Upstream channel with turf reinforcement mat (TRM) lining (March 2012).

South Bend recycles a new channel to protect the St. Joseph River

We don't always have to use all virgin materials for new projects. What does this mean? The city of South Bend, Ind., can tell you all about it.

By Kurt Kelsey

Introduction

Stormwater management is a necessary task that confronts every municipality. But how the stormwater is actually managed can differ.

Typical gray-pipe solutions get the job done, but they do not provide filtering of the stormwater and they are not aesthetically pleasing to the public. Thinking "outside the pipe" about green solutions can result in stormwater management projects that can be more effective at protecting water resources.

In addition, green solutions, when planned and constructed properly, can become a beautiful part of the landscape even in urban settings.

Background

The city of South Bend, Ind., continued to show its environmental conscientiousness and leadership through its Stormwater Management Master Plan.

South Bend's Model Cities sewer program began in the 1970s and it separated 333 acres of land on the northwest side of South Bend. The full build-out of the planned sewer separation associated with the Diamond Avenue Trunk Storm sewer is 946 acres. The Diamond Avenue project's ultimate goal was to provide a positive outlet to the St. Joseph River. Team members involved with this project succeeded in achieving this goal.

Planning

Taking a site from concrete and pipe back to a natural channel is not an easy task.

A feasibility study for the Diamond Avenue project started in August 2006 and design for the project started in June 2009.

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Photos pages 42 & 49 courtesy of American Excelsior Co.

Photos pages 44, 45, 46 & 48 courtesy of The Troyer Group.

Concrete/decorative clad drop structure installation at sediment pond outlet (October 2011).

PROJECT HIGHLIGHTS

PROJECT OWNER
CITY OF SOUTH BEND, IND.
Patrick Henthorn, P.E., and Toy Villa

PROJECT MANAGER
Christopher L. Waidner, P.E.,
Troyer Group (Mishawaka, Ind.)

GENERAL CONTRACTOR
Rieth-Riley Construction Co. Inc.
(Goshen, Ind.)

GRADING CONTRACTOR
Kreager Brothers Excavating Inc.
(Fort Wayne, Ind.)

INSTALLATION
Acorn Landscaping & Excavating
(South Bend, Ind.)

Erosion control/turf reinforcement mat—Recyclex TRM-V

American Excelsior Co.
(Arlington, Texas)

EROSION ANALYSIS AND DESIGN SOFTWARE
ErosionWorks
www.erosionworks.com

Both short-term and long-term planning was completed by the team for this sewer separation projection and included:

- A green channel needed to safely and effectively convey stormwater to the St. Joseph River for initial volumes, but future capacity requirements of the channel would also need to be considered.
- Channel design requirements based on a volume of 392cfs and velocity of 12.2ft/s for the stormsewer outlet channel.
- Establishing native vegetation in the channel that would receive no mowing activities.
- A pond added upstream to collect sediment from stormwater runoff that would eventually be released to the new green channel.
- Vegetated green channel designs to reduce thermal charging of the water before it discharges to receiving water bodies. (Traditional hard armor alternatives can cause water temperatures to increase before entering other water bodies. Vegetated channels also provide a filtering mechanism of stormwater runoff that does not exist with unvegetated hard armor or pipe systems.)
- Transforming the intersection of Angela Boulevard and Riverside Drive into a roundabout.

Finalizing the team

Stormwater management projects are no different from most other activities in everyday life when you get down to it. A good plan and a knowledgeable team to tackle the project is an essential component to every successful project (see Project Highlights).

Executing the plan

Final earthwork activities for the retention pond and stormwater channel followed the completion of the roundabout intersection. Again, the intent of the

channel was to mimic the appearance of a naturally occurring channel while maintaining bank stability for the design peak flow parameters.

First, a channel was graded into the silty loam soil. Channel sideslopes were set at 3H:1V. A 30-mil PVC liner was then placed under the channel area. Geocells were installed into the channel bottom, then filled with stone. Three polyester tendons were installed per geocell section and 24-in. anchors were applied every 6ft along the tendons to hold the system in place. Rocks were placed throughout the channel bottom to further replicate the appearance of a natural stream. Two concrete/decorative clad drop structures were added to the channel bottom to permanently infuse dissolved oxygen into the flowing water.

The intent of the channel was to mimic the appearance of a naturally occurring channel while maintaining bank stability for the design peak flow parameters.

>> For more, search **stormwater** at www.geosyntheticsmagazine.com

Sediment pond lined with TRM (March 2012).

Retention pond (October 2012).

Channel construction before the turf reinforcement mat (TRM) was installed (October 2011).

Geocells were also installed partially up the channel sideslopes in the transition zone between the channel bottom and sideslopes. In this area the geocells were filled with soil, then a mixture of grasses and forbs were applied 5ft up on each side of the channel bottom. Low profile prairie mix was applied to the remainder of the slopes and then a turf reinforcement mat (TRM) was installed.

The TRM contained fibers made from 100% postconsumer goods. The fibers are made from recycled soda bottles, not from all virgin resins. (Approximately 20 bottles are diverted from landfills for every pound of this TRM fiber.) It also does not float in water, an important property to verify before specifying a TRM. Geopins, 18in. long, were used to secure the TRM over the soil-filled geocells. About 2,500 wetland plant plugs were added to the channel, and, lastly, stormwater drainage pipes were routed to the newly constructed green channel.

The bottom of the sediment pond was lined with stone. Above the stone, the TRM was installed over the topsoil and seed. The perimeter of permanently reinforced vegetation was included in the design as an insurance policy if the water level would rise above the stone during extreme stormwater runoff events.

A viewing area at the channel outlet into the St. Joseph River was built and a walking path was also constructed along the waterway and connected to the existing trail system.

Results

The city and local residents are pleased with the final product and its added features that a typical stormwater separation project would not have.

Through their collaboration, the city of South Bend and the key members of the project team were able to create an effective, visually pleasing stormwater management

Channel upstream of intersection (June 2012).

element that blended naturally into the existing river walk and trail system. As local resident Jill Joachim put it, "[City engineer] Patrick Henthorn and company did a great job with the design and execution of the project. It is lovely! The improvements to grade, traffic, aesthetics, utility, and drainage are wonderful."

Since completion, the vegetation established well even through dry periods that followed installation. The channel erosion design has proven its durability during the course of snow melt and rainfall events that have occurred since installation. Minimal maintenance, if any, will be needed at the site. The project team matched the right geosynthetic products to the right applications so the job was done correctly the first time. In addition, proper selection of native vegetation species in the planning stages resulted in a green stormwater management system that will not require mowing.

Project manager Christopher Waidner said, "The project came together nicely. Everyone involved worked diligently to make this a success. [The TRM] meets and exceeds the performance and recyclable properties associated with environmentally sensitive projects such as the Diamond Avenue project. This combined with ease of installation and technical support make it a TRM product of choice for designers and contractors."

Lessons learned

The main lesson learned with this project was that proper planning and material selection can expedite stormwater management projects and lead to successful solutions.

The system of practices and materials used are effectively delivering a positive outlet to the St. Joseph River in an efficient, economic, and environmentally friendly manner that mimics a naturally occurring channel. "Think outside the pipe," as the city of South Bend did, on stormwater management projects.

Stormwater channel outlet to the St. Joseph River (September 2012).

Stormwater channel outlet to St. Joseph River (January 2012).