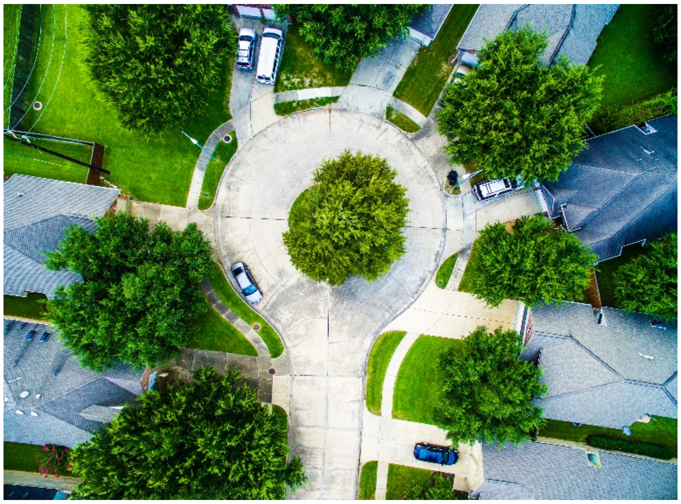
Stormwater Best Management Practice
Alternative Turnarounds

Minimum Measure: Post Construction Stormwater Management in New Development and Redevelopment
Subcategory: Innovative Practices for Site Plans

Description

Alternative turnarounds provide space in the road for vehicles to efficiently drive in the opposite direction. Roadway designers can reduce the hardened surfaces in neighborhoods by replacing or reducing the sizes of cul-de-sacs, which are local streets with closed circular ends that allow vehicles to turn around. Many cul-de-sacs span more than 40 feet. From a stormwater perspective, this represents a significant area of impervious surface that has the potential to generate large amounts of stormwater discharge. Reducing the sizes of cul-de-sacs, either through the use of alternative turnarounds or by eliminating them altogether, can reduce impervious cover and be part of a larger Green Streets program.

Numerous types of alternative turnarounds exist, all of which reduce impervious cover. Some common types include smaller turnarounds (e.g., with a radius of 30 feet), hammerheads,[1] and pervious islands in cul-de-sac centers.



An alternative turnaround with a vegetated island in the center reduces impervious area and is aesthetically pleasing.

The following practices complement alternative turnarounds:

- Permeable pavements
- Green parking
- Elimination of curbs and gutters
- Right-sized residential streets
- Alternative street design and patterns
- Bioretention
- Site design and planning strategies

Applicability

Designers can use alternative turnarounds in residential, commercial and mixed-use developments. Communities can also combine alternative turnarounds with other Green Street stormwater controls to complement their effectiveness. For instance, communities can place a rain garden in a pervious island with curb cuts to enhance infiltration and evapotranspiration of stormwater. By using properly designed and implemented turnaround alternatives in combination with other Green Street practices on a project scale, communities can dramatically reduce impervious cover and allow for on-site treatment of most stormwater.

Implementation

Sufficient turnaround area is an important design factor to consider. In particular, design engineers should consider the types of vehicles entering the cul-de-sac. Fire trucks, service vehicles and school buses are common examples of vehicles that need extra space to turn around. However, research shows that designers have been able to modify some fire trucks to allow for

[1] Hammerheads are T-shaped road ends, allowing for easier three-point turnarounds.

smaller turning radii. In addition, many new larger service vehicles have triaxles to help them turn in small spaces, and school buses usually do not enter individual cul-de-sacs.

Implementing alternative turnarounds can make community streets safer and more appealing for drivers, pedestrians, bicyclists and transit drivers. EPA specifically worked with firefighters to highlight how connected street networks can improve safety and health. Research indicates that a connected neighborhood network of narrower streets encourages people to walk more. Also, compared to areas with many cul-de-sacs, highly connected street networks shorten the distance emergency responders have to travel (U.S. EPA, 2019).

Limitations

Communities may need to update local regulations and address public perception issues when implementing alternative turnarounds. Local regulations often have specific design criteria for cul-de-sacs, such as turnaround dimensions, and local codes may not allow some types of alternatives. Communities can consider initiating a local site-planning round table to change some of these local regulations, starting with a collective effort to review local codes to promote better site design. The following resources may be helpful in addressing and overcoming barriers to implementation:

- *Tackling Barriers to Green Infrastructure: An Audit of Local Codes and Ordinances*
- *Green Infrastructure Opportunities and Barriers in the Greater Los Angeles Region*
- *Barriers and Gateways to Green Infrastructure*

In addition, the public may perceive smaller turning radii as limiting its ability to easily drive down roads. This public perception may dictate designs, particularly in residential areas. Although real estate sources often feature cul-de-sacs as highly marketable, actual research on market preference is not widely available.

Maintenance Considerations

Communities maintain any islands that are part of a turnaround whether hardscaped or otherwise. Keeping an island in a naturally vegetated condition may reduce maintenance costs related to hardscapes. Other fact sheets discuss maintenance requirements for stormwater controls that communities can implement in conjunction with alternative turnarounds, including bioretention practices and permeable pavements. Any option that requires less pavement entails less pavement-related maintenance, such as street sweeping and replacement costs.

Effectiveness

The comparative effectiveness of alternative turnarounds directly corresponds with the amount of impervious surface or stormwater discharge reduction that their designs achieve. For direct reductions in impervious surface, simple comparisons of the geometries of several types of turnarounds show that hammerheads create the least amount of impervious cover (Table 1).

Table 1. Impervious area for various turnaround options.

Turnaround Option	Impervious Area (Square Feet)[a]
40-foot radius	5,024
40-foot radius with 20-foot radius island	3,768
30-foot radius	2,827
30-foot radius with 10-foot radius island	2,512
Hammerhead (60-foot length, 20-foot width)	1,200

[a] Cost data source is RSMeans, 2019.

Costs

Alternative turnarounds reduce impervious cover. Consequently, they also reduce pavement-related construction costs as well as stormwater management costs given that they likely generate less stormwater discharge. Asphalt material costs $1 to $2 per square foot, depending on the thickness and type (RSMeans, 2019), while typical road construction can cost more than $15 per square foot when accounting for full construction costs (ARTBA, 2019; FDOT, 2019). If constructing a 30-foot turnaround with an island can save 2,500 square feet compared to a typical 40-foot turnaround (Table 1), the developer could save $2,500 to $40,000 in construction costs for an individual cul-de-sac. Assuming a small rain garden costs $4.60 per square foot of impervious surface that it treats (see Bioretention (Rain Gardens), installing a rain garden within the island to treat the remaining 2,500 square feet of impervious surface may cost around $12,000. From this perspective, the total cost (paving plus stormwater treatment) for a 30-foot turnaround with an island would likely be less than the cost of paving alone for 40-foot turnaround.

Additional Information

Additional information on related practices and the Phase II MS4 program can be found at EPA's National Menu of Best Management Practices (BMPs) for Stormwater website

References

American Road and Transportation Builders Association (ARTBA). (2019). *Funding, financing and costs frequently asked questions*. American Road and Transportation Builders Association.

Florida Department of Transportation (FDOT). (2019). *Cost per mile models for long range estimating*. Florida Department of Transportation.

RSMeans. (2019). RSMeans data from Gordian (Asphalt paving). [Online database].

U.S. Environmental Protection Agency (U.S. EPA). (2019). *Smart growth streets and emergency response*. Smart Growth.

Disclaimer

This fact sheet is intended to be used for informational purposes only. These examples and references are not intended to be comprehensive and do not preclude the use of other technically sound practices. State or local requirements may apply.