CONTENTS

1. INTRODUCTION.............................................................................. A2-2
2. SITING AND DESIGN CONSIDERATIONS.................................... A2-4
3. STORMWATER BMPS FOR GREEN STREETS............................. A2-6
4. GREEN STREET TYPOLOGIES....................................................... A2-8
5. GREEN STREET BMP LAYOUT CONSIDERATIONS.................. A2-11
This Green Streets Guidelines document is intended to be used as a complementary resource to the Complete Streets Guidelines found in Moving Passaic County—the Transportation Element Update of the Passaic County Master Plan (the Plan). Passaic County’s transportation infrastructure includes 247 miles of roadway running through 16 municipalities. In the Plan, the County outlines its policies, priorities and projects for all modes of countywide transportation using its roadway system. The Complete Streets Guidelines are for planners, engineers, developers, and other interested parties in the preparation and design of roadway facilities under Passaic County jurisdiction.

COMPLETE STREETS AND GREEN STREETS

The Complete Streets Guidelines provide an overview of the County’s goals and objectives related to Green Streets. In the Plan, a Green Street is defined as “a transportation corridor that incorporates low-impact design elements and promotes non-vehicular forms of transportation. These streets are ideal for the installation of structural and non-structural green infrastructure facilities for stormwater management.” Passaic County encourages the use of low-impact design elements in all capital improvement projects and site development to further the goals and objectives of Green Streets.

The Complete Streets Guidelines broadly identify green infrastructure that might be used to create green streets, including:

- Street trees
- Stormwater planters
- Pervious paving (sidewalks and bicycle lanes)
- Rain gardens
- Vegetated swales
- Median planting strips

The Green Streets Guidelines presented here provide more detailed information about siting and design considerations for stormwater Best Management Practices (BMPs), as well as applicable practices and diagrammatic representation (plans and cross sections) of potential BMP locations in relation to the County’s road typologies and street zones, which are described on the following page.
1. INTRODUCTION

STREET ZONES

For each roadway typology, the right-of-way is delineated into pedestrian and vehicular zones, based on user group and function.

PEDESTRIAN ZONE

The Pedestrian Zone extends from the face of the curb to the building or property line and consists of the following subzones:

- Frontage Zone – where buildings are adjacent to the sidewalk, the Frontage Zone provides a transition space for pedestrians between the sidewalk and building doors, awnings, signs, and other architectural elements.
- Sidewalk Zone – intended specifically for pedestrian travel, the Sidewalk Zone should be clear of street furnishings, aboveground utilities and other obstructions.
- Curb Zone – located between the Sidewalk Zone and the roadway, the Curb Zone buffers pedestrians from vehicular traffic. Depending on width, the Curb Zone can provide space for lighting, plantings, street furnishings, signage, and public transit facilities such as bus shelters or kiosks.

VEHICULAR ZONE

The Vehicular Zone typically includes one or more travel lanes for motorized vehicles. Depending on roadway type, there may be the following lanes:

- Shoulder Lane – provides a buffer between the right-side curb zone and travel lane. Suitable distance could allow for bike lanes, parking or emergency pull overs.
- Bicycle Lane – ranges in placement within the vehicular zone. The dedicated bicycle lane should provide sufficient width, official lined markings and signs for user safety.
- Travel Lane – one or more lanes of equal size for vehicles to move from one destination to another.
- Median Lane – typically located in the middle of travel lanes going opposite directions as a vehicle or pedestrian refuge space. The lane can be striped or curbed with landscaping.

USING THE GREEN STREETS GUIDELINES

Choosing an appropriate stormwater BMP for a given street location can be challenging because of the number of site-specific variables that must be considered. These guidelines are intended to help focus the selection process on the most suitable practices for applicable street zones found on specific types of streets. Note that the Guidelines do not provide design and engineering information for BMPs and are intended to be used with the Passaic County Stormwater Management Guidance Manual (Appendix A1).

The Guidelines are organized as follows:

- 1 – Introduction (current chapter) provides an overview of the County’s Complete Street Guidelines, including street typologies, street pedestrian and vehicular zones, and examples of green infrastructure that might be used to create Green Streets.
- 2 – Siting and Design Considerations provides guidance for assessing existing site conditions and applying that baseline information to the planning and design of stormwater management systems in the right-of-way.
- 3 – Stormwater BMPs for Green Streets identifies recommended BMPs for specific Green Street and land use types. Table A2.4 provides recommended zone widths by Complete Street type, which can be used when determining the available space for BMPs.
- 4 – Green Street Typologies presents typical plan and section drawings showing where particular BMPs are applicable for specific street and land use types (e.g., Urban Regional Street, Suburban Downtown Street). The Green Street typologies correspond to the typologies in the Complete Street Guidelines, with land use type added to show some of the variable conditions that may be encountered during planning and design.
- 5 – Green Street BMP Layout Considerations provides typical layout dimensioning for BMP placement within the street ROW, as well as notes to the designer about important technical considerations for appropriate BMP placement.

It is important to note that County roads vary significantly in configuration across the rural – suburban – urban spectrum, so that road typology and right-of-way zone delineation may not always correspond. In rural and suburban parts of the County, for example, a larger proportion of the right-of-way is often dedicated to vehicles than to pedestrians or bicyclists. In these areas, there may be no Frontage Zone, and the Sidewalk Zone may be separated from buildings by a parking lot, driveway or mown lawn. On the roadway side of the Pedestrian Zone, the Curb Zone may be limited to a grass strip too narrow to support trees or other plantings. Also, there may not be any sidewalk at all. As described in the Stormwater Management Guidance Manual (Appendix A1), the selection, siting and design of green stormwater infrastructure is always site specific.
2. SITING AND DESIGN CONSIDERATIONS

When siting green infrastructure within the right-of-way, designers must evaluate all applicable technical design considerations. Each consideration may affect the choice of the most appropriate BMP or siting location. If unforeseen conflicts or problems become apparent as design proceeds, it may be necessary to return to the list of potential GI systems to select alternatives.

CIRCULATION, SAFETY, AND ACCESSIBILITY

- Minimum clear walking zone widths must be maintained around stormwater tree pits and other surface facilities. There should be no pinch-points or tripping hazards.
- Passenger and wheelchair accessibility must be maintained at transit stops.
- Use of curb extensions increases pedestrian visibility, shortens crossing distances and calms motor vehicle traffic. Curb extensions that incorporate bioretention systems should feature low shrubs and other vegetation to maximize visibility.
- Where sidewalk space is constrained, the use of suspended paving systems (e.g., DeepRoot™) in combination with stormwater tree pits and tree trenches to provide the benefits of street trees should be considered.
- The surface of the soil in stormwater tree pits, planters and bumpouts is typically lower than the sidewalk to provide storage depth for ponding and prevent flooding after a storm event. To prevent tripping hazards to pedestrians, curbing and/or fencing around the system is usually needed.
- Opportunities to rearrange travel lanes to align safer bicycling and walking conditions with improved stormwater infrastructure should be explored.
- Existing on-street parking conditions, street width and vehicle turning radii must be considered when siting green infrastructure.
- Curbside access should be maintained at BMPs with step-out zones between on-street parking areas and the stormwater facility.

- Vegetation chosen for stormwater systems should not block sight distances at intersections or have low branches that overhang either the sidewalk or bicycle lanes. Plantings will likely need periodic pruning to maintain height clearance.
- BMPs should be accessible for maintenance activities.

TOPOGRAPHY, GRADING AND DRAINAGE

- Existing topography, longitudinal grades and cross slopes may present challenges to directing runoff into a BMP.
- Where feasible, the depth from finish pavement grade to the top of the planting media should be no more than 15 inches. Up to 22–24 inches below the adjacent pavement may be needed based on site conditions, but in general, deeper soil surfaces should be avoided to the extent possible.
- Alteration of existing curb lines will directly impact existing street drainage patterns, therefore, bump-out design must ensure existing street drainage is not negatively impacted.
- Medians are usually located at the crown of the road, with drainage directed away from the center. Placing green infrastructure in a median may require re-grading the road to direct sheet flow to the center. Alternative designs may require re-grading to collect only part of the adjacent roadway, or collecting runoff upstream and then directing it to the median via subsurface piping. The associated costs should be assessed in relation to potential benefits.

A crosswalk through a stormwater bumpout provides opportunities to easily access the pedestrian zone.

Low-lying grasses and perennials are planted at this bumpout to allow for clear sight lines to the vehicular zone.
### Siting and Design Considerations

#### Existing and Proposed Infrastructure

- Most street rights-of-way have both surface and subsurface infrastructure, including sewer, water, gas, electric, and telecommunication lines. Utility One Call information must be acquired for all potential green infrastructure locations before proceeding with design. The location and depth of underground utilities must be verified. Siting of stormwater facilities must also account for minimum offsets and clearances per codes for pipes, wires, poles, and other utilities.
- The height of overhead wires should be determined before choosing tree species for BMPs. Appropriate trees should be selected based on anticipated mature tree height to avoid conflicts with wires and unsightly eventual pruning by utility companies. Also consider the space needed for healthy tree root systems in relation to subsurface utilities.
- Green infrastructure should be designed to accommodate proposed future utilities to the extent feasible.
- Green infrastructure must be designed to allow routine and emergency access to other types of infrastructure.
- Adequate separation from adjacent buildings or structures is needed to avoid potential basement flooding or damage to buildings. As a general rule, at least 10 feet of separation between infiltrating GSI systems and other structures is needed to avoid potential basement flooding and emergency access to other types of infrastructure.

#### Native Soil

- Existing soils must be assessed to determine feasibility for infiltration.
- On sites where there is a history of industrial activity or other possible sources of contaminants, existing soils should be tested early in the project design phase to determine what BMPs are feasible.

#### Zoning Requirements

- All applicable setbacks and clearances, sight distances, and parking requirements should be determined before siting green infrastructure facilities.

#### Sediment and Debris

- Traffic loading and volume conditions must be considered because high vehicular traffic generates large sediment and debris loads that are deposited into bioretention facilities. Large presetting zones are needed at inflow points.
- When runoff from vehicular pavement is directed to the subsurface parts of the system, special attention should be paid to pretreatment in order to manage sediment that can clog the system.

#### Vegetation

- Tree species should be selected that provide shade and enhance the aesthetics of the street for all users.
- Stormwater tree pits, trenches and bumpouts should be designed with enough space (length, width and depth) to support the root system of a mature street tree (see Table A2.2).
- Aggressively rooting trees such as elms are not recommended.
- Selection of shrubs and herbaceous plants should account for the depth from adjacent sidewalk to the surface of the stormwater planting media. In deeper systems, taller species should be selected to be visible at maturity above the sidewalk grade to provide aesthetic value.
- Salt-tolerant species should be used in systems that receive flow from surfaces treated with de-icing chemicals.
- To provide habitat and food for birds, invertebrate pollinators and other wildlife, the use of diverse, locally and regionally adapted plant species in vegetated BMPs is preferred. However, selected species should be hardy and tolerant of difficult urban conditions, including high levels of sediment and contaminants carried in with a flush of runoff. A high loading ratio (10:1) is indicative of potential stress for plants.

#### Table A2.1 Typical Infrastructure Locations

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>TYPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVERHEAD</td>
<td>Lights, Utility wires, Solar panels, Awnings</td>
</tr>
<tr>
<td>SURFACE</td>
<td>Wayfinding signs, Utility poles, Mailboxes, Water and gas valves, Fire hydrant</td>
</tr>
<tr>
<td>SUBSURFACE</td>
<td>Sewer line, Gas line, Water line, Fiber optic lines</td>
</tr>
</tbody>
</table>

#### Table A2.2 Tree Size and Soil Volume

<table>
<thead>
<tr>
<th>CROWN DIAMETER</th>
<th>SOIL VOLUME (MIN.)</th>
<th>STORMWATER STORANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10 feet</td>
<td>100 cubic feet</td>
<td>20 cubic feet</td>
</tr>
<tr>
<td>11-21 feet</td>
<td>500 cubic feet</td>
<td>110 cubic feet</td>
</tr>
<tr>
<td>22-30 feet</td>
<td>1,000 cubic feet</td>
<td>200 cubic feet</td>
</tr>
</tbody>
</table>

#### Table A2.2 Tree Size and Soil Volume

- Most street rights-of-way have both surface and subsurface infrastructure, including sewer, water, gas, electric, and telecommunication lines. Utility One Call information must be acquired for all potential green infrastructure locations before proceeding with design. The location and depth of underground utilities must be verified. Siting of stormwater facilities must also account for minimum offsets and clearances per codes for pipes, wires, poles, and other utilities.

- The height of overhead wires should be determined before choosing tree species for BMPs. Appropriate trees should be selected based on anticipated mature tree height to avoid conflicts with wires and unsightly eventual pruning by utility companies. Also consider the space needed for healthy tree root systems in relation to subsurface utilities.

- Green infrastructure should be designed to accommodate proposed future utilities to the extent feasible.

- Green infrastructure must be designed to allow routine and emergency access to other types of infrastructure.

- Adequate separation from adjacent buildings or structures is needed to avoid potential basement flooding or damage to buildings. As a general rule, at least 10 feet of separation between infiltrating GSI systems and other structures is needed to avoid potential basement flooding and emergency access to other types of infrastructure.

- Existing soils must be assessed to determine feasibility for infiltration.

- On sites where there is a history of industrial activity or other possible sources of contaminants, existing soils should be tested early in the project design phase to determine what BMPs are feasible.

- Traffic loading and volume conditions must be considered because high vehicular traffic generates large sediment and debris loads that are deposited into bioretention facilities. Large presetting zones are needed at inflow points.

- When runoff from vehicular pavement is directed to the subsurface parts of the system, special attention should be paid to pretreatment in order to manage sediment that can clog the system.

- Tree species should be selected that provide shade and enhance the aesthetics of the street for all users.

- Stormwater tree pits, trenches and bumpouts should be designed with enough space (length, width and depth) to support the root system of a mature street tree (see Table A2.2).

- Aggressively rooting trees such as elms are not recommended.

- Selection of shrubs and herbaceous plants should account for the depth from adjacent sidewalk to the surface of the stormwater planting media. In deeper systems, taller species should be selected to be visible at maturity above the sidewalk grade to provide aesthetic value.

- Salt-tolerant species should be used in systems that receive flow from surfaces treated with de-icing chemicals.

- To provide habitat and food for birds, invertebrate pollinators and other wildlife, the use of diverse, locally and regionally adapted plant species in vegetated BMPs is preferred. However, selected species should be hardy and tolerant of difficult urban conditions, including high levels of sediment and contaminants carried in with a flush of runoff. A high loading ratio (10:1) is indicative of potential stress for plants.

#### Table A2.1 Typical Infrastructure Locations

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>TYPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVERHEAD</td>
<td>Lights, Utility wires, Solar panels, Awnings</td>
</tr>
<tr>
<td>SURFACE</td>
<td>Wayfinding signs, Utility poles, Mailboxes, Water and gas valves, Fire hydrant</td>
</tr>
<tr>
<td>SUBSURFACE</td>
<td>Sewer line, Gas line, Water line, Fiber optic lines</td>
</tr>
</tbody>
</table>

#### Table A2.2 Tree Size and Soil Volume

<table>
<thead>
<tr>
<th>CROWN DIAMETER</th>
<th>SOIL VOLUME (MIN.)</th>
<th>STORMWATER STORANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10 feet</td>
<td>100 cubic feet</td>
<td>20 cubic feet</td>
</tr>
<tr>
<td>11-21 feet</td>
<td>500 cubic feet</td>
<td>110 cubic feet</td>
</tr>
<tr>
<td>22-30 feet</td>
<td>1,000 cubic feet</td>
<td>200 cubic feet</td>
</tr>
</tbody>
</table>
### 3. Stormwater BMPs for Green Streets

#### Table A2.3 Stormwater BMPs for Green Streets

<table>
<thead>
<tr>
<th>Land Use Type</th>
<th>Regional Street</th>
<th>Downtown Street</th>
<th>Community Street</th>
<th>Neighborhood Street</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>3 4 5 6 7 8 9</td>
<td>3 4 5 6 7 8 9</td>
<td>3 4 5 6 7 8 9</td>
<td>3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>Suburban</td>
<td>1 2 3 4 5 6</td>
<td>1 2 3 4 5 6</td>
<td>1 2 3 4 5 6</td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>Rural</td>
<td>1 2 3</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*Refer to Appendix A1, Passaic County Stormwater Management Guidance Manual, for technical information about each type of BMP.

---

#### Table A2.4 Recommended Zone Widths by Complete Street Type

<table>
<thead>
<tr>
<th>Zone</th>
<th>Regional Street</th>
<th>Downtown Street</th>
<th>Community Street</th>
<th>Neighborhood Street</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frontage Zone</td>
<td>2' minimum</td>
<td>2' minimum</td>
<td>2' minimum</td>
<td>No minimum</td>
</tr>
<tr>
<td>Sidewalk Zone</td>
<td>4' minimum</td>
<td>5' minimum</td>
<td>5' preferred</td>
<td>4' minimum</td>
</tr>
<tr>
<td>Curb Zone</td>
<td>4' minimum</td>
<td>4' minimum</td>
<td>4' minimum</td>
<td>4' minimum</td>
</tr>
<tr>
<td>Dedicated Bicycle Lane</td>
<td>5' minimum</td>
<td>5' minimum (with curb and no parking)</td>
<td>4' minimum (with no curb and no parking)</td>
<td>Shared with Travel Lane</td>
</tr>
<tr>
<td>Parking</td>
<td>8' preferred</td>
<td>8' minimum</td>
<td>8' minimum</td>
<td>7' minimum</td>
</tr>
<tr>
<td>Travel Lane</td>
<td>10' minimum</td>
<td>10' minimum</td>
<td>11' preferred</td>
<td>11' preferred</td>
</tr>
<tr>
<td>Median</td>
<td>N/A</td>
<td>6' minimum</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

---

1. Rain Garden/Bioswale
2. Grass Swale
3. Stormwater Planter
4. Stormwater ROW Bumpout
5. Downspout Planter
6. Stormwater Tree Pit
7. Stormwater Tree Trench
8. Pervious Paving
9. Subsurface Infiltration and/or Extended Detention System
4. Green Street Typologies

**Regional Street**

A Regional Street is a major travel route that handles the highest volume of traffic on County roadways, supporting all modes of transportation. These streets are often used for longer intracounty trips and intercounty travel and provide access to major highways. They tend to be well served by public transit, including intercounty and interstate services, connecting major activity centers throughout the County.

Regional Boulevards are similar to Regional Streets, but travel speeds may be lower, parking may be permitted and raised medians are a preferred design treatment. Examples of Regional Streets and Boulevards in Passaic County are Paterson-Hamburg Turnpike in Wayne, Goffle Road in Hawthorne, Preakness Avenue in Totowa, and Long Hill Road in Little Falls.

Highlands Regional Streets are a Regional Street variation located in the New Jersey Highlands Region, where the protection and restoration of natural resources are priority goals. Highlands Regional Streets are characterized by single-use, low intensity development that transitions between residential, commercial and rural settings. In many cases, development is separated by large natural areas and winding roadways. Union Avenue in Bloomingdale and Greenwood Lake Turnpike in Ringwood are examples of Highlands Regional Streets.

**Urban Regional Street** Preaukness Avenue, Totowa

- Applicable stormwater retrofits include small, individual (#3, 5, 6, 7); pervious paving (#8); and subsurface systems (#9) alone or in combination.
- New complete streets projects may also include bumpouts (#4) and linear systems (#1, 2), if width allows.

**Suburban Regional Street** Long Hill Road, Little Falls

- ROW conditions vary widely (e.g., parking lanes, shoulder, bicycle lanes, and/or pedestrian zones).
- Applicable retrofits may include linear (#1, 2); pervious paving (#8); and subsurface systems (#9) alone or in combination.
- New complete streets projects may also include small individual systems (#3, 6, 7).

**Rural Regional Street** Greenwood Lake Turnpike, Ringwood

- Characterized by natural areas and limited development.
- Shoulders may be the only pedestrian facility.
- Applicable retrofits may include linear systems (#1, 2).
- New complete streets projects may also include subsurface systems (#9) alone or in combination.

**BMP Key**

1. Rain Garden/Bioswale
2. Grass Swale
3. Stormwater Planter
4. Stormwater Bumpout
5. Downspout Planter
6. Stormwater Tree Pit
7. Stormwater Tree Trench
8. Pervious Paving
9. Subsurface Infiltration/Extended Detention System

**BMP Placement**

A - Median
B - Travel Lane
C - Parking/Shoulder/Bike Lane
D - Curb Zone
E - Sidewalk Zone
F - Frontage Zone
DOWNTOWN STREET

Downtown Streets are characterized by mixed-use commercial and traditional downtown services and activities. These are typically high-volume, low-speed and undivided arterial roadways which have narrow lanes and are used by a mix of cars, delivery trucks and buses. Parking on Downtown Streets is curbside (parallel or angled) and often metered. Downtown Streets tend to be highly transit-oriented and experience high levels of pedestrian activity. Amenities that create a pleasant pedestrian environment and define the physical character of the businesses along the street are key features for this street typology. Examples of Downtown Streets are Main Avenue in Passaic, Main Street in Paterson, Union Boulevard in Totowa, Van Houten Avenue in Clifton, Wanaque Avenue in Pompton Lakes, and Paterson-Hamburg Turnpike in Bloomingdale.

Applicable stormwater retrofits include small, individual (#3, 4, 5, 6, 7); pervious paving (#8); and subsurface systems (#9) in combination or alone.

New complete streets projects may also include bumpouts (#4) and linear systems (#1, 2) in medians.

“Floating” or “island” stormwater bumpouts may be needed to prevent conflict with bicycle facilities. Cyclists should not be forced into motorized traffic to avoid a bumpout. Alternative designs include narrowing the bumpout to keep a 4’ minimum lane adjacent to the roadway side of the bumpout or placing the bicycle lane between the bumpout and the curb zone.
4. GREEN STREET TYPOLOGIES

COMMUNITY STREET

Community Streets provide connections for local communities to reach regional through-routes as well as local commercial and downtown centers. On-street parking is needed to provide access to local businesses and residences. Examples of Community Streets are McBride Avenue in Paterson and Woodland Park, Passaic Avenue in Passaic, Broadway in Passaic, Ramapo Avenue in Pompton Lakes, High Mountain Road in North Haledon, and Allwood Road in Clifton.

**UREN COMMUNITY STREET** McBride Avenue, Paterson

- Applicable stormwater retrofits include small, individual (#3, 4, 5, 6, 7); pervious paving (#8); and subsurface systems (#9) in combination or alone.
- New complete streets projects may also include bumpouts (#4) in parking lane.

**SUBURBAN COMMUNITY STREET** Ramapo Avenue, Pompton Lakes

- Applicable stormwater retrofits include linear (#1,2); small individual (#3, 4, 6, 7); pervious paving (#8); and subsurface systems (#9) in combination or alone.
- New complete streets projects may also include bumpouts (#4) in parking lane.

**BMP KEY**

1. Rain Garden/Bioswale
2. Grass Swale
3. Stormwater Planter
4. Stormwater Bumpout
5. Downspout Planter
6. Stormwater Tree Pit
7. Stormwater Tree Trench
8. Pervious Paving
9. Subsurface Infiltration/Extended Detention System

**BMP PLACEMENT**

A - Travel Lane
B - Parking/Shoulder/Bike Lane
C - Curb Zone
D - Sidewalk Zone
E - Frontage Zone
Neighborhood Streets are walkable roads that serve local residents and businesses along the road. They are low volume, low speed roadways designed to promote local neighborhood interaction among pedestrians and cyclists. Travel lanes are narrow in order to slow down vehicular traffic. On street parking may be allowed on one or both sides of the roadway. Dedicated bicycle lanes and shoulders are considered unnecessary because of the limited vehicular circulation. Examples of Neighborhood Streets are Highland Avenue in Passaic and Poplar Avenue in Pompton Lakes.

Applicable stormwater retrofits include small, individual (#3, 4, 5, 6, 7); pervious paving (#8); and subsurface systems (#9) in combination or alone.

Applicable stormwater retrofits may include linear (#1, 2); small, individual (#3, 5, 6, 7) in a defined pedestrian zone; pervious paving (#8); and subsurface systems (#9) in combination or alone.

New complete streets projects may also include bumpouts (#4) in parking lane.

BMP KEY
1. Rain Garden/Bioswale
2. Grass Swale
3. Stormwater Planter
4. Stormwater Bumpout
5. Downspout Planter
6. Stormwater Tree Pit
7. Stormwater Tree Trench
8. Pervious Paving
9. Subsurface Infiltration/Extended Detention System

BMP PLACEMENT
A - Travel Lane
B - Parking/Shoulder/Bike Lane
C - Curb Zone
D - Sidewalk Zone
E - Frontage Zone
5. GREEN STREET BMP LAYOUT CONSIDERATIONS

NOTES TO DESIGNER:
1. CORNER STORMWATER BUMPOUTS SHOULD ONLY BE INSTALLED WHERE AT LEAST ONE OF THE TWO STREETS MEETING AT THE CORNER DRAIN TOWARD THE CORNER.
2. BUMPOUTS IN ROADWAYS WITH NO PARKING LANE MAY BE CONSIDERED ON A CASE-BY-CASE BASIS.
3. BUMPOUTS MUST MAINTAIN A MINIMUM OFFSET OF 1' FROM TRAVEL LANE. TRAVEL LANE INCLUDES BOTH VEHICLE AND BIKING LANES.
4. MAINTAIN MINIMUM STREET WIDTH OF 20' AT BUMPOUTS TO ENSURE FIRE/EMERGENCY VEHICLE ACCESS.
5. DETERMINE THE APPROVED GEOMETRY FOR BUMPOUTS BASED ON GOOD ENGINEERING PRACTICE AND JUDGEMENT OF THE SITE. THIS INCLUDES THE ANGLE OF THE CURB THAT IS CROSS TO THE TRAVEL LANE AND ALL CURB RADII. A TYPICAL BUMPOUT GEOMETRY THAT IS OFTEN USED INCLUDES A CURB AT A 45 DEGREE ANGLE TO THE TRAVEL LANE AND 5' CURB RADII.
6. TREES SHOULD NOT BE USED IN CORNER BUMPOUTS TO MAINTAIN CLEAR SIGHTLINES.