner materials and installation

KriStar: BioMod Filter Cell Module and Filterra tree filter box

Pioneer Sand and Gravel: Mix for rain gardens and bioswale

Valerian: Landscape design

J3 Engineering: Project Design

Territory Unlimited: Contractor