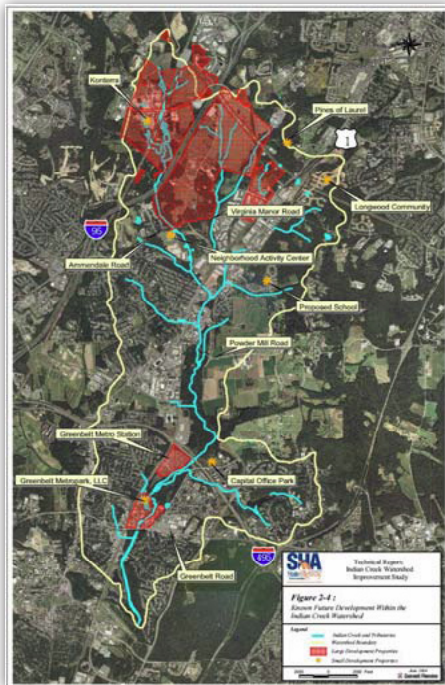




**WHAT ARE GREEN HIGHWAYS?**

Under the GHP, green highways are not defined by a list of requirements. Green highways are defined by an effort to go “beyond compliance” and leave the project area “better than before” through community partnering, environmental stewardship, and transportation network improvements in safety and functionality. What this means differs from project to project, and location to location. Therefore, the Green Highways Partnership discusses characteristics of a green highway that will integrate transportation functionality and ecological sustainability.



Indian Creek Watershed Improvement Study sponsored by Maryland State Highway Administration.

**INTRODUCTION**

Transportation systems in the United States provide valuable opportunities for mobility, commerce and recreation. Various transportation activities such as roadway construction and maintenance, vehicle travel, and vehicle maintenance, can result in water quality and quantity impacts including flooding and erosion, increased concentrations of heavy metals, salts, oil and grease, nutrients and suspended solids. (EPA, 1996, Granato, 2003)

Transportation planning is undergoing significant changes due in part to a growing awareness in the scientific and government communities of the need for more integrated ecosystem approaches and transportation regulation that requires more ecologically sensitive transportation planning and design. (Venner, September 2005)

Applying stormwater management techniques to address water quality and water quantity concerns is now common practice in highway projects. Best Management Practices (BMP) are typically designed to meet regulatory requirements, and are focused on treating and managing runoff within the rights-of-way (ROW) of highways. Whereas, the GHP approach focuses on activities beyond the right-of-way and within the watershed for better-than-before results.

**The Green Highways Watershed Approach** to stormwater management, recognizes that highways coexist with other land uses within watersheds, and a collaborative approach provides an opportunity for highway agencies to plan and deliver the most cost-effective protection, even improvement, to watersheds. To aid in watershed recovery, address watershed impairments, and to be prepared to address future potential water quality standard requirements, designers must begin thinking outside of the right-of-way. The following principals outline the framework for the GHP Watershed Approach to Stormwater Management for Transportation Projects.

**GHP WATERSHED APPROACH PRINCIPLES:**

1. Views regulatory compliance as a minimum requirement for acceptance.
2. Requires a stormwater management plan considering watershed-wide needs, that is based on collaborative watershed improvement goals and plans, and developed in collaboration with local governments and resource agencies.
3. Focuses on achieving good environmental results for the watershed in a cost-effective manner, not just meeting regulatory requirements by using traditional, end-of-pipe approaches.
4. Integrates stormwater plans into project development and project features.
5. Uses collaborative partnerships to leverage and deliver a combination of watershed improvements to cohesively and consciously produce tangible results.
6. A coordinated mitigation/enhancement strategy is important – coordination with other projects in the watershed is necessary.

## KEYS TO ACHIEVING THE GHP WATERSHED APPROACH

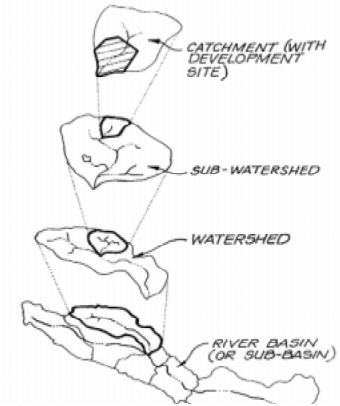
1. DOT should form partnerships with others, such as local governments, resource agencies and private groups in areas of planned major projects to combine resources to improve watersheds.
2. Develop a watershed improvement plan that reflects a consensus between resource agencies and local governments and which includes other data/efforts such as watershed management and green infrastructure plans, tributary strategies, watershed restoration action strategies, 303(d) lists, TMDLs, and Biological Stream Surveys.
3. Watershed improvement plans should include a menu of environmental enhancement projects with cost estimates, environmental benefits, restoration goals, constraints/feasibility, and relative priority.
4. Coordinating local government and private funding for mitigation and watershed improvement purposes are key to achieving cumulative and coordinated watershed benefits.
5. Use a combination of conventional (structural and non-structural) and new BMPs to fit the watershed needs, sustainability goals, and the context of their surroundings.
6. Coordination with other projects—DOT or other—is important to get a coordinated mitigation/enhancement strategy.



2.

## WHAT IS A WATERSHED?

A land area that drains to a common body of water such as a lake, river, bay, or ocean. Watersheds supply drinking water, provide recreation and respite, and sustain life. A watershed is a natural asset that should be managed accordingly.



The Watershed Management Units (Clemens, et al., 1996, Center for Watershed Protection, Article 28, Basic Concepts in Watershed Planning)

Watershed Management Unit	Typical Area (square miles)
Catchment	0.05 to 0.50
Subwatershed	1 to 10
Watershed	10 to 100
Subbasin	100 to 1,000
Basin	1,000 to 10,000

## A WATERSHED APPROACH:

### Is hydrologically defined

- Geographically focused
- Includes all stressors (air, land and water)

### Involves all stakeholders

- Includes public (federal, state, local) and private sector
- Is community based
- Includes a coordinating framework

### Strategically addresses priority water resource goals

- (water quality, habitat)
- Integrates multiple programs (regulatory and voluntary)
- Based on sound science
- Aided by strategic watershed plans
- Uses adaptive management

## Green Highway Watershed-Based Stormwater Management Benefits

The GHP process advocates an ecosystem, watershed-based approach for all phases of project development including planning, design, construction, and maintenance. Some key features and benefits are highlighted below:

GHP Process	Process Highlights	Benefits
Planning	Integration of Watershed Management, Wildlife Management, and green infrastructure plans Land Use, into the transportation planning process.	Saves time and money and increases public support Support a collaborative vision Provides for predictability and conservation on larger scales
Project Development & NEPA Review  Design and Construction  LID/ESD for Linear Facilities and Watersheds	<ul style="list-style-type: none"> <li>• Stormwater management plans should be integral part of project development and NEPA studies.</li> <li>• Watershed needs should be the focus of stormwater management plans, not just on-site regulatory compliance.</li> <li>• Project's minimum responsibilities should be established based on regulatory compliance and a plan should consist of a combination of on-site and watershed-wide stormwater management opportunities, including banking and trading.</li> <li>• Both in-kind and out of kind BMPs should be in the plan, to obtain the best environmental result in a cost-effective manner.</li> <li>• Combine use of natural LID facilities with non-structural and structural BMPs to enhance infiltration and evapotranspiration and reduce runoff and pollutant loads to water resources throughout the watershed.</li> </ul> <p>Examples include but are not limited to:</p> <ul style="list-style-type: none"> <li>• Bioretention</li> <li>• Porous pavement</li> <li>• Soil amendments,</li> <li>• Forrest buffers</li> <li>• Infiltration trenches</li> <li>• Stream and wetlands restoration</li> </ul>	<p>Protects Watershed</p> <p>Combinations of on-site and off-site structural and non-structural &amp; low impact development best management practices will enable restoration of pre-existing hydrologic patterns and reduce pollutant loadings</p> <p>Low Impact Development practices (LID) out perform conventional Best Management Practices (BMP's) for reductions of runoff and treatment of pollutants</p> <p>Promotes real time innovation</p> <p>Improves quality of decisions</p> <p>Opportunity to minimize disruption of natural resources and hydrology</p> <p>Allow for more efficient and effective use of resources</p>
Monitoring and Maintenance  Pollution Prevention	<ul style="list-style-type: none"> <li>• Maximize the use of native species in highway and roadway planting to reduce the need for irrigation and maintenance.</li> <li>• Incorporate integrated pest management control to minimize need and use of fertilizers and pesticides.</li> <li>• Monitor select pilot project and assess effectiveness</li> </ul>	<p>Reduces Resource Use</p> <p>Improves overall performance</p> <p>Extends performance and value</p>

Abbreviations: LID- Low Impact Development; BMP- Best Management Practice; NEPA - National Environmental Protection Act

## RELATIONSHIP BETWEEN THE GHP WATERSHED APPROACH AND GREEN INFRASTRUCTURE (GI)



The EPA's Office of Water defines green infrastructure as essentially encouraging infiltration, evapotranspiration or reuse of stormwater, with significant utilization of soils and vegetation rather than traditional hardscape collection, conveyance and storage structures. GI consists of an interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and nature. It incorporates principles of: landscape ecology, conservation biology, restoration ecology, and watershed management.

Common green infrastructure approaches include green roofs, trees and tree boxes, rain gardens, vegetated swales, pocket wetlands, infiltration planters, vegetated median strips, reforestation, and protection and enhancement of riparian buffers and floodplains.

The GHP approach utilizes GI in the design and implementation of stormwater BMP's along with watershed restoration and protection, including ecosystem management.

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[www.greenhighways.org](http://www.greenhighways.org)  
[www.dot.gov/perfacc2006/environstew.htm](http://www.dot.gov/perfacc2006/environstew.htm)