

An Introduction to Better Site Design

Few watershed management practices simultaneously reduce pollutant loads, conserve natural areas, save money, and increase property values. Indeed, if such “wonder practices” were ever developed, they would certainly spread quickly across the nation. As it turns out, these practices have existed for years. Collectively called “better site design,” the techniques employ a variety of methods to reduce total paved area, distribute and diffuse stormwater, and conserve natural habitats. Despite their proven benefits and successful local application, better site design techniques often fail to earn the endorsement of local communities. In fact, many communities simply prohibit their use.

“Better site design” is a fundamentally different approach to residential and commercial development. It seeks to accomplish three goals at every development site: to reduce the amount of impervious cover, to increase natural lands set aside for conservation, and to use pervious areas for more effective stormwater treatment. To meet these goals, designers must scrutinize every aspect of a site plan—its streets, parking spaces, setbacks, lot sizes, driveways, and sidewalks—to see if any of these elements can be reduced in scale. At the same time, creative grading and drainage techniques reduce stormwater runoff and encourage more infiltration.

Why is it so difficult to implement better site design in so many communities? The primary reason is the outdated development rules that collectively govern the development process: a bewildering mix of subdivision codes, zoning regulations, parking and street standards, and drainage regulations that often work at cross-purposes with better site design. Few developers are willing to take risks to bend these rules with site plans that may take years to approve or that may never be approved at all.

In 1997, a national site planning roundtable was convened to address ways to encourage better site design techniques in more communities. The participants represented the diverse mix of organizations that affect the development process (listed in Table 1) and provided the technical and real world experience to make better site design happen. After two years of discussion, the roundtable endorsed 22 better site design techniques that offer specific guidance that can help achieve the basic better site

design goals. These techniques are organized into three areas:

1. Residential Streets and Parking Lots
2. Lot Development
3. Conservation of Natural Areas

These techniques are not intended to be strict guidelines, and their actual application should be based on local conditions. The remainder of this article introduces each of the better site design techniques, describes some of the barriers to their wider use, and suggests ways to overcome these impediments.

Residential Streets and Parking Lots

As much as 65% of the total impervious cover in the landscape can be classified as “habitat for cars,” which includes streets, parking lots, driveways, and other surfaces designed for the car. Consequently, 10 better site design techniques address ways to reduce car habitat in new developments.



Figure 1: A Neotraditional Community in Gaithersburg, MD
Better site design techniques have been successfully applied in a growing number of communities like the Kentlands.

Table 1: Organizations Represented at the National Site Planning Roundtable (CWP,1998b)

The following organizations participated in a two-year long process to craft and refine the 22 model development principles. For a full look at the national consensus agreement, consult our web site at www.cwp.org.

American Association of State Highway Transportation Officials	Land Trust Alliance
American Forest Association	Linowes & Blocher
American Institute of Architects	Loiederman Associates, Inc.
American Planning Association	Michael T. Rose Company
American Public Works Association	Montgomery County Council
American Rivers	Natelli Communities
American Society of Civil Engineers	National Association of Home Builders
American Society of Landscape Architects	National Realty Committee
Chesapeake Bay Program	Natural Resources Defense Council
Community Associations Inc.	Prince Georges County
The Conservation Fund	Department of Environmental Resources
Office of Comprehensive Planning, County of Fairfax, VA	U.S. EPA
Howard Research and Development Corporation an affiliate of the Rouse Company	Office of Sustainable Ecosystems and Communities
Institute of Transportation Engineers	U.S. Fire Administration
International City/ County Management Association	Urban Land Institute
	Urban Wildlife Resources

Design residential streets for the minimum required pavement width needed to support travel lanes, on-street parking, and emergency, maintenance, and service vehicle access. Street widths should be based on traffic volume.

In some communities, residential streets can be 32, 36, and even 40 feet wide, despite the fact that they only serve a few dozen homes. These wide streets are the greatest source of impervious cover in most subdivisions. Wide residential streets are created by blanket applications of high volume and high speed design criteria, the perception that on-street parking is needed on both sides of the street, and the perception that they provide unobstructed access for emergency vehicles.

Communities have a significant opportunity to reduce impervious cover by revising their street standards to widths of smaller residential access streets. Residential streets widths should be designed to handle expected traffic volumes, provide adequate parking, and ensure access for service, maintenance, and emergency vehicles. Two strategies can help to narrow streets: using queuing streets (see Figure 2) and critically evaluating the need for on-street parking on both sides of the street. Several national engineering organizations have recommended residential streets as narrow as 22 feet in width (ASSHTO, 1994 and ASCE, 1990).

Reduce the total length of residential streets by examining alternative street layouts to determine the best option for increasing the number of homes per unit length.

Conventional Street



Queuing Street



(photos by Randall Arendt)

Figure 2: Queuing Streets as a Technique for Minimizing Street Width

While traditional streets are composed of two travel lanes and parking on either side of the road, queuing streets have one designated travel lane and two queuing lanes that can be used for travel or parking.

It stands to reason that a longer street network produces more impervious cover and greater development costs than a shorter one, yet most communities do not even consider whether a shorter street network can serve individual lots on residential streets. It is generally assumed that the cost of constructing roads is sufficient incentive to assure short street networks. Streets are designed to accommodate rapid, smooth traffic flow, and consequently, total street length is rarely the most important design consideration.

There is no one street layout guaranteed to minimize total street length in residential developments. Instead, site designers are encouraged to analyze different layouts to see if they can reduce street length.

Wherever possible, residential street right-of-way widths should reflect the minimum required to accommodate the travel-way, the sidewalk, and vegetated open channels. Utilities and storm drains should be located within the pavement section of the right-of-way wherever feasible.

In many communities, a single right-of-way width of 50 feet or more is applied to all residential street categories. While a wide right-of-way does not necessarily create more impervious cover, it requires more clearing and consumes land that could be used to achieve a more compact site design. By redesigning each of the main components of the right-of-way (ROW), the total width of the ROW can be sharply reduced. Techniques include reducing street width, narrowing sidewalks or restricting them to one side, narrowing the distance between street and sidewalk, and installing utilities beneath street pavement. Combined, these techniques narrow the ROW by 10 to 25 feet.

Minimize the number of residential street cul-de-sacs and incorporate landscaped areas to reduce their impervious cover. The radius of cul-de-sacs should be the minimum required to accommodate emergency and maintenance vehicles. Alternative turnarounds should be considered.

Many communities require the end of cul-de-sacs to be 50 to 60 feet in radius, creating large circles of needless impervious cover. There are several different options to reduce the impervious cover created by traditional cul-de-sacs. One option is to reduce the radius of the turnaround bulb. Several communities have implemented this successfully and the smaller radii can range from 33 to 45 feet. Since vehicles only use the outside of a cul-de-sac when turning, a second option is to create a pervious island in the middle of

the cul-de-sac, creating a donut-like effect. A third option is to replace cul-de-sacs with loop roads and hammerheads (see Figure 3).

Where density, topography, soils, and slope permit, vegetated open channels should be used in the street right-of-way to convey and treat stormwater runoff.

Communities often require that curbs and gutters be installed along residential streets, which quickly convey stormwater runoff and associated pollutant loads directly into the stream. In contrast, open channels can remove pollutants by infiltration and filtering, and are also often less expensive than curb and gutter systems.

New engineering techniques have greatly improved the performance of conventional roadside ditches, which have traditionally suffered from erosion, standing water and increased pavement maintenance. One alternative is dry swales, which are designed both to convey the 10 year storm and treat a water quality stream through a sandy loam filter along the roadway (see Figure 4).

The required parking ratio governing a particular land use or activity should be enforced as both a maximum and a minimum in order to curb excess parking space construction. Existing parking ratios should be reviewed for conformance, taking into account local and national experience to see if lower ratios are warranted and feasible.

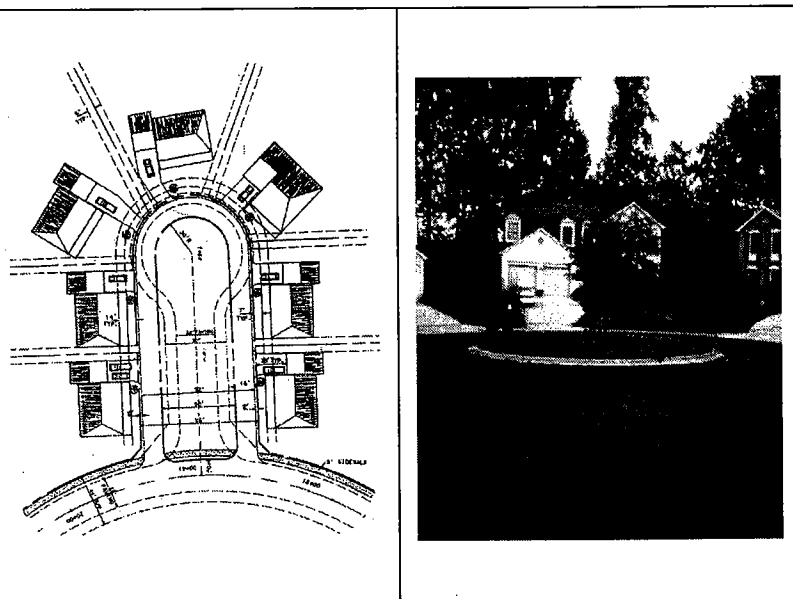


Figure 3: Two Alternatives to the Traditional Cul-de-Sac
A loop road or a pervious island in the middle are two alternatives that can significantly reduce impervious cover.

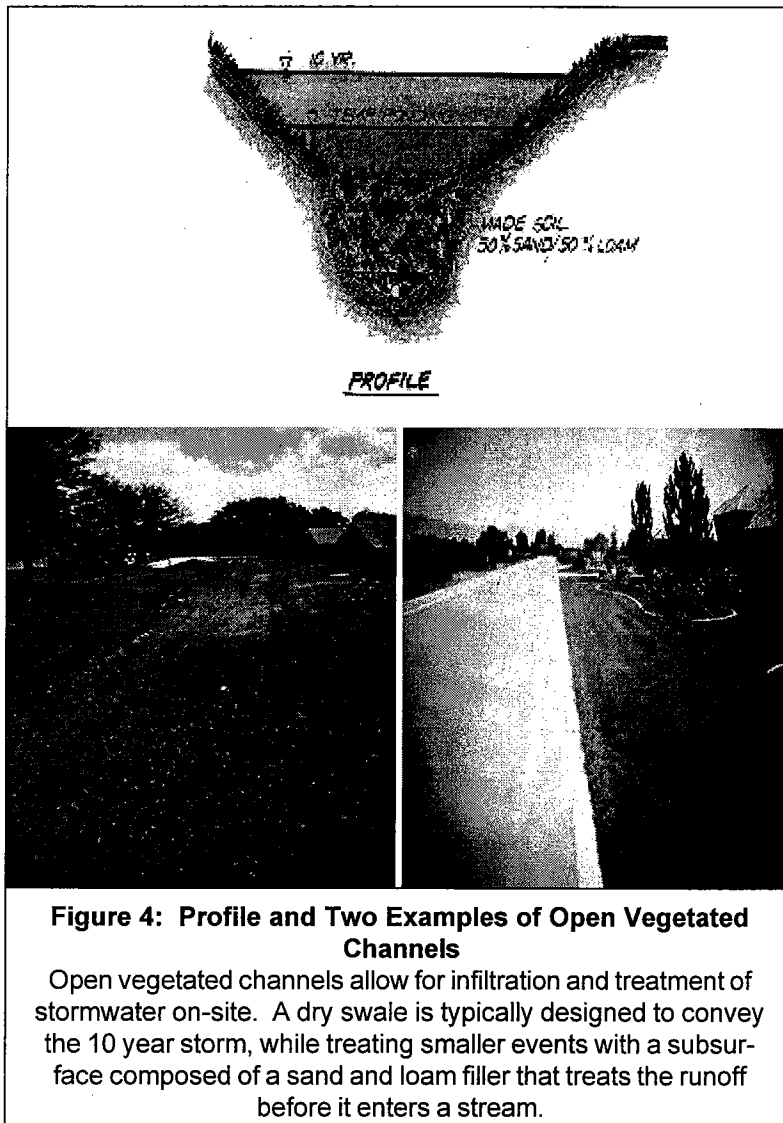


Figure 4: Profile and Two Examples of Open Vegetated Channels

Open vegetated channels allow for infiltration and treatment of stormwater on-site. A dry swale is typically designed to convey the 10 year storm, while treating smaller events with a subsurface composed of a sand and loam filler that treats the runoff before it enters a stream.

Many communities routinely build more parking spaces than are needed to meet actual parking demands. This is a result of using outdated or overly generous local parking codes to determine minimum parking ratios.

Communities should check their local codes to ensure that both a minimum and a maximum number of parking spaces are set for each building project (see Table 2 for recommended maximum parking spaces). By referring to national, regional and/or local studies, communities can evaluate their parking needs more accurately, thereby reducing the creation of unnecessary parking spaces. Even small reductions in parking can reduce construction and stormwater management costs. As it turns out, shrinking parking lots is critical in reducing the impact of commercial development (see article 46).

Parking codes should be revised to lower parking requirements where mass transit is available or enforceable shared parking arrangements are made.

Despite the fact that parking lot size can shrink dramatically if credits for shared parking or mass transit are provided, only a handful of communities require or encourage developers to use these tools. Shared parking allows adjacent land uses to share parking lots if peak parking demands occur during different times of the week. Mass transit can reduce the number of vehicle trips, which translates directly into smaller parking lots.

Despite challenges, several communities have successfully provided parking credits for shared parking and reducing the total number of parking spaces created. One such example is Oakland, California, where a thorough study of short and long term parking demand was conducted. By taking an inventory of existing land uses, parking, and occupancy; and by considering vacancy factors, mass transit access, low auto ownership, and operations of special use facilities, the study concluded that parking rate for office space could be reduced from three spaces to 1.44 spaces per 1,000 gross square feet (ITE, 1995).

Reduce the overall imperviousness associated with parking lots by providing compact car spaces, minimizing stall dimensions, incorporating efficient parking lanes, and using pervious materials in the spillover parking areas where possible.

Reducing the size of parking stall dimensions represents another opportunity to reduce impervious cover. The length and often the width of a typical parking stall can often be reduced by a foot or more. Parking codes can also be amended to require a fixed percentage of smaller stalls for compact cars. Lastly, while permeable parking surfaces can be more expensive to install and maintain, the use of these materials in the 10 to 20% of the lot that will be used for spillover parking can reduce stormwater treatment costs.

Table 2: Recommended Parking Demand Ratios for Selected Land Uses (CWP, 1998b)

Land Use	Better Site Design Parking Ratios
Single Family Homes	2 spaces or less per dwelling unit*
Professional Offices	3.0 spaces or less per 1000 ft ²
Retail	4.0 to 4.5 spaces or less per 1000 ft ²

* can be accommodated in driveway

