11.0

Design Manual: Sustainable Initiatives

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DESIGN MANUAL: SUSTAINABLE INITIATIVES

The Streetscape and Lighting Master Plan has thus far addressed concrete changes that can be implemented in the short term to improve the streetscape in terms of pedestrian safety, aesthetics and community interactions. A sustainable approach is crucial to the future viability of Chapel Hill. In the long term, the town cannot afford to ignore concerns regarding biodiversity, water pollution, energy conservation and sustainable materials.

Based on existing drainage infrastructure and maintenance practices implemented in Downtown Chapel Hill, it is a challenge to connect the sustainable vision of the Master Plan with the existing streets and completed improvements of the past five years. However, in light of the increasing adoption of sustainable strategies in municipalities and cities, it is important that the Master Plan document continue to address a design direction that is more ecologically responsible and begins to establish a culture of a sustainable urban landscape. This chapter begins to illustrate how design interventions can both address the urban function and ecological nature of Downtown.

The strategies outlined in this chapter include strategies that can be immediately implemented, as well as strategies that will require long term consideration. These include:

- **sustainable materials**
  Materials that are utilized in the streetscape should be enduring and sustainable such that replacement and excessive maintenance are not required. By utilizing materials that are not durable, the town generates considerable waste. In addition, where possible, recycled materials should be utilized in the streetscape. For example, the tree grates specified in the Master Plan contain recycled metals; additional opportunities to utilize recycled materials should be considered.

- **biodiversity**
  Plantings should represent a variety of species that comprise a diverse habitat that will be adaptive and resistant to drought, disease and pollution. Canopy trees will also be important in mitigating the urban heat island effect by deflecting the sun's heat from being absorbed into the pavement.

- **surface water**
  A sustainable strategy will consider minimizing the quantity of storm water runoff that enters into storm drains unchecked, washing pollutants into the water system. "Rain garden" planters will absorb storm water and filter it with plant material before it is then drained into the storm drain system.

- **energy efficiency**
  A direct means of improving energy efficiency within the scope of the Streetscape and Lighting Master Plan is the installation of energy efficient lighting. The existing Lumec Domus fixtures that have become the town standard can be refitted to utilize LED lighting technology. This conversion would reduce energy utilization by over fifty percent over the existing mercury vapor lamps.

- **reducing light pollution**
  The 'sky glow' produced by overillumination of urban areas can interfere with the visibility of the night sky and stars, negatively impact wildlife and produce glare that affects the safety of motorists and pedestrians. In addition, light that is unnecessarily cast upward or outward represents wasted energy. Full cut-off light fixtures will ensure that light is directed downward, where it is most needed to illuminate sidewalks, without producing excess light.

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SUSTAINABLE MATERIALS

To establish a sustainable streetscape, lasting materials should be utilized that will not require frequent replacement. In addition, recycled materials will have a lesser impact on utilization of the earth's limited resources. These materials should be utilized in the streetscape design where possible. Below are images of recycled materials that are readily available that are suitable for implementation within the Streetscape Master Plan, including pavers manufactured from recycled aggregates and tree grates that have recycled metal content.

Future nano parks and plazas represent opportunities to use innovative, recycled materials as a means of defining discrete public spaces while maintaining the Town's standard modular paving along adjacent sidewalks. The materials installed within these parks will bring a new visual language to the streetscape without interrupting the continuity of the standard streetscape design.

The current standard Neenah tree grate is manufactured from recycled scrap metal and is made from durable cast iron. These tree grates will have a lasting presence within the streetscape without need for continual replacement or maintenance, in contrast to planting beds or similar alternatives that require higher maintenance. In addition, the Town's Victor Stanley trash receptacles are refurbished and reused, as are the bench frames. Further efforts should be made to install recycled and durable materials in establishing a lasting and sustainable streetscape.

Recycled paving materials are becoming more widely available. The pavers above are made from recycled glass.

Chapel Hill standard receptacle

Current Chapel Hill standard tree grates contain recycled materials.







By planting from a palette of tree species, a diverse urban habitat can be established that will be resistant to extensive damage due to drought, disease, pollution or other environmental concerns. Plantings have been selected that have a consistent visual character, including large canopy trees, while being particularly well adapted to the harsh conditions of urban environments. See Section 5.0 for recommended species.

Planting urban-tolerant canopy trees is also important in mitigating the urban heat island effect, which refers to the rise in temperature in urban areas as a result of solar heat absorbed by large areas of pavement. By providing ample shade in the spring and summer, canopy trees will help to keep the sidewalks cool and will minimize the negative impact of the street on climatic conditions.

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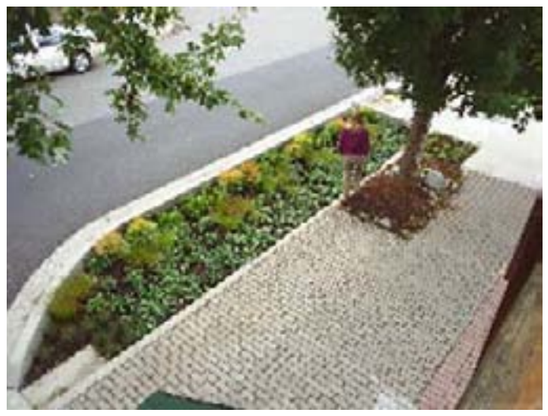
SURFACE WATER

"Green streets" have been implemented in numerous cities, including Portland, Oregon, depicted in the images below. This sustainable approach uses recessed planters that can capture and filter water as it runs off of sidewalks and roads, cleansing it before it is passed back into the water system. Conversely, a conventional system in which rainwater pours directly into storm drains causes pollutants including road grease to be washed directly into waterways.

The long-term approach to streetscape design in Chapel Hill should consider the implementation of storm water runoff filtration. These "rain gardens" can also improve the aesthetics of the sidewalk by including lush plantings with varying colors and textures. An ideal placement for these rain gardens is along sidewalks and in nano parks, where they can capture runoff from roads and sidewalks. In addition, rain gardens may be useful at traffic medians where they can collect storm water runoff at the center of roads. The following pages illustrate a typical sidewalk rain garden design. As an alternative design to the raised planter median described in Section 9.0, a sunken rain garden median can offer the aesthetic benefits of a planted median while also filtering runoff.



Selection of potential sites for rain gardens was based on spatial requirements, as well as prevalence of storm water runoff. Elevation conditions and presence of low points were also factored into the identification of potential locations suitable for rain gardens. Rain garden sites are not necessarily limited to those identified in this plan; potential sites for rain gardens will be evaluated by the Town on a case-by-case basis.

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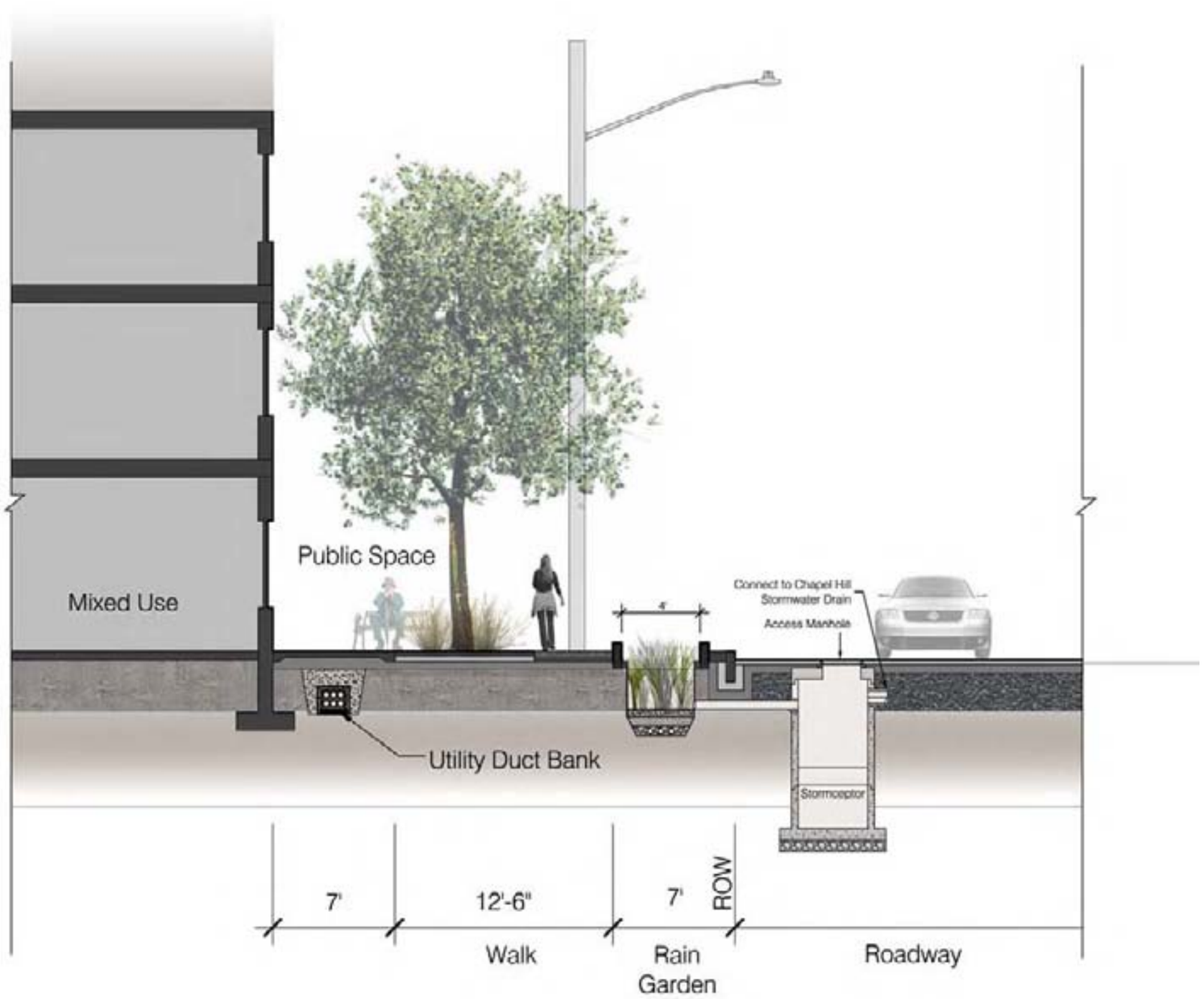
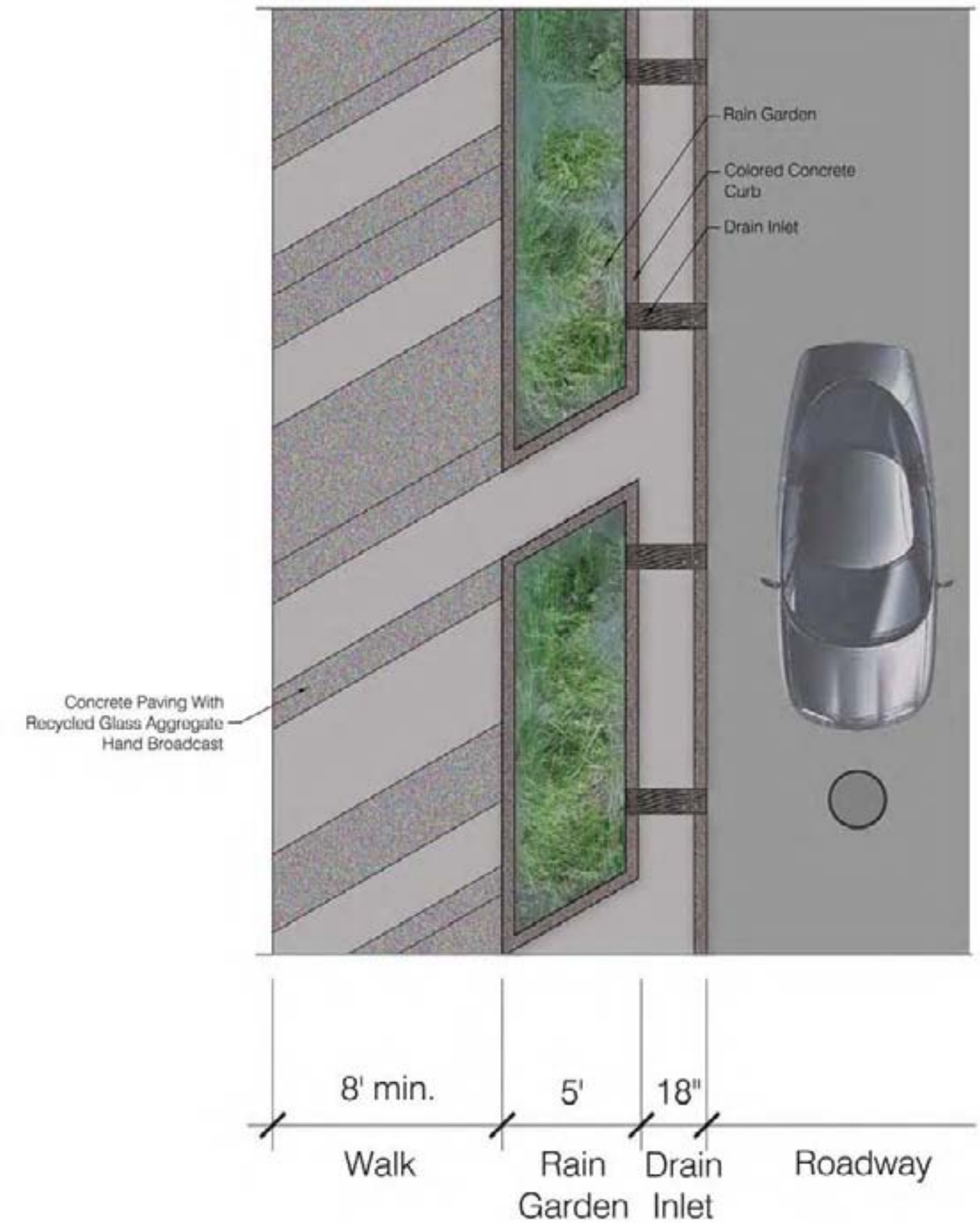


This section envisions a rain garden installed along the sidewalks of a future development. If the Town successfully negotiates an expanded pedestrian right-of-way at the new development, some of the additional area can be captured for sidewalk rain gardens.



Typical Sidewalk Rain Garden

A typical sidewalk rain garden will offer a counterpoint to the standard sidewalk design. Where rain gardens are installed, the sidewalk paving material will change to emphasize the presence of the rain garden and its function. The diagonal stripes in the concrete pavement reflect the direction of movement of water across the site.

Use of recycled aggregate such a recycled glass is recommended in rain gardens to highlight rain garden plant beds with a contrasting material to that of conventional plant beds. These contrasts will work particularly well adjacent to parking lots and Nano Parks, where the spatial conditions of the sidewalk may allow more area for rain garden installations.

Planted with lush plants from the rain garden palette, these gardens will contribute to the public character of the streetscape while promoting a sustainable function. See Section 5.0: Plant Palette for recommendations on plant selections for rain gardens.

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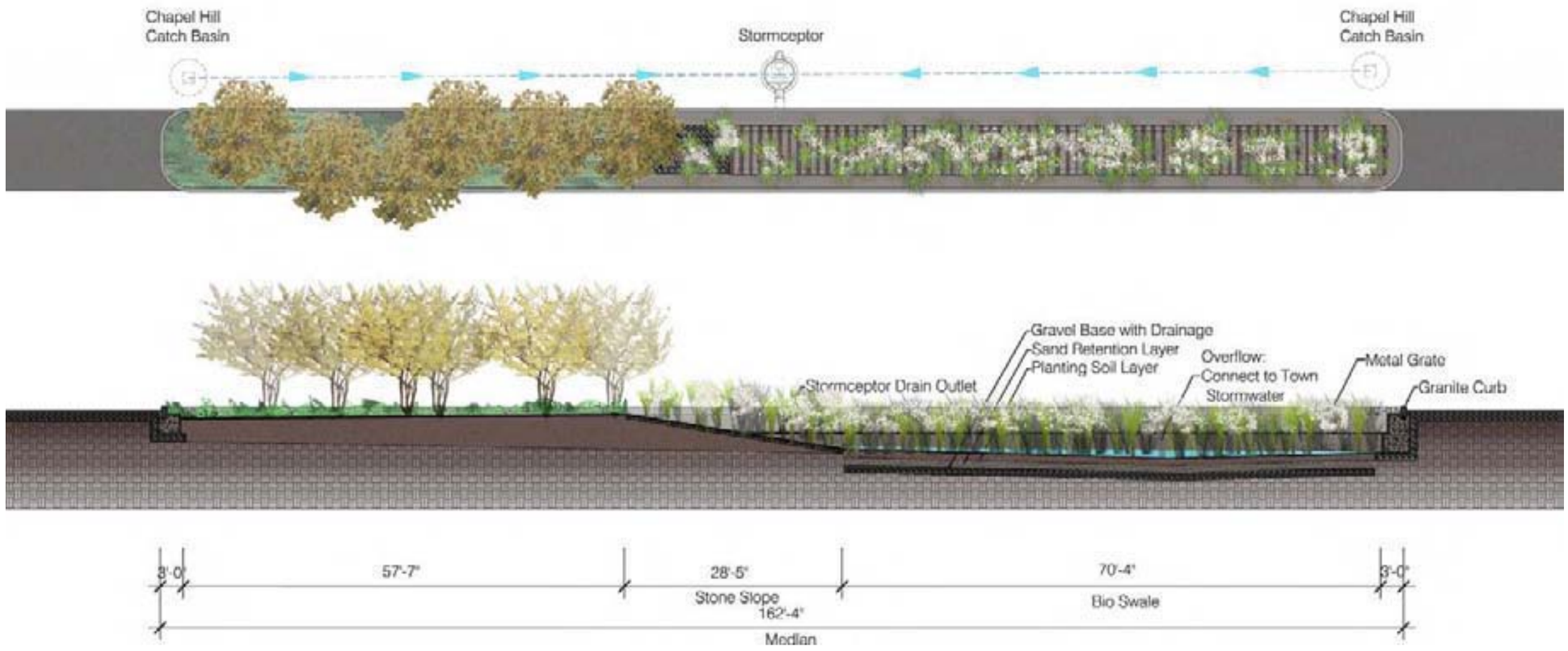
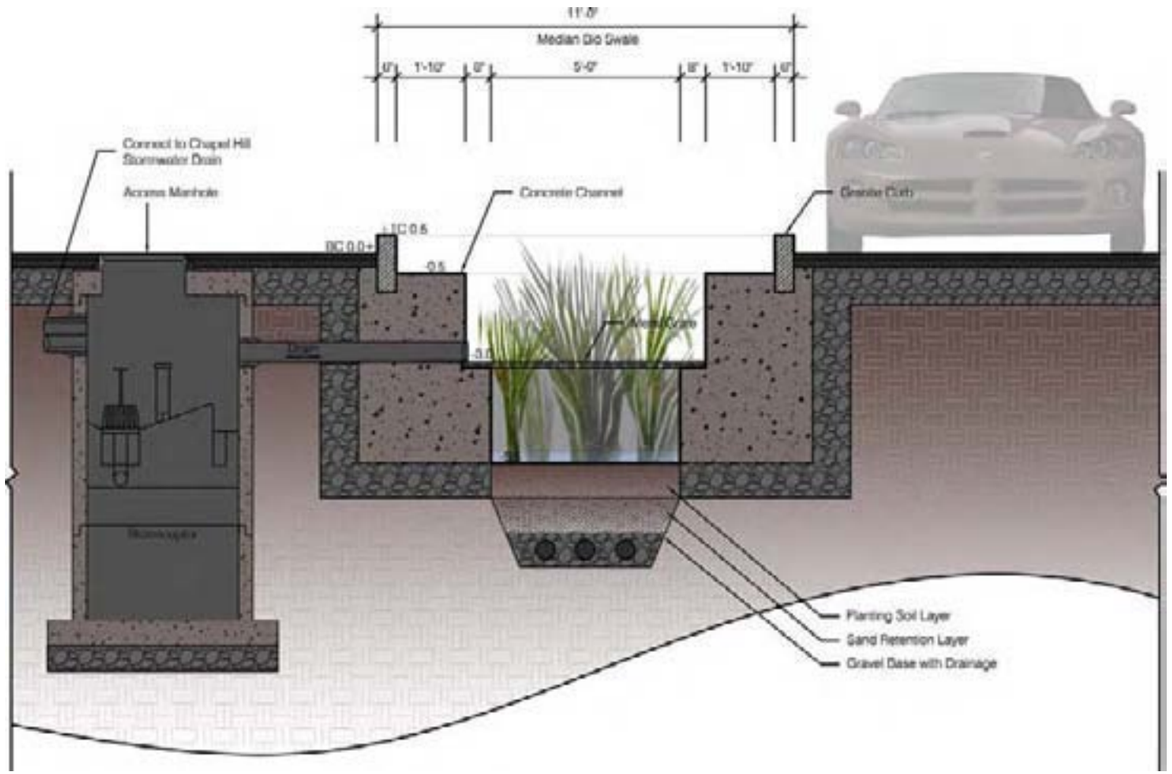
Typical Rain Garden Median: Stormwater Filtration



Note:

Execution of proposed rain garden will require further study and coordination with traffic and civil engineers.



Typical Rain Garden Median: Section

An alternative to the raised planter design, a rain garden median is a recessed planter that will collect and filter storm water runoff from the roadway before it is passed back into the water system. Coordination with existing infrastructure is a significant challenge in the short term; however, as streets are redeveloped in the future, the rain garden median is a strategy that may be implemented to promote responsible treatment of storm water runoff.

The rain garden median will mitigate traffic conflicts in the same fashion as the raised planter median and will also provide paved walking surfaces for pedestrians traversing the street. Tall grasses planted in these constructed rain swales will help to filter the water while contributing a planted, green presence to the streetscape.

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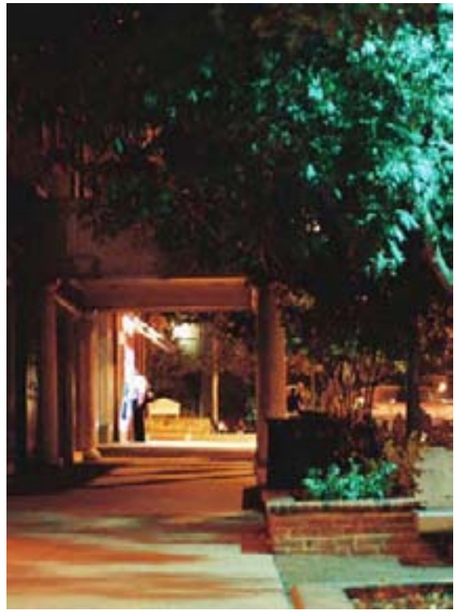


Existing fixtures in Chapel Hill use outdated mercury vapor lamps, which have lower light output per wattage than other types of light fixtures, such as the more common metal halide lamps. Metal halide lamps cast a brighter, whiter light than the blue-hued light emitted from mercury vapor lamps.

Chapel Hill's standard Lumec Domus light fixture can be retrofitted with LED lights, a new and highly energy efficient option.

A direct means of improving energy efficiency within the scope of the Streetscape and Lighting Master Plan is the installation of energy efficient lighting. The town's existing mercury vapor lamps produce less light output per wattage than the more common metal halide lamps. Though conversion to metal halide fixtures will carry an initial cost, the environmental benefits and long-term energy savings are also important considerations.

In addition, the existing Lumec Domus fixtures that have become the town standard can be refitted to utilize LED lighting technology. This conversion would reduce energy utilization by over fifty percent over both mercury vapor and metal halide lamps. The new technology carries a high initial cost but will become more affordable as it becomes more widely available. Implementation of LED lighting should be considered in the long-term lighting design strategy for Downtown Chapel Hill.

REDUCING LIGHT POLLUTION

Excessive glare from outdoor lighting, caused by light being cast unnecessarily upward and outward, is a form of light pollution. This unnecessary glare, also referred to as sky glow, can result in wasted energy from light cast where it isn't needed, affect visibility of stars overhead, and have an impact on wildlife, such as birds and bats, that are sensitive to light conditions.

Many urban areas in the U.S. have taken on 'dark sky' initiatives that seek to reduce light pollution through a number of means. The most common is to install full cut-off light fixtures, which prevent light from being cast upward and outward. These types of fixtures also have the benefit of reducing glare that can pose hazards to motorists, pedestrians and cyclists.

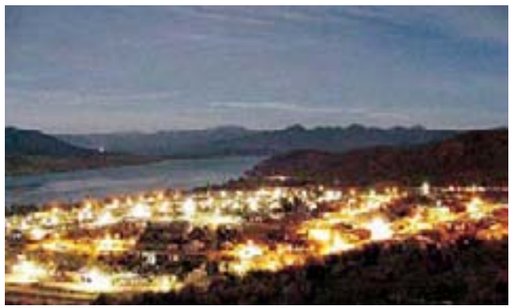
(information from New England Light Pollution Advisory Group, Harvard-Smithsonian Center for Astrophysics)

Consideration must be given not only to installing lighting that will meet IESNA standards on sidewalks and streets but also to preventing additional light pollution. The current standard Lumec Domus fixture comes in full cut-off configurations; the Town should continue to implement these as needed.

Full cutoff lights direct all light downward, maintaining a brightly illuminated path without casting unnecessary light elsewhere. Note that light does not extend into upper portion of the trees above each fixture. (www.nightwise.org)

Documentation of existing sky glow from American cities (www.astronomy.com)

Simulation of reduced light pollution (www.noaa.gov)



Before: over-illumination in Monte Patria, Chile

After: light pollution reduction in Chile (sao.arizona.edu)

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