Chapter 4—Engineering
4.9 Innovative Practices

Introduction

When considering building complete streets, innovative practices should be explored as well. Using innovative practices and applying existing standards more flexibly may require decision makers to make decisions that are outside of the traditional ways of building streets. However, using innovative practices could result in benefits such as reduced costs and improved environmental stewardship.

Below are examples of innovative practices related to road pavement and stormwater management .

Sustainable Pavement Practices

Greenroads

Greenroads is a rating system that gives credits to projects that apply sustainable pavement practices to new, reconstructed, or rehabilitated roads. The certification is based on a total point value similar to the LEED certification. "A Greenroad is defined as a roadway project that has been designed and constructed to a level of sustainability that is substantially higher than current common practice" (Greenroads).

Best practices for Greenroads are divided into two types: required and voluntary. A project can become Greenroads-certified based on the total points achieved from the required and voluntary best practices. There are four certification levels:

- Certified: All Project Requirements + 32-42 Voluntary Credit points (30-40% of total)
- Silver: All Project Requirements + 43-53 Voluntary Credit points (40-50% of total)
- Gold: All Project Requirements + 54-63 Voluntary Credit points (50-60% of total)
- Evergreen: All Project Requirements + 64 + Voluntary Credit points (>60% of total)

Greenroads is a project-based system and is applicable to the design of the project. The system boundaries apply distinctively to the design process and construction activities within the work zone, as well as the hauling of material and production of concrete and asphalt.

Considerations (Greenroads):

- Lower construction cost as it recommends using existing asphalt by recycling and reusing it on-site.
- More environmentally friendly since it uses recycled material and decreases the amount of transportation of road materials.
- Shorter timeframe for completion of construction since most work is done on-site.

In central Ohio, Greenroads can be found in the City of Upper Arlington. Five roads were included as part of its Greenroads pilot program:

- Edgevale Road
- Glenmere Road
- Sunset Drive
- Inverness Way
- Eastcleft Drive

▲Edgevale Road during the Greenroads process
(Photo: Upper Arlington, Ohio)

▲Edgevale Road after the Greenroads process
(Photo: Upper Arlington, Ohio)

Green Asphalt Repair Treatment: RePlay

RePlay is a bio-based green product made from recyclables that is used as a preservation agent to seal and renew asphalt while adding new polymers to the pavement. By reversing the oxidation and moisture penetration, which are major sources of road deterioration and pothole formation, it reduces the need to repair or patch roads and extends the useful life (Ohio). BioSpan Technologies, Inc. is the manufacturer of RePlay.

Considerations (Ohio):

- 75% agricultural-based, with over 30% made from soybean oil.
- Reduces water permeability by over 95%.
- Increases the useful life of a treated road surface by 2-3 times its normal life span.
- Has a fast cure time of 15-30 minutes, reducing the amount of time a road has to be closed.
- Low maintenance cost due to quick cure time.

◄ Replay being applied to a road in Licking County, Ohio *(Photo: Ohio Pavement System)*

- Replay is the darker looking treatment applied to a road in Licking County, Ohio

Permeable Pavement

Permeable pavement refers to a range of materials and techniques for paving roads, bike paths, car-parks, and pavements that allow the movement of water and air around the paving materials. Types of permeable pavement include: pervious concrete, porous asphalt, single-sized aggregate, porous turf, open-jointed blocks, resin bound, and bound recycled glass porous pavement.

Permeable pavement reduces the need for retention ponds, swales, and other stormwater management devices and is thus more sustainable and cost effective. The use of permeable pervious pavement is among the Best Management Practices recommended by the Environmental Protection Agency. The advantages and disadvantages for using permeable pavement are discussed below.

Considerations (Paver Search Inc., 2011):

- Reduces rate and quantity of stormwater runoff since the pavement is designed to allow water to sink through the soil.
- Reduces stress on storm sewer systems because permeable pavers are a self-drainage system.
- Recharges groundwater to maintain aquifer levels.
- Channels more water to tree roots and landscaping, so there is less need for irrigation.
- Relatively high cost during the initial project.
- In cold climates, snow plow blades could damage the surface and the chlorides contained in road salt could migrate through the porous pavement into groundwater.
- Requires frequent maintenance because grit or gravel can block the open spaces that allow water filtration.
- Not a good source of pavement for high-traffic roads.

▲ Pervious Pavement
(Photo: Grange Insurance Audubon Center, Columbus, OH)

- Pervious Pavement used as part of the parking lot at the Audubon Center

▲ Pervious Pavement
(Photo: Grange Insurance Audubon Center, Columbus, OH)

- Pervious Pavement used as part of a rain garden at the Audubon Center

Stormwater Management

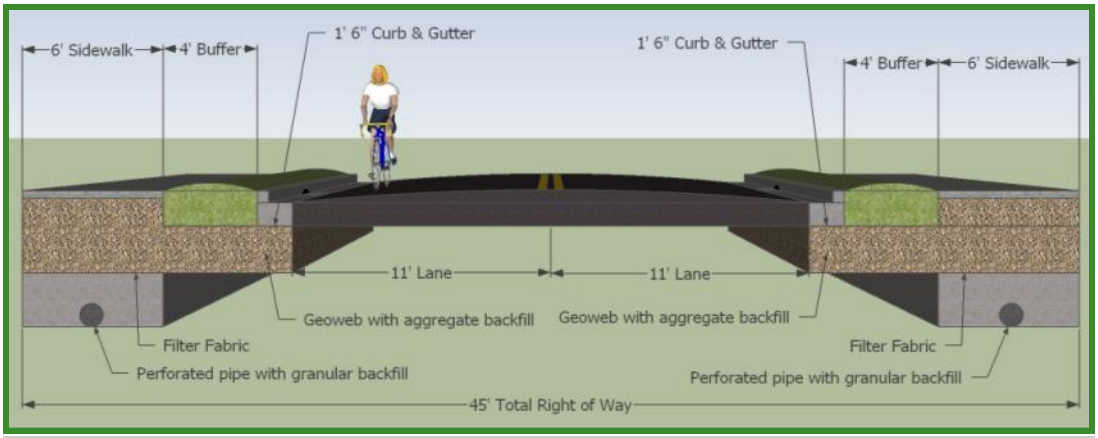
Stormwater runoff occurs when precipitation flows over the land surface. Surfaces that prevent water from soaking into the ground, such as asphalt roads, driveways, and rooftops, increase the runoff volume during storms. The runoff is then quickly carried to local streams, lakes, wetlands, and rivers and can cause flooding and erosion. The stormwater runoff carries with it different pollutants that are found on paved surfaces, and thus, stormwater runoff is the number one reason of stream impairment in urban areas.

The Clean Water Act was expanded by the Environmental Protection Agency (EPA) to reduce the impacts of runoff on urban streams. In 1987 the Clean Water Act was amended to require the EPA to develop a program to address stormwater discharges. The EPA requires municipalities to obtain permits for discharges of stormwater runoff (Clean Water Act).

There are many options that can be used for stormwater management and some are discussed below. In general, innovative stormwater management practices seek to reduce the volume and speed of runoff through a variety of on-site treatments. As with other elements of Complete Streets, context is very important. In particular, constrained rights-of-way may be obstacles to the implementation of innovative practices in some areas.

Curb and Gutter (United States EPA & Minnesota Sustainable Housing Initiative)

Curb and gutter is the traditional model for stormwater management in urban areas and is meant to prevent flooding in more developed areas. Curb and gutter transport the flow of water as quickly as possible to a stormwater drain without allowing for the removal of pollution or infiltration. There are a number of downsides to curb and gutter, such as a high-peak flow rate immediately after a rain event, which contributes to erosion. Pollutants are often not filtered when using curb and gutter. Additionally, curb and gutter systems often account for a substantial portion of transportation project costs.



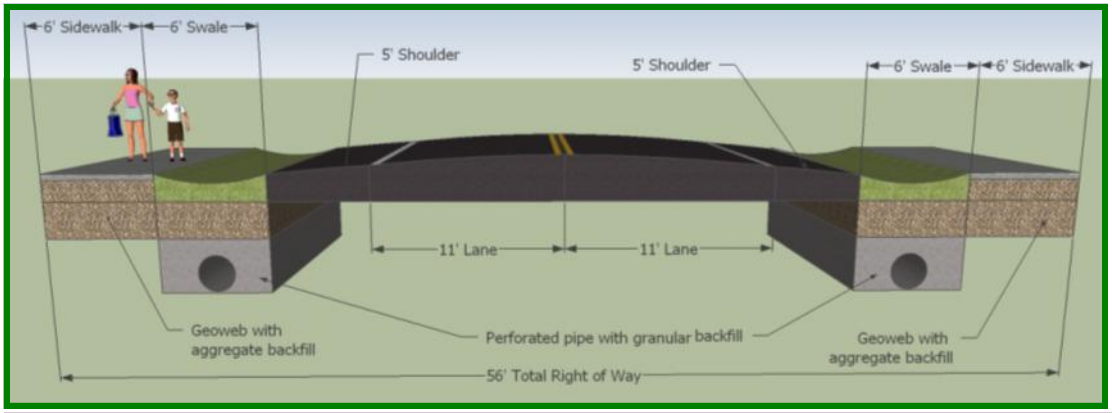
▲ Example of 1'6" Curb and Gutter

Figure 1.1

Swale

A swale is a "graded and engineered landscape feature appearing as a linear, shallow, open channel with trapezoidal or parabolic shape. The swale is vegetated with flood-tolerant, erosion-resistant plants" (Lake Superior Duluth). The swale encourages stormwater to pass through at a slower controlled rate and acts as a filter for removing pollutants.
The swale allows for stormwater infiltrations and has a significant improvement over traditional draining in both slowing and cleaning the water. Swales are particularly useful in more rural and suburban areas with sufficient right-of-way and reduce the need for curb & gutter. The depth of the swale varies based on the swale width and the pipe size.

Figure 1.2

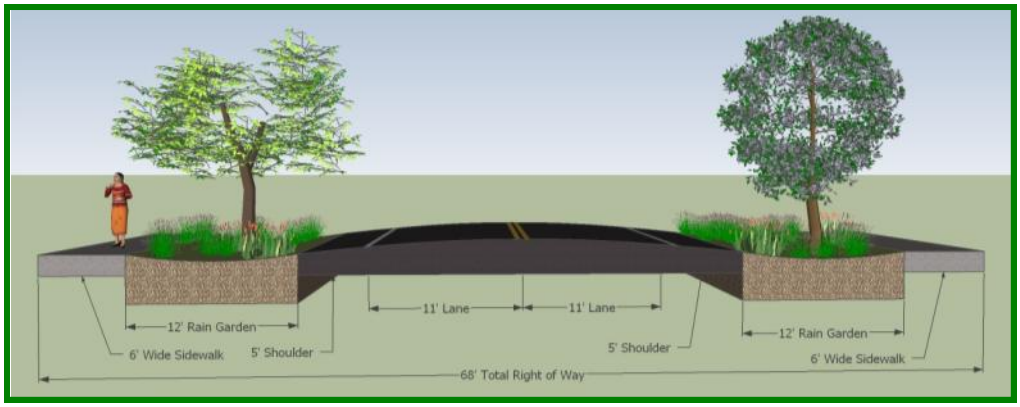


▲ Example of a 6' swale.

Rain Garden (Central Ohio Rain Garden Initiative)

Rain gardens are a natural way to use rain water as a resource instead of as a waste product. Every time it rains or snow melts, large amounts of water from our rooftops, roads, sidewalks, and parking lots are carried through our stormwater system and drain directly into our creeks and streams. Pollutants are collected through the stormwater and create flooding that is harmful to property owners, stream life, and drinking water. Rain gardens are an easy, cost-efficient way to slow and decrease the amount of stormwater runoff that ends up in the waterways. Rain gardens also enhance the streetscape and can eliminate the need for underground piping. Rain gardens are useful along narrow urban roads with slow speed and a high number of residential housing.

Figure 1.3

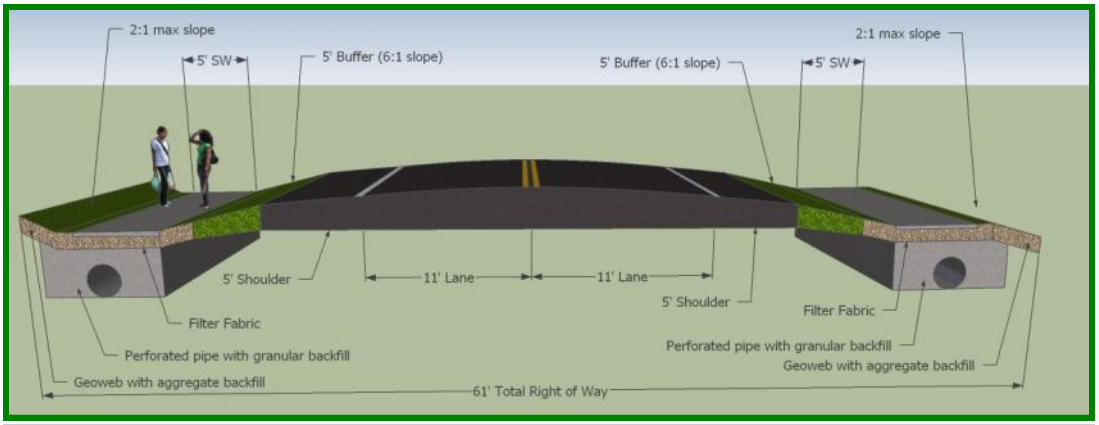


◄ Example of a rain garden.

Reduced Drainage Option (United States EPA)

Permeable pavement can be used to reduce drainage when considering stormwater management. It is used as an alternative to asphalt or concrete surfaces and it allows stormwater to drain through the porous surface to a stone reservoir underneath. The stone reservoir temporarily stores surface runoff before infiltrating it into the subsoil. "The appearance of the alternative surface is often similar to asphalt or concrete, but it is manufactured without fine materials and instead incorporates void spaces that allow for storage and infiltration" (United States EPA).

Figure 1.4



▲ Example of a Reduced Drainage Solution

Integrating Innovative Stormwater Management Practices with Complete Streets

In many cases, innovative approaches to stormwater management are complementary to complete streets concepts. A rain garden, for example, can be used as a "bump-out" to reduce pedestrian crossing distance at intersections and slow vehicular traffic. Similarly, vegetated swales offer a buffer between pedestrians and vehicles that allows for more comfortable pedestrian travel. Portland, OR has a "green streets" program which serves as a model for the incorporation of innovative stormwater management with multimodal transportation options.

Sources

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