

8

Steps to Green Infrastructure Success

State DOTs share their strategies for building an effective GI program

BY ANDREA J. THOMAS

For highway agencies, effective roadside water management is critical to keeping motorists safe and mitigating the adverse impacts of flooding, drought, and temperature extremes on roads and bridges. Although green infrastructure (GI) installations such as bioswales, detention ponds, and infiltration facilities can help agencies effectively address drainage issues and mitigate pollution, GI is not used routinely as a standard stormwater management method at many agencies.

In 2017, a team of experts from several state departments of transportation (DOTs) set out to identify the characteristics of robust, successful, and cost-effective GI programs. “As state DOTs, we sometimes focus on meeting policy and permitting requirements for individual construction projects rather than looking at how all of the stormwater features along a roadside are helping the water body as a whole—including aesthetics, ecology, and habitat,” says Jennifer Taira, senior landscape architect at the California Department of Transportation. “I wanted to see how other agencies had been successful in taking a more holistic approach to stormwater management and GI.”

To gather more information, Taira turned to the U.S. Domestic Scan Program, which helps connect state DOT practitioners with innovative peers across the country to address issues of common interest. Administered by

the Transportation Research Board’s National Cooperative Highway Research Program, the scan program funds workshops and traveling “scan tours,” where a small team visits multiple states to get a firsthand look at effective practices.

Through the scan program, a group of stormwater experts, hydrologists, landscape architects, and other professionals from agencies in 15 states came together for a four-day workshop in November 2017 on implementing GI practices for cost-effective roadside water management at state DOTs. By the end of the week, the group had developed a suite of recommendations and best practices to help highway agencies build successful GI programs.

The scan team identified eight attributes of effective GI programs at state DOTs—approaches that provide long-term results across varied climates, geography, and topography.

1. Be Clear on What GI Means

Recognizing that GI has different meanings and definitions at different agencies, the scan team would like to see a national standard definition of GI that state DOTs could adopt to help facilitate a consistent message and implementation. “We see GI as not just a stormwater feature, although GI does address the immediate need of stormwater treatment,” Taira says. “But beyond

that, there are longer-term benefits to GI that improve habitat, watershed hydraulics, and blending into the natural environment.”

Having a nationally recognized standard in the transportation sector would help clarify eligibility for federal funding and grants and promote a deeper understanding of the many categories and components of GI. Toward that end, scan team members are advocating for the American Association of State Highway and Transportation Officials (AASHTO) and the Federal Highway Administration to develop a GI definition that would ultimately be incorporated into the AASHTO “Green Book”—the national roadway design guidebook used by all state DOTs (formally titled *A Policy on Geometric Design of Highways and Streets*).

2. Take a Watershed Approach

In the transportation realm, local and regional agencies have led the way with exemplary applications of GI that move beyond a project-based approach to consider an entire watershed. While this can be more challenging at the state level, where a highway reconstruction project may cross rivers and streams that are part of several watersheds, state DOTs are continually looking for local and regional approaches that can be scaled up.

The Southeast Michigan Council of Governments (SEMCOG) shared one such approach with scan workshop participants. Several years ago, SEMCOG worked

with local agencies in southeast Michigan to develop a region-wide process for implementing GI practices. This included a GI vision plan that identified areas of opportunity for GI implementation within the area’s eight major watersheds and 67 subwatersheds.

SEMCOG also partnered with Michigan DOT to create a policy to support coordinated efforts to align water, natural resources, and transportation priorities and facilitate collaboration on stormwater management activities. “By reaching out to municipalities, counties, and other agencies to form common goals and policies, they were able to accomplish much more than one agency could have done alone,” says workshop participant John L’Etoile, landscape architect supervisor at Nevada DOT. “When each group addresses its part of the watershed, the entire watershed can more effectively be improved. Taking this approach can also help you identify areas that will have the greatest impact and prioritize them for treatment.”

For DOTs, using a watershed approach also helps avoid the right-of-way constraints that can limit the potential for GI in transportation projects. DOTs typically obtain right of way in linear segments along a roadway, which can limit the opportunity for GI practices such as bioretention areas that cannot fit within a narrow strip of land. Taking a watershed approach and partnering with other agencies increases opportunities for building GI or banking credits in other areas.

Nevada DOT

Along I-580 in Reno, Nevada, a drainage outlet empties into an area that has been seeded with native plants.



3. Choose Effective BMP Designs

For DOTs, developing state-specific GI design guidance can help streamline the critical process of selecting the best design for a given location. By employing an interdisciplinary team that includes landscape architects trained in site design, soil types, regional plant selection, and other



An extended detention pond in Anne Arundel County, Maryland.

aspects of GI, agencies can develop environmentally informed standard designs that are primed for success.

Washington State DOT (WSDOT) took this approach when low-impact development was introduced as a permitting requirement for the agency in 2009. After analyzing the effectiveness of different stormwater best management practices (BMPs) in various situations, WSDOT then provided further direction, developing a flowchart that helps designers choose the appropriate BMP.

4. Ensure Quality Construction

With a viable design in place, quality construction is the next step in an effective GI installation. This includes successful vegetation establishment—a common challenge for GI facilities that are built as part of roadway projects, since general contractors may lack experience with GI construction.

“You can have a great set of

plans, but if it isn’t built correctly, you get something that doesn’t work,” says scan team member Charles Hebson, manager of the Surface Water Resources Division at Maine DOT. “DOTs need to convey that GI is every bit as important as the steel you’re putting down. It’s not just an add-on.”

Construction contract provisions can help get that message across. Some DOTs require specialized landscape subcontractors, or provide a contract structure that includes plant establishment and replacement of dead and dying plant material. Having specifically trained GI construction inspectors on site, like the environmental compliance inspectors Maine DOT uses, can also help ensure quality work.

5. Plan for Maintenance

From removing debris and sediment to ensuring plant establishment, maintenance staff play a critical role in the success of a GI installation. Careful planning—including identifying maintenance needs early, establishing a funding mechanism, and providing training for crews—can help facilitate this important work.

For Maryland DOT, the scan workshop helped enhance an ongoing effort to improve communication between stormwater management personnel and the maintenance staff who care for GI assets. Inspired by a similar approach in Pennsylvania, Maryland DOT updated its stormwater management facility maintenance manuals to better meet crews’ needs.

“Pennsylvania DOT had really nice infographics developed to help their maintenance people quickly understand the needs of each type of stormwater facility,” says Kiona Leah, drainage and stormwater assets manager at Maryland DOT. “Following that approach has really helped our maintenance folks as well. We now work more closely with our maintenance staff to find out what they need.”

6. Take Advantage of Asset Management

Analyzing maintenance records can give agencies valuable information about where different types of GI facilities work best. When a facility isn’t performing as expected, Leah says, the first step is often to conduct maintenance or remediation, such as removing accumulated sediment from a detention pond.

“We don’t know if a facility needs to be retrofitted to a different type of facility until we do that type of work first,” Leah says. The next step is to track whether the repairs are successful—and how long they last.

Maryland DOT has been collecting this type of data on its stormwater facilities for more than 20 years; the department currently uses a GIS-based asset management system. “Having a location-based database is huge,” Leah says. “Over years of collecting and analyzing data, we’ve found that certain facility types just don’t work for us.”

7. Expand Public Outreach

Public unfamiliarity with GI practices can cause misunderstanding, criticism, and loss of public support.



Inspection training at a Maryland DOT wet extended detention pond in Montgomery County, Maryland.

Increasing outreach efforts can help encourage public acceptance of previously unknown practices—which in turn helps sustain the use of GI infrastructure at state DOTs.

“In Nevada, we’ve seen real ben-

efits to reaching out to the community about our GI projects—letting them know what we’re doing and why we’re doing it,” L’Etoile says. “We want to help people understand that by improving the health of the environment, they can improve the quality of life in their community.”

In arid Nevada, that means using project signage, informational webpages, and public meetings to explain that the DOT’s use of native plants and drought-tolerant species in GI installations not only helps the environment but also beautifies the area and benefits pollinators and other wildlife. In addition, native plants do not need expensive irrigation systems, which can reduce installation and maintenance costs.

“With native vegetation, we know it will take a few seasons for the seeding effort to establish, and in the meantime it can look pretty bare; it can look like weeds,” L’Etoile says. “We’ve seen benefits from engaging with the community and asking them to have patience during the establishment period.”

8. Facilitate Research and Information Sharing

Since the scan workshop’s conclusion, the participants have continued their efforts to improve the exchange of information among GI professionals in the transportation sector. Scan team members are working to secure funding for a national GI conference specific to transportation professionals and a website for state DOTs that would provide resources and research on GI and roadside water management. The proposed website would help educate state DOTs about the benefits to the environment, native habitat, and ecology that GI installations can provide.

Investing in research on GI performance is another way that highway agencies can advance the state of the practice and encourage broader acceptance. By sharing research results with regulatory agencies and other stakeholders, state DOTs can help demonstrate

that GI is both an effective strategy for stormwater management and a smart business practice. ♠

Authors Note: For more information on the scan workshop, please visit www.domesticscan.org/16-02.

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