Section 4

Green Street Design Principles

SECTION 4

Green Street Design Principles

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MORRISTOWN, VERMONT: A bioretention area in a school parking lot median.

Aligning street and parking lot use and long-term Green Street objectives can help communities make the most of their streets and time projects for when opportunities arise.

4.1 LANDSCAPE APPROACH

Low Impact Development (LID) is a design approach that recognizes the value of natural landscape features that support the infiltration, evapotranspiration or use of stormwater to protect water quality and associated aquatic habitats. LID principles indicate that key site characteristics should be preserved for optimal environmental outcomes. Before beginning to design a Green Street, take an LID approach and evaluate your site for successful ecological or community features that can be preserved or enhanced. These features might include something as expansive as a continuous wetland system but could also come in the form of matures trees. For example, in areas without curbs, examine all pros and cons of adding curbs that may channelize stormwater flow. Adjacent landscape areas may already be directing or filtering stormwater. Consider how these features can be integrated into the design rather than eliminated in lieu of something entirely new.

4.2 STORMWATER MANAGEMENT PRINCIPLES

A landscape approach to stormwater management entails bringing together built and natural elements valuing water as a limited and precious resource, rather than as waste or a problem. It also recognizes that each site is unique, both in constraints and opportunities and applicable design solutions must reflect the context. Simultaneously, public safety is holistically addressed by catalyzing on more livable spaces and sustainable environments. By aiming to reduce the amount of impervious cover and seeing every surface as an opportunity to capture water, an integrated design can emerge which is not only effective, but pleasant to experience.

Green Streets strive to meet three general goals when addressing water treatment: 1) **water quality goals**; 2) **flow reductions goals**; and 3) **volume reduction goals**. Achieving all three goal categories is ideal but seldom possible based on site and capacity restraints.

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WATER QUALITY GOAL

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WATER QUALITY GOALS include ensuring that runoff that enters waterbodies is free of pollutants. Filtration through assemblages of plants and soil media can physically trap suspended sediments, chemically bind nutrients and metals, and biologically transform pollutants. This goal may be especially relevant from a compliance standpoint for communities with an impaired waterbody.

FLOW-REDUCTION GOAL

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FLOW REDUCTION GOALS recognize the negative impact that stormwater runoff velocity can have on waterbodies – regardless of the quality of the runoff water. Common strategies to achieve this goal include facilities that detain stormwater for slow release over several hours following a rain event. Stormwater detention ponds are a commonly-used practice to meet this goal but they require large areas of land. Integrating functional design elements such as rain gardens, pervious paving, and green roofs in a decentralized system addresses flow reduction within a developed area. Naturalized surfaces can help slow the flow by mimicking the natural hydrological cycle. Achieving this goal may be especially beneficial to a community with a steep topography that contributes to accelerated velocity of flow.

VOLUME-REDUCTION GOAL

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VOLUME REDUCTION GOALS are focused on the management of the overall volume of water that enters waterbodies as surface runoff. Retention systems that hold water for longer-term storage or infiltrate runoff into the ground reduce the overall volume of surface flow. Plants also play an important role in volume reduction by intercepting rainfall, taking up water from the soil and causing evapotranspiration as well as providing conduits for infiltration adjacent to root systems. Aiming for volume reduction may be especially beneficial for large catchment areas where the amount of runoff can be particularly damaging to receiving waters.

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MONTPELIER, VERMONT: The Main Street Pocket Park.

4.3 STREETSCAPE PRINCIPLES

Placemaking

Placemaking is an essential element in the success of Green Streets, yet it is often overshadowed by the importance of stormwater management. While streets are primarily used for getting from one place to another, they are also meant for people to walk, gather, rest, and interact. Placemaking is a way to make the village or downtown a better place to live and work by transforming streets into vibrant community places. Well-designed streets and wide sidewalks can allow for unplanned human encounters through amenities such as benches at street intersections and mid-block locations. Existing parking spaces and private frontages can be transformed into "parklets" (as shown in the example on this page) that can foster a greater sense of place. Combined with a backdrop of green infrastructure and trees, streets can thrive, surrounding businesses can prosper, and stormwater can be managed.

Walkability

Providing adequate pedestrian circulation along streets and in parking lots should always be a priority and should not be compromised when considering stormwater systems. Many Green Streets can offer solutions for better pedestrian circulation by providing more buffer against vehicular traffic, reducing pedestrian crossing distances, or improving sight angles at intersections. Many conflicts arise when trying to integrate stormwater systems with the need for on-street parking. However, there are ways that stormwater systems can be integrated into differing street conditions while still maintaining on-street parking and adequate pedestrian circulation.

Creating Safe Access

When on-street parking is designed next to a stormwater system, it is critical to consider where people will walk when they leave their cars. People need adequate room and a place to step when they exit their vehicle that does not interfere with the stormwater system. This area should be a minimum of 3 feet wide adjacent to the street curb. Pedestrians also need to have sufficient access from the sidewalk to the parking zone. This can be provided by installing frequent walkways or bridges across stormwater systems.

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People also need to safely detect where there is a change in grade adjacent to walkways. Where there is a vertical grade change of more than 6 inches immediately adjacent to a sidewalk zone, every effort should be made to visually and physically denote this through installation of a raised curb edge, a low-profile railing, or detectable warning. These design elements give people, especially the visually-impaired, a means to safely navigate around any grade changes.

Bikeability

Bicycling, whether for commuting to and from work or for recreation, requires safe and connected streets. Design elements should address the range of both existing and potential bicycle users. For low-volume and low-speed residential streets, use sharrows (painted symbols) on the road to signal a shared use between bikes and vehicles. On busier streets separate, painted bike lanes and signage are often warranted. In high use corridors and areas with on-street parking, bicyclists and vehicles may need to be completely separated from each other on the street through use of landscaped buffer areas. These landscaped buffers are well-suited for green infrastructure facilities that can also capture stormwater.

Transit Facilities

Along streets with higher traffic volumes, transit stops and pedestrian amenities should also be included and be connected to walking and biking systems. Green infrastructure systems such as stormwater planters, pervious paving, and green roofs covering bus shelters can provide stormwater benefits as well as opportunities for education about stormwater.

Outreach and Education

Active pedestrian use also provides educational opportunities to showcase the differences between conventional streetscapes and the functional landscapes of Green Street design. Sometimes, this can be accomplished through educational signage. In other instances, this may require low fences, rails, or exposed curbs to alert users of the presence and value of green infrastructure. Investment in outreach often gives users of the site a greater sense of responsibility to keep the site clean, care for the plants, and respect the overall space.

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▲ *This Green Street project utilizes a series of stormwater planters while maintaining on-street parking and adequate space for pedestrian circulation.*

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▲ *This bold Green Street project separates bike, pedestrian, and vehicular movements with vegetated swales and stormwater planters.*

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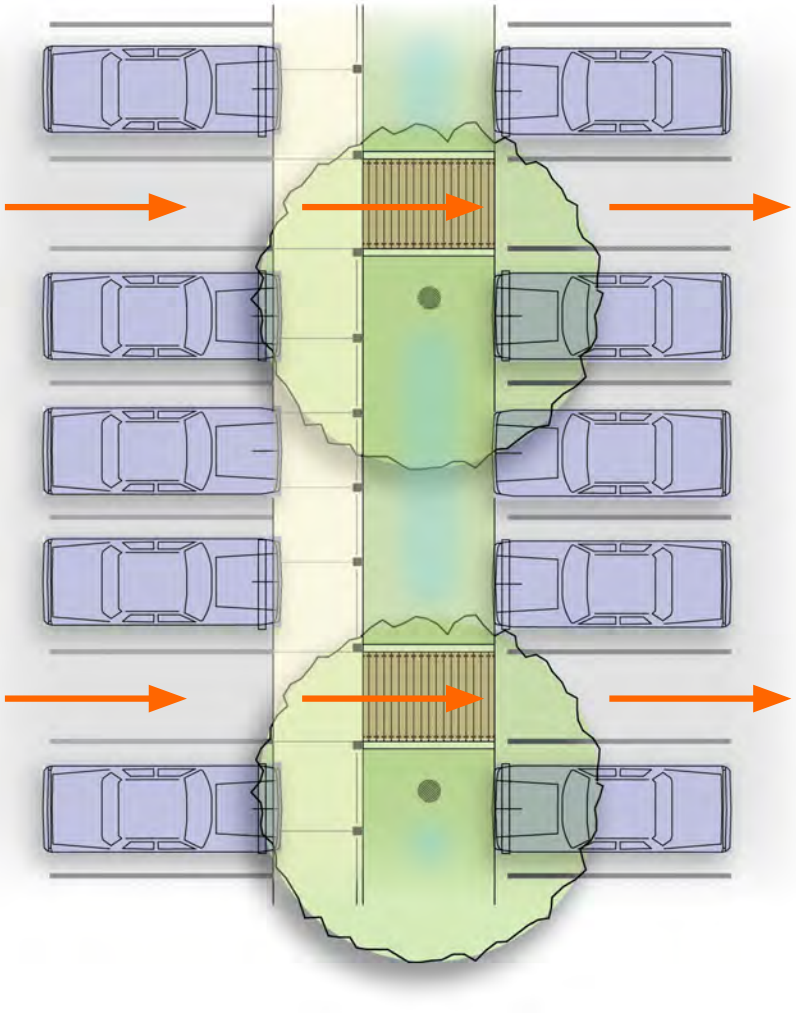
BRISBANE, CALIFORNIA: A pedestrian bridge crossing a rain garden.

Walkability In Parking Lots

Pedestrian circulation is an important design consideration when using stormwater systems in parking lots. It is essential to identify the primary pedestrian destination(s) in relation to the parking lot. For stormwater management, it is best to align stormwater systems perpendicular to the sheet flow of water to maximize the capture potential. Sometimes this optimum alignment conflicts with the desired pedestrian flow to and from a destination. It is important to design a parking lot that provides bridges/pathways over the stormwater systems and/or walkways for people to safely walk alongside and to prevent people from cutting through the landscaped areas. Inadequate provisions for pedestrian circulation may result in trampled plants, compacted soil, and increased erosion in the stormwater system.

Many well-intended landscape projects are negatively impacted by wayward foot traffic and trampling. Providing ample space for pedestrian circulation within or around green infrastructure ensures basic safety for both people and plants. Consider natural human movement patterns in a downtown street scape or parking lot. Provide clearly delineated and convenient walking spaces to avoid vegetation damage.

WALKABILITY IN PARKING LOTS



Perpendicular Pedestrian Flow

Pedestrian circulation is perpendicular to a stormwater facility alignment

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▲ *To protect plants from being trampled, multiple pedestrian crossings were placed through a rain garden at this middle school project.*

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▲ *Another method for protecting plant material from foot traffic but also provide space for stormwater management is to introduce raised boardwalks over the landscape.*

RICHARD AMORE

ST. ALBANS, VERMONT: A Downtown Main Street pedestrian crossing.