Environmentally Green…Economically Green

Tools for a Green Land Development Program

NAHB Research Center, Inc.
400 Prince George's Boulevard
Upper Marlboro, MD 20774

with support from

U.S. Environmental Protection Agency
Innovative Transportation Programs & Partnerships
1200 Pennsylvania Avenue, NW
Washington, DC 20460

July 2001

Disclaimer

This guidebook is based on information obtained during 1999 and 2000. Certain information, particularly Web site references and specifics of the green land development programs featured in the guide, is likely to change. Any references to costs or cost premiums should also be used with care.

Although the information in this guidebook is believed to be accurate, neither the U.S. Environmental Protection Agency, nor the NAHB Research Center, nor any of their employees or representatives make any warranty, express or implied, with respect to the accuracy, effectiveness, or usefulness of any information, method, or material in this guidebook, nor assumes any liability for the use of any information, methods, or materials disclosed herein, or for damages arising from such use.

Given the nature of any program that certifies or qualifies a particular product or technique under certain standards of content, operation, or performance, the NAHB Research Center strongly recommends that any home building association or other party seeking to use this guide in the development of a formal certification program seek legal counsel to protect the interests of both the association itself and its members.

COVER PAGE: Union Street Station by McGurn Investment Company, Gainesville, Florida (right) and Redmond Ridge, Seattle, WA.

Acknowledgments

The NAHB Research Center, Inc. would like to thank the individuals/organizations below for graciously contributing to this project. Many people spent considerable time gathering information, discussing details of their work, reviewing the final draft of the guidebook, and even hosting Research Center visits that permitted the authors to gain a better understanding of how green building and land development programs operate. Without these pioneering individuals and organizations, the guide would not have been possible.

- *Built Green™ Communities* Program, Home Builders Association of Metropolitan Denver
- *Built-Green™ Program,* Master Builders Association of King and Snohomish Counties, Seattle, Washington
- *Build A Better Clark* Program, Clark County Home Builders Association, Washington
- *Evergreen Builders Guide,* Issaquah, Washington

The Research Center would also like to thank the following individuals who reviewed the guide:

- Debbie Bassert - National Association of Home Builders (NAHB)
- Bill Browning - Rocky Mountain Institute
- Mark M. Bundy - Maryland Department of Natural Resources
- Rich Claytor - Center for Watershed Protection
- Brian Cloward - Mithun Partners
- Larry Coffman - Prince George's County Department of Natural Resources
- Reid Ewing - Florida International University
- Pierce Jones - University of Florida
- Al Schauer - MacKay & Sposito, Inc.
- Brett VanAkkeren - U.S. Environmental Protection Agency
- Daniel Williams - Jones & Jones, Architects and Landscape Architects

The NAHB Research Center, Inc. is the research and development leader in the home building industry. Federal, state, and local government agencies, manufacturers, builders, remodelers, and developers rely on the expertise and objectivity that are at the heart of the Research Center. Uniquely positioned to facilitate invaluable liaisons between builders and manufacturers, design professionals and housing researchers, and government and developers, the Research Center is dedicated to advancing housing and land development technology and techniques and enhancing housing affordability for the benefit of all Americans.

This project was completed under a cooperative agreement with the U.S. Environmental Protection Agency's Innovative Transportation Programs & Partnerships. Richard Dooley and Brian Dyson were the primary authors from the NAHB Research Center. The project manager, Robin Snyder, worked diligently to meet the needs of both the agency and the land development industry. The Research Center would especially like to thank her for her vision and patience as the project progressed.

CONTENTS

PART I – GREEN LAND DEVELOPMENT OVERVIEW AND PROGRAM DEVELOPMENT

OVERVIEW

Purpose Of The Guidebook

Environmentally Green...Economically Green is intended for local-level practitioners who want to incorporate green land development practices into their work. Part One of the guidebook contains a brief overview of green land development and information on how to create a local green land development program. Part One is geared primarily toward Home Builder Associations (HBA) that are considering developing a "green" program of their own. However, other organizations interested in developing a local program could also find the information useful. Part Two of the guidebook lists green land development principles and offers brief explanations for each principle. Although these principles are essential parts of a successful green land development program, they can also be used for many other purposes.

Developers can use Part Two to identify ways in which their companies can become more resource-efficient and save money. Local government officials will find the principles beneficial as they review local regulations, such as zoning ordinances, street standards, and stormwater management ordinances that govern land development. While current regulations may prohibit developers from implementing some of the action items contained in Part Two, the principles can nevertheless provide a centerpiece around which private industry representatives and public sector officials can discuss how affected parties can work together to address cost-effective, environmentally sensitive land development.

What Is Green Land Development?

Each year, the United States witnesses the construction of over 1 million new homes. Many of these homes are built in subdivisions, on land that was previously undeveloped. The goal of this guidebook is to help individuals incorporate environmental considerations into all phases of the land development process.

Green land development does not conform to a narrow definition. For this document, we define it as making improvements over current practice that produce a more environmentally-friendly development within reasonable economic limitations. To the extent possible, we focus on residential design and development that addresses both the cost and the environmental issues associated with development. The guidebook emphasizes improvements that developers can make at their discretion or improvements that require some minor or moderate institutional change by local regulatory agencies. For the most part, improvements are limited to items within a site's boundaries.

Current discussion about green development represent a push to foster land development practices that preserve open space and undeveloped land, limit stormwater runoff, reduce automobile traffic, decrease soil erosion, and increase aquifer recharge. These practices encourage more resource-efficient land use practices and residential environments while ensuring that development keeps pace with economic growth.

The principles outlined in this guidebook can help the reader enhance a project's resource efficiency. The guidebook's goal is to explain the advantages of each principle and to discuss considerations in implementing a given action item.

Green Land Development Applied To Smart Growth

"Smart Growth" is a term often used by the media to characterize developments that are town-centered and transit- and pedestrian-oriented, that feature a wider-than-usual mix of housing types as well as on-site commercial and retail uses, and that optimize the use of open space. According to the National Association of Home Builders (NAHB), Smart Growth means meeting demand for housing by building political consensus and applying market-sensitive and innovative land use planning concepts. That translates into meeting housing demand through more intelligent means by planning and building to higher densities, preserving useful and valuable open space, and protecting environmentally sensitive areas. This guidebook does not focus on Smart Growth issues but instead demonstrates how green development principles can enhance developments within the context of Smart Growth.

Land development has become a national topic due to our population growth and the pressure for communities to provide better services. Within the premise that growth is inevitable is the desire among many to preserve farmland, parks, and other undeveloped areas.

One concern in the creation of a community is the replacement of natural pervious landscape with impervious surfaces that include rooftops, roads, parking areas, driveways, and sidewalks. A conceptual goal of sustainable development is to promote economic growth while also protecting the natural environment. At times, local codes and standards can work against that concept by promoting excessively wide streets, excessive parking requirements, and large-lot subdivisions. At the same time, there may be little in the local codes that conserve natural areas.

This guide attempts to highlight those and other areas where communities and developers can better work together to build environmentally-friendly neighborhoods.

Why Do We Need Green Land Development?

There are numerous reasons for an HBA to establish a green land development program:

- ***To acknowledge*** and promote *existing* land development practices that represent resource-efficient or environmentally friendly construction.
- ***To encourage*** and reward the use of *new* or *additional* land development practices that represent resource-efficient or environmentally friendly construction.
- ***To satisfy*** existing and/or ***create*** new market demand for resource-efficient or environmentally friendly construction.
- ***To improve*** existing or establish productive new relationships with key local and state government agencies.
- ***To educate*** developers, builders, and homebuyers with meaningful, comprehensive, and practical information about the impact of land development on the environment.
- ***To shape*** the public debate and regulatory agenda on local environmental issues.

Green land development can benefit the developer, the community, and the environment. The following is an example of one developer's project:

A Comparison of Two Different Land Plans

PROJECTED RESULTS FROM TOTAL DEVELOPMENT		
Total Site	**Conventional Plan**	**Revised (Green) Plan**
Lot Yield	358	375
Linear Feet--Street	21,770	21,125
Linear Feet–Collector Street	7,360	0
Linear Feet--Drainage Pipe	10,098	6,733
Drainage Sections--Inlets, Boxes, Headwalls	103	79
Estimated Total Cost	$ 4,620,600	$ 3,942,100
Estimated Cost per Lot	**$ 12,907**	**$ 10,512**

ACTUAL RESULTS FROM PHASE ONE		
	Conventional Plan (engineer's estimated figures)	**Revised (Green) Plan** (actual figures)
Lot Yield	63	72
Total Cost	$ 1,028,544	$ 828,523
Total Cost per Lot	**$ 16,326**	**$ 11,507**

ECONOMIC AND OTHER BENEFITS FROM LOW-IMPACT DEVELOPMENT	
Higher Lot Yield	17 additional lots
Higher Lot Value	$3,000 more per lot over competition
Lower Cost per Lot	$4,800 less per lot
Enhanced Marketability	80 percent of lots sold in the first year
Added Amenities	23.5 acres of green space/parks
Recognition	National, state, and professional groups
Total Economic Benefit	More than $2,200,000 in savings

(LAND DEVELOPMENT magazine, "Bridging the Gap: Developers Can See Green," Spring/Summer 2000, pp. 27–31.)

Some developers have already addressed the costs of green land development in comparison with conventional land development. For example, Ron Tyne of Tyne and Associates redesigned the site plan for a 130-ace parcel after the initial design failed to satisfy his environmental goals. The table to the left contains the cost comparison for the two designs. In addition to reducing the site's environmental impacts, the developer was able to reduce developments costs by over $2.2 million.

Green Development Tools

In 1993, the NAHB Research Center produced *Proposed Model Land Development Standards and Accompanying Model State Enabling Legislation* for the U.S. Department of Housing and Urban Development. This was based on several decades of research into cost-effective development methods. The document discusses development methods, including the use of drainage swales, pathways and walkways, and resource conservation from an affordable housing perspective. Subsequently, other organizations have used the 1993 publication along with other materials to create documents that focus in greater depth on the environmental aspects of land development.

For example, the Center for Watershed Protection (CWP) has developed a concise, categorical organization of development principles to provide general design guidance. The 22 principles in the Center's *Better Site Design* are divided into three topic areas: residential streets and parking lots, lot development, and conservation of natural areas; the three areas are labeled, respectively, "Habitat for Cars," "Habitat for People," and "Habitat for Nature" . The publication is designed to help people identify areas where existing local codes and standards can be amended. In addition, CWP recognizes that each locale has different needs and that each principle must be locally adopted rather than nationally implemented to reflect the unique characteristics of a site and community.

Another organization, Sensible Transportation Options for People (STOP), addressed land use issues by setting forth a set of traffic-calming principles in its publication entitled *Traffic Calming: The Solution to Urban Traffic and a New Vision for Neighborhood Livability*. STOP defines traffic calming, which deals primarily with traffic and automobiles, as "environmentally compatible mobility management." The group contends that roads do not act solely as a corridor for traffic but also as an area of "social interaction, walking, cycling, and playing."

NATIONAL GREEN LAND DEVELOPMENT PRINCIPLES

Methodology

The process used to develop the list of green land development principles involved researching and using the information collected from existing green land development programs and publications. The step-by-step process for creating the list called for:

- Reviewing practices that are more environmentally friendly and cost-effective than conventional land development practices;
- Developing a list of best development practices based on the background literature and green land development program search;
- Reviewing a draft list of principles by a team of nationwide land development experts; and
- Pilot testing the list of principles through a local home builders association.

Green Land Development Programs

We analyzed three home builder association (HBA) programs that combined green building and green land development requirements. We reviewed the following programs to create a list of features that could be included in any community's green land development checklist:

- *Built-Green Program* of King and Snohomish Counties
- Clark County Home Builders Association *Build A Better Clark* Program
- *Evergreen Builders Guide* of Issaquah

Appendix A provides the green land development aspects of each program.

***Built-Green Program* Of King And Snohomish Counties, Washington**

The *Built-Green Program* of King and Snohomish Counties, Washington, uses a point system for awarding builders and developers Built-Green membership and project approval. The builder's point system is based on criteria in the "Health and Air Quality" section of the Built-Green Program while the developer's point system is based on criteria in the "Site and Water" section.

Overall, applicants are required to meet the Washington State Water Use Efficiency Code Standards and all applicable stormwater management and site development requirements. Additional points are awarded for building on an infill lot and building in a development that meets the Built-Green criteria on the builder and developer lists. For the purposes of this guidebook, we considered only those components in the developer list, including criteria in the areas of 1) Ecosystem Protection, 2) Pedestrian/Transit-Oriented Neighborhoods, and 3) Community Enhancement.

***Build A Better Clark* Program Of Clark County, Washington**

The Clark County Home Builders Association of Washington created the *Build a Better Clark Program* for both builders and developers. The program awards a development certificate and single-level *Build a Better Clark Program* membership, which a developer can earn by attending a program orientation and receiving a minimum 15 points from each of the two sections of a developer survey that outlines the green land development requirements. The developer survey requirements address the following issues: Building Pedestrian/Transit-Oriented Neighborhoods and Protecting Ecosystems and Conserving Natural Resources.

***Evergreen Builders Guide* Of Issaquah, Washington**

The *Evergreen Builder's Guide* of Issaquah, Washington, is based on what the guide calls the three "Es" of sustainable development: Environment, Economy, and Equity. Though it was designed largely for builders and homeowners, the guide also applies to the various trades and addresses site plan issues that should be considered in green development.

The Evergreen guide specifies criteria to reduce the environmental impacts of land development, ensure quality neighborhoods, and protect and enhance property values. The main elements of the guide include performance categories, performance improvement measures, and a priority ranking system.

The guide's five performance categories include community enhancement, water quality and conservation, environmental quality, energy conservation, and resource management. Strategies that support category goals are intended to lead to choices for improving performance. To achieve performance improvements, strategies are translated into measures of preferred building components that are designed to improve performance. Measures are expressed as a fixed point value based on initial cost and environmental benefits. Points establish "star" levels, and participants must implement measures to at least the first star level.

Each of the local green building and development programs reviewed for this guidebook blend green building and green land development principles in each of their checklists. In addition, as noted later, the Home Builders Association of Metropolitan Denver used a draft of the Research Center's green development principles and created its own Built Green™ Communities Program. Appendix B presents the draft checklist for the Denver program.

Other Sources

In addition, we reviewed a variety of other green land development publications. The list of principles in Part Two of the guidebook contains elements from each source.

We recognize that green land development programs will most likely be voluntary and should include features that meet the needs of a particular community. Thus, our goal is to create a list of principles that can act as a foundation for local organizations interested in creating a local green land development program.

The principles located in Part Two of the guidebook focus on the subdivision level and are cost-effective resource-efficient land development methods. The principles are grouped into eight categories, listed below. We used these categories because they capture the essence of green land development currently in practice.

- Pedestrian system
- Layout/density/land use
- Streets and parking
- Stormwater
- Landscaping/grading
- Wastewater
- Site selection
- Other

How To Use The National Green Land Development Principles

In its current state, the list of green land development principles is not to be used as a green land development checklist to certify a developer's handiwork. On the contrary, it is a list of principles to be used in helping to create a green land development program tailored to the issues most pertinent to a given community. For instance, communities in the Southwest might be particularly interested in reducing a development's water use. On the other hand, communities in the Pacific Northwest might be focused on reducing the effects of a development's increase in stormwater runoff. Either way, the guidebook can help satisfy existing market demand for resource-efficient construction or help communities prepare to respond to projected demand for such construction.

At the same time, developers interested in comparing their current projects to the latest green land development principles might find the guidebook useful. Similarly, developers, local organizations, and/or local government officials who are frustrated by opposition to innovative land development concepts can use the guidebook to focus discussions among various groups and to help build new relationships between different stakeholders in order to help reduce regulatory obstacles to green land development practices.

The action items are grouped under a list of eight overarching themes: 1) Pedestrian System, 2) Layout/Density/Land Use, 3) Streets and Parking, 4) Stormwater, 5) Landscaping/Grading, 6) Wastewater, 7) Site Selection and 8) Other. A developer can implement each action item to address the environmental and economic aspects of each respective theme.

Implementing one action item can influence a community in several ways. For example, by reducing the width of roads that wind through a development, a developer can limit a development's impervious surface, use fewer raw materials (e.g., asphalt) to build roads, and influence the design of the pathways along which emergency vehicles may travel. The matrix in Part Two of the guidebook shows how each principle affects the environment by denoting how each principle fits into one of three categories: 1) Reduce Pollutant Runoff, 2) Preserve and Conserve Natural Resources, and/or 3) Reduce Vehicle Use.

Reduce Pollutant Runoff

Communities can experience adverse impacts with stormwater runoff, particularly during heavy rains. Conventional development practices sometimes increase the amount and frequency of runoff, causing flooding, erosion, and water quality problems. Runoff is usually directed (either through pipes or above ground) to a water body or stormwater facility to protect property from damage. However, in so doing, runoff often collects pollutants from the land. Some of those pollutants include sediment, bacteria, garbage, chemicals, and nutrients. A green development should manage stormwater in a manner that better maintains natural runoff characteristics, reduces erosion and pollution, and deals with stormwater runoff as a resource instead of as a liability.

Preserve And Conserve Natural Resources

An overriding goal of most green development programs is to preserve open space and conserve natural resources. Through the use of clustering and other techniques, developers can provide open space, conserve resources, promote natural vegetation, provide wildlife corridors and

sanctuaries, create community recreational space, and promote watershed protection. Developers can also take into account environmental characteristics such as topsoil, hydrology, vegetation, wetlands, and habitat and balance market demand with site capacity. In addition, infill development can be used to preserve open space, make efficient use of existing buildings and infrastructure, and help spur social and economic revitalization.

Reduce Vehicle Use

Transportation planning should consider all forms of alternative transportation---- from public transit and ride sharing, to walking, bicycling, and programs such as telecommuting that reduce a community's dependence on the automobile. A well-designed transportation plan can yield several benefits, including the following:

- Reduced construction costs;
- Reduced maintenance costs;
- Alternative modes of transportation (e.g., walking, bicycling);
- Reduced vehicle miles traveled;
- Improved air quality;
- Within a development or pedestrian areas, slower traffic flow leading to potentially fewer accidents;
- More amenity space; and
- Connecting residential communities to services and shopping centers.

For each principle in Part Two of the guidebook, a check mark (✓) denotes to which of the three categories each principle best applies. *The lines of importance drawn here are gray since many of the action items carry over into more than one category.* If an action item equally affects more than one category, then multiple categories are checked. If a category is not checked, it means that the action item does not influence that category as much as a category with a check mark. These categories are in the guidebook to help local officials and members determine which action items have the greatest impact on stormwater management, transportation, and so forth. For instance, the principle "*Create a Street Network That Moves Vehicles at an Appropriate Rate of Speed*" is designed to help reduce vehicle speeds and thus encourage alternative forms of transportation (e.g., walking, bicycling). Therefore, a community that is focused on stormwater management may not benefit greatly from devoting a great amount of effort to such a principle.

Explanation Of One-Page Action Item Descriptions

Part Two of the guidebook contains roughly a page of details for each principle, including the principle's intent and the factors developers should take into account when determining whether they want to implement that particular item. In addition, real-world examples from the local and regional levels provide lessons in the success and failure of implementation. Some principles are harder to implement than others; however, an overarching theme among the examples is that coordination with local planning officials is often the key to efficient principle implementation.

HOW TO CREATE YOUR OWN GREEN DEVELOPMENT PROGRAM

The steps suggested below are generally sequential, although some may occur simultaneously. Often, a newly conceived project suffers from the "chicken-and-egg" phenomenon; that is, attempts to address one issue have ramifications for other issues and generally blur important overall direction. For the steps below, the discussion highlights actions or issues that may be tied to other elements or features of an evolving program.

Program development from an HBA's perspective is broken down into 11 steps. Details for each step follow the summary list presented below. A similar list of steps has been used in *The Guide to Developing Green Builder Programs.*

STEP ONE	***Determine member and homebuyer interest in/basic knowledge of green land development***
STEP TWO	***Establish a development committee***
STEP THREE	***Set program objectives***
STEP FOUR	***Determine program partners***
STEP FIVE	***Determine program coverage***
STEP SIX	***Discuss first-year budget and structure of program fees***
STEP SEVEN	***Consider the role of existing programs***
STEP EIGHT	***Determine the certification or approval process***
STEP NINE	***Discuss and establish program resources and activities***
STEP TEN	***Establish key elements of program structure***
STEP ELEVEN	***Create program content items***

NOTE: These steps are the result of a review of existing local green building and land development programs.

STEP ONE: Determine member and homebuyer interest in/basic knowledge of green land development

You are probably investigating a green land development program in response to interest from members, the public, and/or a local government agency. You need to know the reason for interest in the program--whether it is based on economic growth, environmental protection, quality of life improvements, or a combination of these reasons. The feedback you will be looking for is a combination of the level of interest in, awareness of, and knowledge of green land development.

NOTE: It is important to recognize the difference among interest, awareness, and subject knowledge. Consumers often demonstrate interest in and awareness of environmental issues, but they fail to make the connection with the land development process. Accordingly, marketing campaigns need to become educational campaigns. Educational campaigns can be the shared responsibility of any number of entities, including industry groups, government agencies, foundations, and environmental organizations.

There are two basic mechanisms for soliciting feedback from developers and homebuyers—focus groups and surveys. Home builders associations have used each technique to test the advisability of launching new programs.

Focus Groups

A focus group is a qualitative market research tool used to gain information on and insight into the attitudes, motivations, perceptions, and decision-making processes of a particular group. The group normally consists of eight to ten people selected for certain attributes: occupation, expressed interest, level of education, and so forth.

The keys to a successful focus group are a clearly defined agenda and a professional moderator. Sessions can be audiotaped and videotaped for later review. The cost to set up, conduct, and analyze one two- to three-hour focus group can run from $4,000 to $10,000.

Even though the guidebook is intended primarily for use by home builders associations, it is potentially useful to other organizations interested in developing programs that promote resource-efficient land development. The important point to remember is that the most effective programs succeed by gaining both industry and local government buy-in from the outset. Organizations other than home builders associations that elect to use the guidebook should strive to include members of the land development industry from start to finish. As the steps below suggest, HBAs using this guide should determine, early in the process, the role that local government can play in program development. Partnerships, particularly with local government, can help HBAs overcome hurdles that may be encountered when the program calls for changes to local codes.

Developer Survey

HBAs have used general membership meetings, fax, mail, and telephone interviews as methods of obtaining completed surveys. General membership meeting surveys are by far the least expensive means of soliciting feedback, but they limit the range of responses to a group generally much smaller than the total membership. Fax and mail surveys cast a much wider net. In any case, care must be taken to keep the survey short enough to enable builders to complete it quickly but substantive enough to enable the organization to collect useful information. Telephone interviews can be the most useful survey tool because they encourage feedback that goes beyond the survey questions. Telephone interviews are, however, time-consuming for both developers and interviewers and confining because they often require scheduling of the interview.

Homebuyer Surveys

The key to a homebuyer survey is to identify a forum or vehicle that targets buyers as a consumer group. Two successful approaches include in-person interviews at home shows and a written survey run in the home section of a local newspaper.

The Home Builders Association of Central New Mexico used a home showcase to conduct in-person interviews with 250 potential homebuyers. Conducting an exit survey at a home show event effectively targeted the survey to potential homebuyers. A professional business information group developed, conducted, and analyzed the survey for a cost of approximately $1,100.

The Home Builder Associations of Kitsap and Clark counties also administered surveys at home show events. The program consultant developed the survey, and the HBA and local government volunteers administered it at HBA show booths.

The Greater Atlanta Home Builders Association made arrangements to run a full-page survey in the home section of the Sunday edition of the *Atlanta Constitution*. Respondents mailed or faxed the completed one-page survey back to the HBA.

Surveys of developers and homebuyers can yield two results. They provide valuable information, and they spread the word to individuals, firms, or agencies that might participate in the development of your program. Survey results can also provide the foundation for the development of marketing materials for the entire program

STEP TWO: Establish a development committee

Creating a green land development program involves considerable decision-making regarding program objectives, scope, financing, and structure. The composition of the committee (developers, associate members, outside organizations) needs to be broad enough to represent any and all directions the program might take. On the other hand, program development must maintain a focus that is reasonable in view of program objectives and available resources. It is easy to see how Step Two is closely linked to several other steps, particularly Steps Three and Four.

Consider the following for committee membership:

- **Developers.** Your committee should include a range of developers—from developers who specialize in small developments to those who tackle multifaceted sites. Differences in methods of land development, management, financing, product selection, and marketing can all have a significant impact on program structure and content.
- **HBA leaders.** HBA leaders must be directly involved through their membership on the development committee or indirectly involved through regular briefings. In this way, HBA leaders' commitment to the program will be cultivated or maintained.
- **Local government.** HBAs have long worked with local planning departments, safety officials, and stormwater management officials, taking advantage of both their financial and technical resources. As discussed below and in Step Four, the timing and level of local government involvement is often important to program success.
- **Lender(s).** Financial incentives for both homebuyer and developer participation in the program are a major part of the program—at least one lender should be involved in program development.
- **Real estate professionals.** The realty community can play an important role in the marketing of any program. Energy efficient mortgages can create incentives and additional buying power for homeowners and potential homeowners interested in buying a green home in a green land development.
- **Associate members.** Distributors, trade contractors, and local product manufacturers can be important sources of technical information and funding support.

- **Environmental land development professionals.** Even with the assistance provided by the guidebook, nothing can replace local expertise in resource-efficient land use design and construction. Technical support to the committee is particularly important if the committee lacks developer members with field experience in green development practices.

There are two basic approaches to establishing a development committee. The first approach is to start with a core group of approximately six HBA members (primarily developers) and staff who will decide how and when to expand the land development committee to outside organizations. This early work will help ensure that the larger committee includes the appropriate mix of perspectives and resources. The start-up or core group should probably limit its role to establishing initial program objectives and scope before moving on to expand the committee.

The second approach is to include at least one outside organization at the outset. Such an organization can bring resources and a level of interest to the emergent committee. The establishment of a development committee raises the issue of partners in program development as discussed in Step Four.

STEP THREE: Set program objectives

HBAs with green land development programs have noted that one of the most important program benefits has been the good will generated with the public in general and with some local government offices in particular. A green land development program represents the opportunity for both private industry and government to demonstrate cooperation and consensus, building public support for both.

It is important for an HBA and its program development committee to discuss and establish program objectives during the early stages of program development because the objectives have a significant impact on everything that follows. It is also important to assign priorities to program objectives.

STEP FOUR: Determine program partners

The decision to include outside organizations in program development is often based on one or more of the following four factors: credibility, control, cooperation, and financial resources.

- **Credibility.** A stand-alone program, regardless of whether it is developed by an HBA, an environmental organization, or a government agency, faces the added challenge of convincing the public and interested outside parties that the program is substantive and objective. Generally, programs that contain an element of public/private partnership have greater credibility and receive more supportive media coverage than stand-alone programs.
- **Control**. The trade-off often made when a program involves two or more organizations is one of control. It is likely that the enhanced credibility of a partnership brings with it some compromise on or accommodation to program objectives or their priority. Accordingly, initial discussions regarding objectives can be important when seeking the appropriate partners in program development.

- **Cooperation.** Including outside organizations in the program development phase can help an HBA build bridges and, in the early stages of program development, identify potential/actual issues that may ultimately hinder program implementation.
- **Financial resources**. Although the costs of starting and running a program are discussed later, they usually include HBA staff time, production of educational and marketing materials, and consulting services (marketing, surveying, environmental consulting). The resources of each HBA and the goals of each program will determine the importance to the program of partners with financial resources. Step Six discusses in detail program development costs in detail.

Listed below are entities to consider when seeking partners.

- **Government agencies**. A variety of local or state government agencies or departments may be interested in contributing to the development of a local green land development program, including those in the following areas: planning, stormwater management, energy conservation, environmental quality, solid waste management, and building inspection. It is important to consider, however, that the participating entity may want to focus on the particular environmental issue that it champions. Another important consideration when working with government agencies is the substantial time and effort required if when seeking grants or other forms of financial support.
- **Product manufacturers**. While local distributors and suppliers often participate in local HBA programs as associate members, product manufacturers may be willing to be financial sponsors of a local green land development program. It is important to discuss with product manufacturers any expectations they may have for featuring particular products as a part of their sponsorship.
- **Non-profit organizations/foundations**. Nonprofit organizations with an investment in local environmental issues can make good partners in the creation of a green land development program. These organizations often enjoy strong relationships with both the media and environmentally related government agencies.

With the land development committee and program objectives established, information on member and homebuyer interest and attitudes collected, and initial financial resources identified, the committee can begin to address the details of program structure.

STEP FIVE: Determine program coverage

Land developers are the primary HBA constituency interested in a green land development program. Developing a land development program requires attention to issues such as local planning, zoning, stormwater management, infrastructure standards, and transportation systems. Addressing these issues may require significant changes in regulations, ordinances, and master plans as well as long-term political and educational efforts. Although the HBA programs noted earlier in the guidebook have formally introduced green land development into their programs, several existing green builder programs initially did not include elements or an entire section on land development for the simple reason that they would have required considerable legislative change. However, most HBAs plan to use the green builder program over the long term to address development issues.

The Home Builders Association of Metropolitan Denver Program includes a prerequisite that all homes in a green community must meet or exceed the Built Green™ Home certification. We recognize that multiple builders are often involved in the construction of a project and that the original developer will not have control over how each house is built once a lot is sold to a builder. Anyone trying to establish a local green land development program may want to discuss with developers the possibility of a "green home" prerequisite to determine if such a requirement would undermine program participation rates.

STEP SIX: Discuss first-year budget and structure of program fees

The first-year budget of a green land development program involves the costs of development and implementation. Most development costs are labor-related—staff, HBA members, and possibly consultant(s). Usually, implementation costs are largely the hard costs of printing materials, planning events, and promotion. The table below describes in broad categories the costs for one of the existing green builder/land development programs.

First -Year Budget for a Green Building/Land Development Program

Features	
Hard costs	**Kitsap**
Advertising	$ 4,400
Builder/consumer surveys/focus groups	$ 550
Marketing materials (logo, ad slicks, yard signs, certificates, plaques, and so forth.)	$7,650
Builder handbooks	$3,715
Hard Cost Subtotal	$16,315
Labor*	
Program development (HBA staff)	$ 6,775
Program development (consultant)	$26,770
Event planning (staff)	$0
Total	$49,860
Field checks (independent inspector)	N/A

****NOTE***: Labor figures are for existing programs that did not benefit from this guidebook. Use of the guidebook can result in significant savings in both staff and consultant labor.

Here are some general rules of thumb taken from the existing green land development programs:

- At least initially, the programs are not set up as revenue generators—the goal is to make the program revenue-neutral after the first or second year.
- Staff time to develop and administer the program is often not specifically allocated to the program budget. Staff are under direction as to the portion of their time to invest in development, implementation, and then ongoing administration of the program. The total

staff investment during the first year of program development averaged around one-quarter- to one-half- time for one person.
- Program membership fees are often set up to cover only the hard costs of the program—printing materials, signs, and conducting spot checks. Excluding advertising and staff time, program hard costs average around $11,000.
- Advertising costs often are set up to be covered by project sponsorships as reflected in the wide range of advertising costs in the first year of the programs.
- It takes a substantial amount of time to gather and present background information on the program's content areas for compilation into an HBA library and/or builder's handbook. Before investing time and money in either, check with builder members likely to enroll in the program as to which vehicle they think will be more useful.

Even before specific features of the program have been established, however, answers to the following questions can help in determining program structure:

- Are developer enrollment fees assessed annually and/or per project?
- Are developer member fees tied in any way to the size of a developer's projects?
- Can a developer pay more to be a founding member and receive sponsor-level recognition?
- Can associate members (architects, subcontractors, building material suppliers, lenders) join, and how do their fees compare with those for developers?
- What is the cost of being a program sponsor or partner, and is there a limit to the number of sponsors or partners?

STEP SEVEN: Consider the role of existing programs

The land development committee should compile a list of existing local, regional, or national programs that may relate to the local green land development program. These programs may be HBA, NAHB, federal/state/local government, local environmental, or utility programs. One example includes the Building *With* Trees recognition program sponsored by the National Arbor Day Foundation in cooperation with the National Association of Home Builders. The program outlines tree protection practices and provides two opportunities for builders and developers to receive recognition for their efforts--one following the planning and design phase of a project and the other following construction. Another pertinent program is the Joint Center for Sustainable Communities, which is a collaboration between the U.S. Conference of Mayors (USCM) and the National Association of Counties (NACo). The Center helps local elected officials build sustainable communities by promoting community leadership initiatives, providing technical assistance and training, and conducting community policy and educational forums.

STEP EIGHT: Determine the certification or approval process

There can be two elements to the process of certifying participants in the program: an initial agreement and project-by-project certification. Some programs rely on a fairly formal contractual agreement for program members that states the rights and responsibilities of both the

member and the program administrator. Typical elements of these agreements include the following:

Developer Member

- Pay dues (annual and project)
- Enroll minimum number of development projects
- Permit use of developer name in program
- Assume responsibility for compliance
- Provide random access to projects for spot verification
- Limit use of program materials to enrolled projects
- Fairly represent and document compliance to lot buyer

Program Or Administrator

- Provide technical support/training
- Promote program to general public
- Promote program to real estate professionals/suppliers/developers
- Provide signage
- Establish grievance process
- Maintain records/process applications
- Provide program financial oversight

Most programs have begun with a self-certification process under an agreement that the program has the right to random checks of any project's compliance with program criteria.

STEP NINE: Discuss and establish program resources and activities

A wide range of resources and activities should be considered in the creation of a green land development program. The following list highlights the most significant resources that can be offered to developers:

Resources

- **Developer Handbook.** Most green land development programs develop a handbook that is distributed to developers when they enter the program. Handbooks usually take the form of a three-ring binder that easily accommodates changes and updates. Some handbooks are designed as a developer's introduction to the program; some are set up as a marketing tool for the developer to use with clients; and some are an extensive, detailed reference and educational tool for the developer. The most common elements of the handbooks are the following:
    - ***Summary checklist.*** This is a checklist all of the items described in one-line phrases on one or two pages. This summary sheet is often the same as the record of compliance that a builder will *complete for each qualifying home or project.*
    - ***Detailed action item descriptions.*** Although some or many of the items may require little elaboration for developers, others may require detailed examples or instructions. Details may be spelled out in the handbook or included in specific references that are part of the program resource library as discussed below.
    - ***Resources.*** The implementation of many program items requires contact or outlet information. Given that the resource portion of the program is that aspect of the

program most subject to change (e.g., add new companies, change contact personnel, update range of services), resource information is often kept in a separate section of the handbook.

NOTE: The elements listed above can be provided in a software package, thus facilitating easy updates.

- **HBA Resource Library.** A balance needs to be struck between the amount and level of information given to developers in the handbook and the materials retained for developer use in the HBA library. Some programs report that developers use little of the detailed information in the handbook and prefer to seek out information and guidance on specific items as needed. Others report that developers prefer a reference that is thorough enough to be used as an independent tool. The type, frequency, and level of education/training provided by the program may also affect the design and intent of the library and handbook.
- **Newsletter.** Several programs issue a one-page newsletter distributed to all members on a regular basis. The newsletter announces upcoming events, makes members aware of program updates, and provides tips to developers on green land development techniques.
- **Web site or listserv.** More and more developers and associate members enjoy computer access. As a result, the HBA Web site can be used in place of or in conjunction with the newsletter to communicate with program members.
- **Promotional materials.** The specific materials that programs provide to their developers include signs, ad slicks, logo stickers, brochures, certificates, and plaques.

Activities

- **Training.** Training can take the form of an initial orientation and/or an ongoing educational series. Several programs operate or are developing a training series to expose developers to the full range of options available within the program. While some of the techniques or actions suggested within the program may be straightforward or represent current practice for many developers, others may require both classroom and hands-on education. Developer training is generally a part of the program that is not well developed during the first year but evolves in subsequent years as developer needs are identified.
- **Community events.** Any existing community event that focuses either on housing or the environment provides an opportunity for the HBA to get the word out to potential homebuyers about the advantages of buying a home in a community developed in accordance with green land development practices. The Build a Better Kitsap program has a booth that features resource-efficient techniques and materials used by its participants. The booth is used at home shows and other local events. Any event that involves the creation of an exhibit involves the costs of construction as well as the costs of unit set-up, breakdown, and storage.

STEP TEN: Establish key elements of program structure

This step and Step Eleven are often considered together because of their impact on each other.

Five basic decisions guide the structure of the content areas and individual items in a green developer program: performance-based versus prescriptive standards, number of program levels, types of requirements, weighting of items by points, and organization of content areas.

Standards

Individual items in the program can be expressed as performance-based, prescriptive, or a combination of both.

Performance-based standards are expressed in terms of the end-product—the emphasis is on where you end up, not how you get there. An example is, "Percentage of common area open space to total area is 25 percent." The standard does not dictate *how* the developer preserves at least 25 percent of the land as open space but rather sets an end to be achieved.

Characteristics of performance-based standards include the following:

- The method and details of how a level of performance is achieved are left to the practitioners--the developers--giving them more flexibility and encouraging ingenuity.
- A baseline or conventional performance must be established for comparison purposes.
- Comparing individual performance with the baseline usually requires a calculation system or software program.
- If the current local zoning regulations are used as the baseline, then areas of the green land development program not addressed in the regulations may require the establishment of baselines for these areas.

Prescriptive standards are expressed in terms of the means used to achieve an end; the emphasis is on how the developer achieves a desired outcome. An example is, "Construct residential streets to 28 feet back of curb to back of curb."

Characteristics of prescriptive standards include the following:

- The method and details of compliance are explicitly stated.
- The system is generally simple and easy to use.
- There is no need for an explicitly stated baseline or conventional practice.
- There is no need for a system of calculation or a software program.

In general, a performance-based approach can require more time and/or investment in the compliance process than a prescriptive approach. A prescriptive approach requires carefully considered options and language so that the simplicity of the system does not come at the price of relevance, feasibility, or flexibility.

Some existing programs use a combination of both types of standards, and most provide a range of options that are prescriptive in nature but broad enough to provide developers with significant flexibility. In general, prescriptive standards that are carefully considered, clearly expressed, and

generated by a developer committee have a good chance of finding acceptance among and proving useful to participating developers.

Levels

Programs can be either "all-or-nothing" single-level or multiple-level programs.

With single-level programs, developers earn either one point or satisfy an item total to qualify projects for the program; this is similar to a pass/fail approach. Single-level programs are generally set up for simplicity. The main idea is to set the bar high enough to make certification meaningful but not so high as to discourage developer participation. An example of a single-level program is the Home Builders Association of Metropolitan Denver Program (see Appendix B).

Multiple-level programs generally involve three or four levels under which builders can qualify their homes. Multiple-level programs are designed to accommodate and distinguish among a wider range of developer projects. They are often set up to motivate developers to adopt environmentally-sensible practices at the basic level and to provide opportunities for progression and education at the higher levels.

Requirements

Programs vary widely in both the extent and nature of their requirements. All of the green land development programs have sought a balance between flexibility and prescriptive standards. The best way to describe the various ways that requirements can be handled is by examples from existing programs. Appendix A provides program checklists for each of the programs discussed below.

Straight Item Count Versus Point-Weighting

Programs can either treat every listed item with equal weight or assign points to each item. The simplest approach is clearly to treat each item equally, in essence giving each program item a value of one.

Points can be assigned to each item based on the relative difficulty or cost of an action item, the relative significance of the environmental impact of an action item, or a combination of the two. In almost all cases, the determination of points for action items results from consensus among the members of the program development committee. .

Organization Of Content Areas

The number, listing order, and selection of content areas are all a part of how program items are organized. Content areas can be organized by environmental issue or by the approximate chronology in which environmental issues arise at the job site. Developers tend to be most comfortable with an organization that follows the order in which items need to be addressed on the job. To a greater or lesser degree, all of the programs reviewed here followed an organization based on environmental issues, not on the chronology of the issues.

In any case, the content areas should be numerous enough to create distinct topic areas but not disaggregated to a level that overwhelms the developer.

STEP ELEVEN: Create program content items

The next section of this guidebook is dedicated to a review of the full spectrum of potential program action items. As individual action items are reviewed for inclusion in your local program, here are some basic issues to consider:

- **Avoid vague language.** Be as quantitative as possible so that meeting an item is clear-cut for the developer. *Example:* "85% of the lots have their front or rear facing within 15 degrees of solar south."
- **Avoid putting more than one action, technique, or material in one item.** For example, the phrase, "Use shared driveways to reduce impervious areas and construct streets to 32-34 foot PL (property line) to PL width" can be improved to "Use shared driveways to reduce impervious areas" or "Construct streets to 32-34 foot PL (property line) to PL width."
- **If your program uses points, avoid ranges for a single item whenever possible.** For example, the phrase, "Between 1 to 5 points will be given for recycling construction waste" can be improved to "___ (1-3 points) Take one point for each of the following materials that you recycle/reuse: scrap wood, cardboard, and soils."
- **Link items to resources, particularly items that may be new to builders.** For example, the phrase, "Select appropriate turf areas" can be improved to "Use native/drought tolerant grasses in turf areas exceeding 50%."
- **Leave room for items not considered, even the most thorough of program development efforts will not anticipate every developer's approach.** Include a write-in item in each content area. For example, instead of using the phrase, "Use this space to include a stormwater management technique that you employ but that is not included in this section—see program administrator for approval and credit," the developer could write in "Stormwater inlets will be labeled 'Stormwater Flows Directly to the River."
- Try to keep the same level of detail across topic areas and on individual items.

PART II – GREEN LAND DEVELOPMENT PRINCIPLES

OVERVIEW

As noted earlier in this document, Part II presents details of green land development principles. A matrix offers a quick glance at what developers can do to create green land developments. The matrix also presents the primary environmental benefits of each principle as well as the main effects of implementing the principles. The main effects under consideration include 1) Reduced Pollutant Runoff, 2) Preservation and Conservation, and 3) Reduced Vehicle Use.

A synopsis of each principle follows the matrix. The synopsis format is consistent across all principles and contains the following sections:

Intent

Certain objectives are associated with each principle. The "Intent" contains a description of what will most likely occur if the developer implements the principle.

Considerations And Examples

Each principle has its own set of considerations that developers should take into account before implementing the principle. For example, even though the principle will lead to numerous environmental benefits, the associated concept may be difficult to implement in communities where public officials are hesitant to endorse the principle. This section provides some items for consideration and offers examples where the principle has found application.

Cost Implications

The overall goal of the guidebook is to provide cost-effective land development solutions that also yield environmental benefits. The section on cost implications provides basic information on the main cost factors attributed to each principle. The cost implications are primarily qualitative in nature. They are intended to give a general understanding of cost implications, not actual costs.

The synopses are provided to help the reader understand more about each principle; however, the reader should not consider the guidebook an exhaustive source of information for the highlighted concepts. We encourage the reader to become familiar with the listed references or other sources of related information to gain a more thorough understanding of the nuances associated with a particular principle.

Part Two of the guidebook references home builder association green land development programs, green land development publications, and other resources. You can reference one or more of these resources to obtain more information on specific principles. Below is a list of the sources of information used for Part Two of the guidebook:

Acronym/Descriptor Words Used in Part Two	Information Source
Best Development Practices	*Best Development Practices: A Primer for Smart Growth,* Reid Ewing
Build a Better Clark	Build a Better Clark Green Builder Program
CNU	*New Urbanism and Traditional Neighborhood Development – Comprehensive Report and Best Practices Guide*, New Urban News, 2000
CWP	*Better Site Design: A Handbook for Changing Development Rules in Your Community*, Center for Watershed Protection, August 1998
DTJ	Downing, Thorpe and James checklist
Denver HBA	Home Builders Association of Metropolitan Denver Built Green™ Communities Program
Evergreen	*Evergreen Builder's Guide,* Port Blakely Communities and the City of Issaquah (WA)
HUD	*Proposed Model Land Development Standards and Accompanying Model State Enabling Legislation, 1993,* U.S. Department of Housing and Urban Development
International Dark Sky Organization	International Dark-Sky Association, Inc. 3225 N. First Avenue Tucson, Arizona 85719-2103 USA Phone: 520-293-3198 Fax: 520-293-3192
King-Snohomish	King-Snohomish Counties (WA) Built Green™ Program
STOP	*Traffic Calming: The Solution to Urban Traffic and a New Vision for Neighborhood Livability*, Citizens Advocating Responsible Transportation, 1993

COST-EFFECTIVE GREEN LAND DEVELOPMENT PRINCIPLES MATRIX

Green Land Development Principles	Environmental Benefits	Effects		
		Reduce Pollutant Runoff	Preserve & Conserve Natural Resources	Reduce Vehicle Use
1.0 Pedestrian System				
Include pedestrian pathways and bicycle paths to/from key areas	Encourages walking/biking over vehicle use			✓
Create safe and easily accessible pedestrian crossings	Encourages walking/biking over vehicle use			✓
Create a street network that moves vehicles at an appropriate rate of speed	Uses fewer materials; reduces impervious surfaces/stormwater runoff; encourages walking/biking over vehicle use	✓	✓	✓
2.0 Layout / Density / Land Use				
Optimize the average density of development	Preserves open space; reduces impervious surfaces/stormwater runoff	✓	✓	
Reduce the overall street area and utility runs (see also "Streets and Parking")	Preserves open space; reduces impervious surfaces/stormwater runoff; reduces utility runs/materials	✓	✓	
Connect amenities within the development and/or provide a pedestrian/bicycle pathway to existing external amenities	Encourages walking/biking over vehicle use			✓
Create a mixed-use development	Services within walking distance of homes reduce reliance on vehicle travel			✓
Optimize lot placement via clustering	Preserves open space; reduces impervious surfaces/stormwater runoff	✓	✓	
Optimize solar exposure and passive solar heating via appropriate lot orientation	Reduces use of natural resources		✓	
Preserve trees and other natural resources	Preserves open space; reduces impervious surfaces/stormwater runoff; reduces use of natural resources	✓	✓	
3.0 Streets and Parking				
Reduce street widths and lengths	Uses fewer materials; reduces impervious surfaces/stormwater runoff; encourages walking/biking over vehicle use	✓	✓	✓
Eliminate/reduce curbs and gutters	Uses fewer materials; reduces impervious surfaces/stormwater runoff	✓	✓	

Green Land Development Principles	Environmental Benefits	Effects		
		Reduce Pollutant Runoff	Preserve & Conserve Natural Resources	Reduce Vehicle Use
Ensure sidewalk placement meshes with overall development design	Uses fewer materials; reduces impervious surfaces/stormwater runoff	✓	✓	
Reduce parking areas and requirements	Uses fewer materials; reduces impervious surfaces/stormwater runoff; treats stormwater; encourages walking/biking over vehicle use	✓	✓	✓
Use alternative street, driveway, walkway, and parking surfaces	Reduces impervious surfaces/stormwater runoff; replenishes groundwater supply	✓		✓
Use alternatives to large-diameter cul-de-sacs	Uses fewer materials; reduces impervious surfaces/stormwater runoff	✓	✓	
4.0 Stormwater				
Use swales and grassy channels in place of curbs and gutters	Uses fewer materials; reduces impervious surfaces/stormwater runoff	✓	✓	
Incorporate bioretention, infiltration, and retention/detention ponds into development design	Reduces impervious surfaces/stormwater runoff; treats stormwater; preserves open space	✓	✓	
Capture sheetflow from paved areas	Reduces impervious surfaces/stormwater runoff	✓		
Use porous pavements and other pervious materials to help recharge water table (see “Streets and Parking”)	Reduces impervious surfaces/stormwater runoff; replenishes groundwater supply	✓		✓
5.0 Landscaping / Grading				
Use sensible landscaping techniques (e.g., Xeriscaping)	Uses fewer natural resources; reduces impervious surfaces/stormwater runoff	✓	✓	
Use and/or create wind breaks	Helps reduce development’s energy needs		✓	
Use/plant street trees in urban areas	Helps reduce development’s energy needs; creates separation between traffic and pedestrians		✓	✓
Preserve trees and other natural areas (see “Layout/Density/Land Use”)	Preserves open space; reduces impervious surfaces/stormwater runoff; uses fewer natural resources	✓	✓	
Limit turf areas	Conserves natural areas; reduces need for chemicals; reduces impervious surfaces/stormwater runoff	✓	✓	
Use/preserve native plant species	Reduces stormwater runoff; replenishes groundwater supply; uses fewer natural resources; reduces need for chemicals	✓	✓	

Green Land Development Principles	Environmental Benefits	Effects		
		Reduce Pollutant Runoff	Preserve & Conserve Natural Resources	Reduce Vehicle Use
Use soils with increased organic materials and reuse topsoil	Reduces stormwater runoff; replenishes groundwater supply; uses fewer natural resources	✓	✓	
Grade site so that the slopes follow the natural contours as much as possible	Reduces stormwater runoff; preserves natural areas	✓	✓	
6.0 Wastewater				
Treatment of wastewater onsite for small communities	Reduces the land impacts (excavation, sediment runoff) that result from connecting a community to a municipal sewage system		✓	
Collection of wastewater effluent for offsite treatment with onsite solids collection	Reduces excavation and its impacts by using small-diameter effluent collection pipes		✓	
7.0 Site Selection				
Place new development in existing service and infrastructure areas	Encourages walking/biking over vehicle use; reduces the need to extend utilities and infrastructure		✓	✓
Conduct a site-suitability analysis	Identifies ecological and biological pros and cons to building on the site; aids in design layout by mapping site topography		✓	✓
Remediate Abandoned or Brownfield Properties Instead of Developing Open Space	Makes use of previously used site often located within existing infrastructure; remediates a potentially contaminated site and potentially limits development land impacts	✓	✓	✓
8.0 Other				
Educate homeowners on transportation options such as transit and ridesharing	Encourages walking/biking over vehicle use			✓
Involve public in site development process	Helps increase homebuyer awareness of development's environmental benefits and describes how to reduce environmental impacts	✓	✓	✓
Educate municipalities and homeowners on green land development	Helps increase homebuyer awareness of development's environmental benefits – describes how to reduce environmental impacts	✓	✓	✓
Educate public on wise water use and resource-efficient lawn care	Encourages the efficient use of water and helps improve water quality of stormwater runoff		✓	

Green Land Development Principles	Environmental Benefits	Effects		
		Reduce Pollutant Runoff	Preserve & Conserve Natural Resources	Reduce Vehicle Use
Promote green homes to lot buyers	Uses fewer materials and natural resources and improves site runoff characteristics	✓	✓	
Provide access to and incentives for public transportation	Encourages walking/biking over vehicle use			✓

GREEN LAND DEVELOPMENT PRINCIPLES

Pedestrian System Principles

1.1 Include Pedestrian Pathways and Bicycle Paths to/from Key Areas (also see Section 3.3: Ensure Sidewalk Placement Meshes with Overall Development Design)

Intent

Provide a convenient, safe, pleasant network of pedestrian paths that meander throughout neighborhoods and communities, thus encouraging walking, cycling, and reducing automobile use. The overall sidewalk and path network should be considered as part of an overall plan to move people to desired locations. For instance, due to the amount and frequency of pedestrian traffic in some suburban developments, some streets may warrant a sidewalk on only one side of the street. In other neighborhoods, pathways connecting local streets to one another may encourage pedestrian traffic more than automatically creating a sidewalk network parallel to all existing roadways. Create paths by which people can travel on foot or bicycle to gain access to basic services and amenities, thereby helping to reduce homeowners' automobile dependence. Reducing vehicle miles traveled results in fewer pollutants emitted into the air by automobiles.

Considerations And Examples

- Pedestrian linkages can reduce pedestrian and vehicular conflicts and link neighborhoods, basic services, and amenities.
- Pathways can be used to route community members along lakes, streams, and other natural amenities, adding value to the overall development. In addition, pedestrian and bicycle paths should be well designed and integrated into the community. The paths should link residents to the natural and man-made features (e.g., stores, sports fields, schools) they are most likely to frequent by foot or on bicycle.
- Provide access between different land use types.
- A community may want to determine if existing trails could connect to planned trails in the new development. Such connections help create longer trail systems for activities such as rollerblading, cycling, running, and walking.

Cost Implications

- Increased costs due to additional materials needed to create paths.
- Creates a strong selling point; helps to set the development apart from conventional developments.
- Sidewalks and their planting strip account for a two percent increase in the hard costs of housing. These costs can often be reduced or eliminated to help pay for additional pathways.

1.2 Create Safe and Easily Accessible Pedestrian Crossings

Intent

Use different types of road surface materials at pedestrian crossings and integrate pedestrian walking paths and bicycle paths into street movement while providing a sense of safety and separation from automobile traffic. Design to decrease automobile speeds to allow pedestrians to become better integrated into the movement of a community and street. Enhance the visibility of drivers and pedestrians at road crossings. Provide an appropriate amount of high-quality street lighting that is directed toward the light's target. An efficient lighting system meets safety needs, guides vehicular movement, encourages pedestrians' and bicyclists' movement, and reduces night sky light pollution.

Considerations And Examples

- Install traffic-calming devices such as roundabouts and crosswalks to limit vehicle speed.
- Road design methods used to decrease traffic speed include narrowing traffic lanes, using paved or cobblestone strips across the road surface, installing paved speed tables, and installing neck-downs.
- Alter the color or type of paving material for pedestrian traffic, especially at pedestrian crossings where speed tables might be used.
- Place paved speed tables at pedestrian crossings. Raise whole intersections to the same level as footpaths or sidewalks.
- Provide proper street lighting. Keep lighting poles low; space them more closely. Specify "full-cutoff" luminaires to avoid uplight or glare (Note: full-cutoff luminaires differ from "cutoff" luminaires, which still allow some uplight). Avoid mercury vapor lamps; metal halide or high-pressure sodium lamps are preferable for most applications. "Fully shielded" lighting fixtures decrease glare and direct light to the intended target. Provide a strong sense of safety, but not light pollution that disturbs wildlife.

Cost Implications

- Additional pedestrian crossing features will carry some extra cost, but will offer a safer and more pedestrian-friendly environment in return.
- Additional and expensive lighting will obviously increase initial costs. However, inexpensive lighting fixtures often have inefficient lamps and a short lamp life and thus consume far more energy than needed. Paying for more electricity than needed is expensive, as is the maintenance cost associated with lower quality fixtures.

1.3 Create a Street Network That Moves Vehicles at an Appropriate Rate of Speed

Intent

The farther that motorists can see ahead of their car, the greater the likelihood that they will increase their speed. Changing road direction and using roundabouts and "neck-downs" can cause drivers to slow down and increase their field of vision, facilitating increased awareness of pedestrians and cyclists. However, it is important to note that communities should not restrict sight lines and that they need to meet the minimum sight-distance requirements for intersections and curves.

TRAFFIC CALMING

Traffic calming relates to automobile traffic and its relationship to pedestrian movement and the community. These principles can reduce the significance of the automobile and makes the neighborhood more pedestrian-friendly.

Considerations And Examples

- Ensure that safety and rescue equipment can readily move through the area.
- Create 45-degree bends in roads, allowing back-in parking on alternating sides of the street.
- Incorporate tree lawns, detached walks, planting areas, lighting, signage, raised walkways, and crossings into design.
- Provide crosswalks and bicycle lanes, paths, or routes. Design streets to be shared with pedestrians and cyclists. Create and appropriately mark bicycle lanes, dedicated bicycle paths, crosswalks, and sidewalks to ensure safe travel. Ensure that routes are networked to encourage pedestrian travel. In Minnesota, planners have found that using a different color for the entire bicycle lane is effective at slowing vehicles by making the street appear narrower.
- A speed table differs from a speed bump in that it is a slightly raised section of road that is wide enough for both sets of tires to sit on top of the "table" at the same time.
- Roadways can appear to have been narrowed simply by building landscaped islands out from the footpath to provide protected parking bays.

Cost Implications

- Increased maintenance costs.

Layout / Density / Land Use Principles

2.1 Optimize the Average Density of the Development

Intent

Increased density can preserve open-space and natural areas by providing more homes in a smaller area. This also gives the designer more flexibility in determining where to place homes, and allows the existing environment and natural features such as vegetation and water bodies to be functional parts of the development. Higher density can facilitate clustering (see later discussion of this topic).

LAND USE

This section encourages developments that allow for various uses and structures, creating a diverse community that allows people to work and shop where they live while minimizing commute and drive time. In addition, it allows for the creation of a diverse community by allowing numerous types of housing development that is available to all socioeconomic groups.

Considerations And Examples

- Consider incentives for developing land at higher gross residential densities.
- For multifamily housing, housing densities can be 20 units per acre or higher. This can be used as a target.
- Institutional changes, such as revised zoning designations that allow higher density, are often time-consuming to obtain.

Cost Implications

- Developing housing at higher densities can save the developer land and infrastructure costs on a per-unit basis. It may and create opportunities to "market" more green space or common areas. Smaller lots can also save maintenance costs for homeowners.

2.2 Reduce the Overall Street Area and Utility Runs *(also see Section 3: Streets and Parking)*

Intent

By creatively placing the homes in a development, a developer can reduce the linear feet of street and utility runs. This can result in fewer materials used, reduced impervious surface, and reduced costs per lot.

Considerations And Examples

- Consider using hybrid street designs to help optimize land use and to make the community more functional. This also helps make the neighborhood amenities more accessible.
- By placing homes in closer proximity to one another, the developer can often increase the total number of homes built in the community.

Cost Implications

- Ron Tyne of Tyne and Associates redesigned the site plan for a 130-acre parcel after dissatisfaction with the initial design. On the following page is the cost comparison for the two designs.

Comparing Two Different Land Plans

PROJECTED RESULTS FROM TOTAL DEVELOPMENT		
Total Site	**Conventional Plan**	**Revised (Green) Plan**
Lot Yield	358	375
Linear Feet - Street	21,770	21,125
Linear Feet–Collector Street	7,360	0
Linear Feet-Drainage Pipe	10,098	6,733
Drainage Sections: Inlets, Boxes, Headwalls	103	79
Estimated Total Cost	$ 4,620,600	$ 3,942,100
Estimated Cost Per Lot	**$ 12,907**	**$ 10,512**

ACTUAL RESULTS FROM PHASE ONE		
	Conventional Plan (Engineer's Estimated Figures)	**Revised (Green) Plan** (Actual Figures)
Lot Yield	63	72
Total Cost	$ 1,028,544	$ 828,523
Total Cost Per Lot	**$ 16,326**	**$ 11,507**

ECONOMIC AND OTHER BENEFITS FROM LOW IMPACT DEVELOPMENT	
Higher Lot Yield	17 additional lots
Higher Lot Value	$ 3,000 more per lot over competition
Lower cost per lot	$ 4,800 less cost per lot
Enhanced marketability	80 percent of lots were sold in the first year
Added amenities	23.5 acres of green space/parks
Recognition	National, state, and professional groups

TOTAL ECONOMIC BENEFIT: MORE THAN $ 2,200,000 ADDITIONAL PROFIT

(NAHB Land Development Magazine, "Bridging the gap: Developers can see green", Spring/Summer 2000, pp. 27-31.)

2.3 Connect Amenities within the Development and/or Provide a Pedestrian/Bicycle Pathway to Existing External Amenities

Intent

Developers can help reduce vehicle miles traveled by providing access to available services within walking/cycling distance and opportunities for employment and recreation. When available, neighborhoods can be connected to regional transit service and mesh logically with larger land use patterns.

Considerations And Examples

- Use open spaces, parks, and other community amenities to link various entities within the community to one another as well as to other communities.
- Consider developing parks and land uses for the benefit of the overall community as a way to market a development.
- Provide pedestrian/bicycle access to facilities such as recreation centers, pools, and schools.
- A low-cost approach for future amenities, such as planned bus or rail service, is to provide access easements for future paths/sidewalk construction.

Cost Implications

- Locating amenities within or close to a development can translate into higher property values, less time consumed in commuting, reduced dependence on the automobile, and reduced fuel costs. However, these features must be balanced against their initial cost.
- Typically, providing paths or other access to existing amenities can be done in an economic manner if it is part of an overall plan for moving people to desired locations.

2.4 Create a Mixed-Use Development

Intent

A mixed-use development provides more than one use or purpose within the development area, which encourages less reliance on automobile trips. Gathering places and activity centers designed to accommodate civic and commercial functions encourage both social interaction and a sense of community. A mixed-use development with a variety of land uses and neighborhood gathering places and/or village centers within proximity to each other can minimize automobile trips, encourage walking, and increase social and economic vitality.

Considerations And Examples

- Potential uses for the community include single-family, owner-occupied housing; multifamily housing; rental housing; retail outlets; business enterprises; recreation centers and facilities; and educational and cultural establishments.
- In the Home Builders Association of Metropolitan Denver *Built Green™ Communities* Program, points are awarded to a developer that provides amenities that are located close to homes.
- Community-owned space within the development can provide some or all of the following features:
    - A place for community meetings and social events within the development
    - Play areas
    - A common laundry room
    - Office space
    - A community library or media room
    - A community swimming pool, tennis courts, exercise room or fitness course
    - Community tennis courts
- Provide commercial facilities that promote community interaction within the development, including any of the following:
    - A neighborhood coffee house or small restaurant
    - Small office spaces for rent to resident businesses
    - A daycare facility

Cost Implications

- Mixed-use developments may be more marketable in that you are helping reduce the amount of time residents have to spend on the road for their shopping or recreation trips.

2.5 Optimize Lot Placement via Clustering

Intent

Decrease the total amount of developed property per development by clustering homes on smaller lots in exchange for more open space.

Considerations And Examples

- Develop land at a higher density and with clusters that preserve open space and sensitive natural areas.
- Cluster development to emphasize common space, open space to be used for recreation, visual aesthetics, and natural and wildlife habitats.
- Cluster housing a safe distance away from water bodies to reduce runoff pollution and to protect watersheds.
- Cluster homes on smaller lots in exchange for more public space.
- Reduced lot sizes will result in reduced maintenance for homeowners.

Cost Implications

- Clustering homes can reduce infrastructure costs. Fewer feet of pipe and cable need to be run with clustered homes.

2.6 Optimize Solar Exposure and Passive Solar Heating through Appropriate Lot Orientation

Intent

Buildings and units should be oriented to make the best use of passive solar heating in appropriate climates. Encourage development solutions that use street, lot, and home designs to maximize passive solar exposure, collection, and use.

Considerations And Examples

- Promote energy conservation by maximizing solar exposure through access and building orientation
- Build first on the north area of a lot, retaining the south area for outdoor activities.
- Orient over 50 percent of lots to take advantage of passive solar heating. With the appropriate orientation determined for maximizing solar benefits, design the street layout to capitalize on passive solar energy.
- Install properly sized and angled overhangs on housing units to limit solar gain during summer, while still capturing passive solar heat during winter.
- Use natural daylight to reduce energy consumption for lighting.
- Overhangs, seasonal shading (trees), low-E windows, and window coverings can all be used to minimize solar gain during summer and maximize passive solar heating and lighting during other seasons.

Cost Implications

- Reduced energy costs for homebuyers.

2.7 Preserve Trees and Other Natural Resources

Intent

To preserve and protect wetlands, shorelines, bluffs, and other critical areas during construction, portions of a site's natural vegetation may be left undisturbed. Trees, bushes, natural turf and wetlands act as a natural method of erosion and stormwater control, help shelter homes from the elements (e.g., extremes of weather, wind, precipitation), and enhance a site's aesthetic value. All of these benefits add value to lots and to the community as a whole.

NATURAL RESOURCE PRESERVATION

Erosion prevention and natural resource preservation help minimize the loss of essential land through runoff and construction. They also connect existing wildlife corridors within areas of new development.

Considerations And Examples

- Create a preservation program to save valuable trees and native vegetation. Protect trees during construction, particularly the root zone and tree dripline.
- Employ sensitive site grading practices, such as:
  - Creating terraces or forms that step with the existing slope
  - Following natural topography with roads, driveways, and on the lots themselves
  - Using retaining walls to protect sensitive areas
- Preserve existing native vegetation as landscaping.
- Integrate wetlands and landscape areas to promote infiltration of stormwater runoff.
- Enhance/create nonrequired wetlands.
- Create sediment traps in detention ponds to clarify water.
- Create natural alternative to conventional stormwater detention.
- Provide wildlife corridors. Set aside as much habitat as feasible, including a buffer zone or setbacks from high-use areas such as roadways.
- Phase construction activity to prevent adverse impacts on adjacent properties.
- Use compost to stabilize disturbed slopes.
- Grind land-cleared wood and stumps for reuse on construction site. Used wisely, mulch can renew the soil by improving water and nutrient retention.
- Replant or donate removed vegetation.

Cost Implications

- It may cost more in labor time in designating the natural resources to protect and in rerouting equipment to meet your goals. However, lots and communities that contain such amenities often sell at a premium compared to developments that do not preserve natural resources.

Streets and Parking Principles

3.1 Reduce Street Widths and Lengths

Intent

Reducing the width and length of residential streets accomplishes two primary functions. First, it decreases the amount of impervious surface associated with development. By reducing the amount of pavement, the developer helps decrease the volume of stormwater runoff and allows more stormwater to recharge local aquifers. Second, wider streets encourage higher vehicle speeds. In a study of over 5,000 pedestrian and bicycle crashes, a narrow roadway was a factor in only two cases. Thus, reducing street widths can help improve pedestrian and cyclist safety.

STREET DESIGN

Street design relates to how streets are incorporated into the surrounding environment, what materials are used to construct streets, and how automobiles, bicyclists, and pedestrians use streets.

Considerations And Examples

- Use the minimum amount of pavement needed for travel lanes, on-street parking, and emergency and service vehicle access.
- 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 of a street. Street patterns that reduce both congestion and vehicle trips should also be considered.
- Provide narrower, slower-speed local streets. New guidelines from the Institute of Transportation argue for streets no wider than the minimum width needed to accommodate the "typical and usual vehicular mix"(e.g., garbage trucks, postal service trucks). Residential streets should be built at widths dependent on their function and hierarchy in the community street system.
- Several U.S. communities have implemented narrower street widths. For instance, Boulder, Colorado, reduced street widths to 20 to 26 feet, depending on traffic volume. The state of New Jersey allows 20-foot widths (no parking lanes) to 28-foot widths (parking on one side) for residential streets with a maximum average daily traffic flow of up to 3,500 trips.
- Reduce on-street parking. Housing density and the need for on-street parking help determine whether on-street parking should be allowed on both sides of the street, one side, or not at all (CWP).
- Connect to surrounding street network at 660- to 800-foot intervals. Such a measure reduces traffic congestion within and around neighborhoods and provides easier, safer routes for pedestrians and cyclists.
- Work with the site's topography to design the street layout. Adapt the street layout to natural contours to minimize excavation and expense.
- Maximize the number of homes with direct access to main streets.

Cost Implications

- Reduced street lengths and widths permit a reduction in paved area, runs of cable and pipe for utilities, and the amount of storm sewer/curb and gutter or open channel construction. Each linear foot of street costs approximately $150; therefore, an overall reduction of 100 feet of road length yields a savings of $15,000 (CWP).
- Reduction of impervious area and thus storm water runoff may decrease cost of storm water management facilities.
- Reduced infrastructure maintenance costs will be realized.

3.2 Eliminate/Reduce Curbs and Gutters

Intent

Many developments are required to install curb-and-gutter systems that move the stormwater, such as sheetflow runoff, to a system of pipes that in turn discharges the untreated water into nearby streams. For those developments not governed by such requirements, eliminate or reduce the use of curb and gutter. This will minimize stormwater's impact on the local stormwater management system, improve the filtering of pollutants from the stormwater, and help recharge the local groundwater system.

Considerations And Examples

- If curbs are eliminated on heavily-traveled streets, consider incorporating grass strips with planted trees between the street and any installed sidewalk. Mixed-use, high-density developments may particularly need a separation of this type. Consider the short-term and long-term context of the development if it is likely to change.
- Consider providing tree-lined planting strips along curbs to capture as much sheetflow runoff from streets and driveways as possible.
- Roadside swales can be used in place of curb and gutter systems to collect runoff, reduce downstream erosion and sedimentation, and improve the quality of storm water runoff.
- Cars are not more likely to hit pedestrians in the absence of curbing. In a Federal Highway Administration study of pedestrian and car crashes, only 0.2 percent of crashes were associated with low soft shoulders.
- If curbs are needed, use a small rising lip near facilities or curb cuts to allow runoff to enter retention areas or filters. Multiple curb cuts have a similar effect on runoff to having no curbs or gutters.

Cost Implications

- A curb and gutter system is typically two to three times more expensive ($40 to $50 per running foot) than an engineered swale.
- Stormwater management carried out at the source decreases downstream requirements for larger stormwater management facilities.
- The primary expenses for stormwater management are land acquisition, construction, and maintenance. Limiting stormwater management to already landscaped areas and setbacks could reduce other acquisition costs.

3.3 Ensure Sidewalk Placement Meshes with Overall Development Design

Intent

Sidewalks should be placed in parts of the development where people are likely to use them. For instance, a sidewalk may be needed from a cluster of homes, through a common area, or to a bus stop located on another block. The overall goal is to optimize the amount of paths or sidewalks in the development to minimize the amount of impervious surface while still making the development easy to use for pedestrians. For instance, urban, high-density developments often have sidewalks on both sides of the street, but due to the amount and frequency of pedestrian traffic in some suburban developments, some streets used infrequently by pedestrians may warrant a sidewalk on only one side of the street or pathways can be placed through common areas to link local streets.

Considerations And Examples

- Mixed-use, high-density developments can effectively use sidewalks to link the development to adjacent communities, recreation, and shopping areas.
- In the development planning and design phase, identify locations in and adjacent to the development that would benefit from a sidewalk linking it to a large group of homes.
- Each street should permit pedestrian movement without introducing conflicts with automobile traffic.
- Consider both the short-term and long-term context of the development. The developer should take into account the development's long-term "walkability" during the design and construction phases. For instance, if adjacent land is zoned "commercial," it will most likely have amenities to which residents of the development would like to walk. Installing a sidewalk or dedicating an easement for a path that connects the development to outside areas will help facilitate pedestrian movement in the long-term.
- Consider using permeable materials and/or narrower sidewalks.

Cost Implications

- Reduced material costs due to fewer linear feet of sidewalk constructed.
- Lower long-term maintenance costs.

3.4 Reduce Parking Areas and Requirements

Intent

The main goal is to reduce stormwater and stormwater pollutant runoff. Pollutants can be attributed to a vehicle's tire wear, emissions, and fluid leaks. Pollutants deposited onto parking lots, which usually consist of totally impervious surfaces, will be washed away with stormwater runoff. Often overlooked is the provision of stormwater management control and minimization of runoff. When designing on-street and off-street parking, optimize the number of spaces needed through shared parking and minimize driveway length to help reduce the amount of impervious surface.

Considerations And Examples

- Time sharing of spaces, overlapping use of paved parking areas (parking and basketball court).
- Parking located at the rear of buildings helps maintain a relationship between building scale and sidewalks.
- To address the issue of parking or reduced parking, consider local trends in vehicle ownership.
- Consider rear access to garage or house via an alleyway.
- Provide for on-street guest parking rather than open-lot parking. Determine if code permits on-street parking to count toward required parking.
- Provide shared parking. Provide a central lot for residents' recreational vehicles, boats, and other vehicles used infrequently. For businesses within a mixed-use community, shared lots and employee parking located behind buildings avoid the need for a large parking area in front of a business.
- Structured parking reduces the total footprint of a parking area.
- Reduce minimum parking requirements, allowing for construction of smaller parking lots.
- Use pervious materials if spillover parking areas are needed. Ensure that accessibility and climatic conditions are taken into account when selecting paving material. Conventional paving material should be used in handicapped parking areas and on public pathways.

Cost Implications

- Lower long-term maintenance/repair costs.
- Reduced material costs when using fewer amounts of impervious material.

3.5 Use Alternative Street, Driveway, Walkway, and Parking Surfaces

Intent

To reduce runoff in parking areas and on pathways, use paving materials that are permeable or have permeable characteristics.

Considerations And Examples

- Use porous pavements such as pervious asphalt, concrete, or open paver blocks that allow rainfall to infiltrate into substrate.
- Consider providing unpaved trails for recreational use.

Cost Implications

- Increased maintenance and upfront costs.
- Permeable paving materials may require additional maintenance. For instance, they may need to be replaced more often in areas where climate requires the use of snowplows. Snowplows have a tendency to tear apart permeable pavers.
- According to CWP, construction costs for pervious pavements are greater than for conventional pavement. However, with pervious surfaces comes a reduced need for other stormwater facilities, which may help offset the cost difference.

Permeable Pavement Costs (Source: CWP)

Product	Manufacturer	Cost (per square foot)*
Asphalt	Numerous	$ 0.50 – $1.00
Geoweb	Presto Products, Inc.	$1.00 – $2.00
Grasspave™, Gravelpave™	Invisible Structures, Inc.	$1.00 – $2.00
GRASSY™ PAVERS	RK Manufacturing	$1.00 – $2.00
Geoblock	Presto Products	$2.00 – $3.00
Turfstone	Westcon Pavers	$2.00 – $3.00
UNI Eco-Stone	Concrete Paving Stones	$2.00 – $3.00
Checkerblock	Hastings Pavement Co.	$3.00 – $4.00
Grasscrete	Bomanite Corp.	$3.00 – $4.00

* Includes material cost, typical shipping, and installation on a fully prepared base course. Does not include cost of gravel, labor, or soil and grass fill. These costs add approximately $0.10 to $0.25 per square foot.

Paving Material Comparisons (Source: CWP)

Material	Initial Cost	Maintenance Cost	Water Quality Effectiveness*
Conventional Asphalt / Concrete	Medium	Low	Low
Cobbles	Low	Medium	Medium
Concrete Unit Pavers	Medium	Medium	Medium
Brick	High	Medium	Medium
Natural Stone	High	Medium	Medium
Gravel	Low	Medium	High
Wood Mulch	Low	Medium	High
Turf Block	Medium	High	High
Pervious Concrete	High	High	High
Porous Asphalt	High	High	High

* Relative effectiveness in meeting stormwater quality goals.

3.6 Use Alternatives to Large-Diameter Cul-de-Sacs

Intent

A cul-de-sac is a street in the shape of a large "bulb"; it is open at one end but wide enough to allow emergency and service vehicles to turn around. With a typical radius of 50 to 60 feet, a cul-de-sac takes the form of a large circle of impervious surface that is rarely ever fully used. Limit the size or use of cul-de-sacs; if an "end-of-road" look is needed, alternatives to a conventional cul-de-sac should be considered.

Considerations And Examples

- Vehicles Minimize the use of conventional cul-de-sacs by using alternative turnaround street designs. A "T-"shaped turnaround (hammerhead) creates less impervious cover than a traditional cul-de-sac.
- Develop smaller-radii cul-de-sac turnarounds with a 35 to 38-foot turning radius with approval of fire department. Reducing the radius by a few feet can greatly decrease impervious cover.
- Consider short interconnected streets with direct routes and loops instead of cul-de-sacs (Wilmington-Middletown, Delaware).
- Typically travel on the outside of a cul-de-sac; therefore, consider a pervious island in the center of the turn. The island in the middle of the cul-de-sac can be landscaped and designed to store and treat stormwater, ice and snow, and pollutant runoff. Small shrubs and groundcover can be used on the island.
- Consider loop roads; create a road that joins another road at each end and has two points of entry and exit, allowing for multiple access for emergency vehicles.

Cost Implications

- Reduced materials result in reduced construction costs.

Stormwater Management Principles

4.1 Use Swales and Grassy Channels in Place of Curbs and Gutters

Intent

Minimize stormwater's impact on the local stormwater management system and improve the filtering of pollutants from stormwater. Stormwater collects materials such as oil, grease, salt, sand, and tire and brake pad particles and carries them away as the water flows along the ground. Using features such as swales, ditches, or depressions to convey surface water helps reduce runoff velocities, reduces stream erosion, enhances clarification, and removes pollutants from the water.

STORMWATER MANAGEMENT

Stormwater management relates to the movement of stormwater runoff through the built environment. Green land development encourages the use of natural features and/or environmentally friendly concepts to reduce flooding and waste.

Considerations And Examples

- Swales are engineered grass channels that provide full treatment of stormwater and pollutants. Runoff proceeds to the swale from impervious surfaces like roads and driveways, with some of the sediment load deposited as the water flows through the turf. Movement of the water through the sandy loam further removes pollutants from the runoff.
- Swales increase the filtration of pollutants from stormwater runoff. They also help to separate sidewalks from automobile travel lanes and protect pedestrian movement, thus encourage walking.
- Integrate landscape areas to promote infiltration of stormwater runoff.
- Provide tree-lined planting strips. A planting strip along the curb provides pedestrians with additional buffering from street traffic.

Cost Implications

- Swales cost less than paved channels, pipes, or curb and gutter.
- Low maintenance costs.
- Stormwater management carried out at the source decreases the requirements for larger downstream stormwater management facilities. The primary expenses for stormwater management are land acquisition, construction, and maintenance. Limiting stormwater management to already landscaped areas and setbacks could reduce other acquisition costs.
- Stormwater management requirements are reduced, and less stringent quality controls can be used.
- Some stormwater management facilities can reduce the need for storm sewers, in turn reducing other stormwater infrastructure costs.

4.2 Incorporate Bioretention, Infiltration, and Retention/Detention Ponds into Development Design

Intent

Provide a place in which stormwater can settle and slowly drain back into the earth's surface.

Considerations And Examples

- Bioretention calls for integrating stormwater management practices directly into the landscape areas by locating planting strips within parking areas. The strips are shallow landscaped areas or beds that provide temporary detention. The beds filter the runoff, which then infiltrates the subsurface or collects in underdrain pipes for discharge into a second facility or stream. Bioretention encourages stormwater treatment at the source before pollutants enter the stream. Other advantages include enhanced groundwater recharge, parking areas' enhanced aesthetics, and reduced runoff velocities into waterways.
- Bioretention facilities are an integral part of the Prince George's County, Maryland, strategy for development. The county promotes the use of the facilities in commercial, industrial, and residential development to encourage low-impact development that minimizes the expanse of impervious surface. To encourage developers to use bioretention, the county provides incentives such as reduced stormwater management requirements and mitigation credits for environmental impact.
- Use small permanent check dams and level spreaders. A check dam is a constructed across a drainage ditch, swale, or channel to lower the speed of runoff flows. A level spreader is a drainage outlet constructed by cutting a shallow trench at zero grade across a slope to disperse concentrated runoff. Level spreaders convert concentrated flow into sheet flow for discharge onto areas stabilized by vegetation. By reducing runoff velocity check dams and level spreaders help reduce erosion, enable sediment to settle out, and enhance infiltration.
- Use infiltration trenches, or stone-filled reservoirs, to remove pollutants from stormwater as runoff flows downward through the soils beneath the reservoirs. Compared with bioretention, infiltration trenches require greater care in design, maintenance, and operation.
- Bioretention translates into extra areas for snow storage and little engineering design relative to other systems.
- Parking lot stormwater management can be addressed with bioretention, dry swales, perimeter sand filters, and filter strips.

Cost Implications

- Minimal costs are associated with bioretention's low-engineered techniques.
- May require more landscaping but could be offset by lower stormwater management costs elsewhere.
- Low maintenance costs.

4.3 Capture Sheetflow off Paved Areas

Intent

Sheetflow off a paved surface is preferred to a concentrated stream of water moving offsite. However, the carrying capacity of the earth adjacent to a paved area often cannot hold the volume of sheetflow running off the paved area. Thus, the stormwater is wasted instead of used as a natural resource that recharges the local aquifer.

Considerations And Examples

- Provide tree-lined planting strips along curbs to capture as much sheetflow runoff as possible.
- Perimeter sand filters are engineered at the source of pollution and runoff and located underground along the downstream side of parking lots, consuming little usable land. Runoff flows into a graded sedimentation chamber that traps coarse sediments. The runoff spreads over the filter bed, and pollutants are captured as runoff flows through the filter. Treated runoff collects at the bottom and is returned to the storm sewer or stream.
- Filter strips rely on vegetation to decrease the speed of runoff, filtering out sediments and other pollutants. They are most effective in sheetflow conditions and require a significant amount of land that is equivalent to 100 percent of the impervious drainage area. Thus, strips are recommended for small parking lots or sections of parking lots and are best suited to areas adjacent to stream buffers or open space.
- Install vegetative buffers on the downstream side of parking lots. Vegetative buffers should be at least four feet wide and planted with grass and other plants; (plants should reach a 30-inch maximum height).

Cost Implications

- Minimal costs are associated with these low-engineered techniques.

4.4 Use Porous Pavements and Other Pervious Materials to Help Recharge the Water Table

See Section 3: Streets and Parking Principles for details.

Landscaping and Grading Principles

5.1 Use Sensible Landscaping Techniques (e.g., Xeriscaping)

Intent

By using orientation techniques as well as landforms that create buffers and microclimates, the landscape itself can contribute to energy conservation and water savings.

SENSIBLE LANDSCAPING

Concepts relating to water-wise and native landscaping promote the planting and retention of landscaping that reduces overall water use and improves the vitality, livability, and integration of a community or development into the natural landscape or environment.

Considerations And Examples

- Xeriscape principles include:
  - Improve the soil (mix in organic material)
  - Select appropriate turf areas
  - Use native/drought-tolerant grasses
  - Use mulches
  - Install efficient irrigation
  - Group plants according to moisture and sunlight needs
  - Provide maintenance guidelines
- Use nonpotable water for common area irrigation.

Cost Implications

- Implementation of the above considerations can reduce water needs and lead to only minimal, if any, increases in developer costs. The primary cost increase is associated with the longer design time.

5.2 Use and/or Create Wind Breaks to Reduce the Development's Overall Energy Needs

Intent

Trees and shrubs can greatly reduce a homeowner's heating or cooling requirements. The developer should identify healthy trees and shrubs and denote which ones should be left undisturbed to help shade and protect the homes planned for a site.

Considerations And Examples

- Implement landscaping techniques for energy conservation (e.g., evergreen trees for wind and snow breaks to reduce heating costs; deciduous trees for summer shading to reduce cooling needs/costs; vegetation and tree planting that encourages channeling of breezes for summer cooling; and the use of insulating shrubs and vines).

Cost Implications

- Evergreen wind and snow breaks reduce heating costs.
- Deciduous tree canopies provide shade that reduces cooling costs.
- May require higher initial landscaping costs.

5.3 Use/Plant Street Trees in Urban Areas

Intent

A planting strip along the curb offers pedestrians additional buffering from street traffic. In addition, such trees also help capture stormwater runoff, allowing it to filter into the ground.

Considerations And Examples

- Provide tree-lined planting strips and allow for regular tree maintenance.
- Landscaping consists of groundcover, a mix of trees, and high and low shrubs and is required in building and street setbacks, typically five to ten feet in width (Portland, Oregon).

Cost Implications

- Evergreen wind and snow breaks can help reduce residents' heating costs.
- Increased initial landscaping costs and maintenance costs.

5.4 Preserve Trees and Other Natural Resources

Intent

Developers can preserve native trees and other plantings without significantly increasing costs. Preserving existing trees and plants help preserve topsoil and shades/shields homes from the weather elements (i.e., wind and sun).

Considerations And Examples

- Preserving existing trees adds value to properties, making homes easier to sell at a premium price.
- Preserve portions of lowlands and areas with mature vegetated soils. Use geological survey information and ecologists to help identify areas with mature vegetated soils. Vegetated areas and lowlands help manage stormwater runoff by providing natural storage areas.
- Balance cut-and-fill work while maintaining a site's original topography.
- During the site design phase of the project, a developer should have a certified arborist or landscape architect assess the property for tree health and value, making decisions on which trees to retain or remove. Once a plan is made, all trees tagged to remain should be fenced, and those designated for removal should be cut down.
- When the homes are being built, the developer and builders should constantly communicate with subcontractors, reminding them not to store heavy materials and equipment near trees.

Cost Implications

- Creating nontraditional neighborhood layouts that utilize islands of natural areas, wetlands or stands of trees can reduce infrastructure costs for roads and sidewalks.

5.5 Limit Turf Areas

Intent

Decrease the use of turf grass and substitute other forms of landscaping to promote the "right plant/right place" concept to reduce water consumption.

Considerations And Examples

- Mulch landscape beds with two-inch organic mulch.
- Limit use of turf grass within landscaped areas.
- Replace large turf areas with planted beds and pervious materials. Large turf areas require more irrigation and maintenance than beds of well-adapted plants.
- Preserve as much "natural" area as possible.

Cost Implications

- Reduced maintenance costs for the homebuyer.
- Reduced initial landscaping costs when land is left in its natural state.

5.6 Use/Preserve Native Plant Species

Intent

Incorporate native plant materials into common areas to help restore pre-existing ecosystems and to help re-establish a healthy and diverse ecology that limits the need for artificial alternation, enhancement, and irrigation. Eliminate or reduce irrigation using potable drinking water.

Considerations And Examples

- Landscape with plants appropriate for a site's topography, climate, and soil type; adopt the "right plant/right place" approach.
- Replant removed vegetation for reuse.
- Use grass types requiring less irrigation and maintenance.
- Minimize common area irrigation systems and use drip irrigation systems.
- Reduce lawn size.

Cost Implications

- Reduced maintenance costs for the homebuyer.

5.7 Use Soils with Increased Organic Materials and Reuse Topsoil

Intent

Use soils with higher levels of organic materials to allow for greater infiltration and moisture content. The goal is to integrate organic materials into the soil that is excavated during site development in order to create a mixture that will allow for greater filtration. In addition, reuse nutrient-rich topsoil to reduce erosion and save landfill costs.

Considerations And Examples

- Protect topsoil with mulch or plastic.
- Improve the soil and save and reuse topsoil.
- Remove/replace topsoil in all disturbed areas (house pad and street excluded).
- Encourage use of compost soil with turf and other vegetation, reducing the need for irrigation, fertilizer, and other chemicals.
- Limit soil compaction by creating movement zones for areas of heavy movement or heavy machinery to limit soil compaction. It is more difficult for water to infiltrate compacted soil.
- Grind land-cleared wood and stumps for reuse on the construction site. Used wisely, mulch can renew the soil by improving water and nutrient retention.

Cost Implications

- Reduced waste results in decreased landfill tipping fees.

5.8 Grade the Site So That Slopes Follow Natural Contours as Much as Possible

Intent

Conserve natural and existing hydrologic patterns and develop for most efficient use of resources.

Considerations And Examples

- Create architecture and build with foundations that "step" with existing slopes by incorporating walk-out basements, tuck-under garages, and garden-level units.
- Employ sensitive site grading practices such as the following:
  - Creating forms that step with the existing slope
  - Designing roads to follow natural topography
  - Using retaining walls to protect sensitive areas
  - Developing parcel grading solutions to create smaller terraces
- Balance cut-and-fill work while maintaining a site's original topography.
- Follow natural topography in the development of lots and sites, avoiding cut and fill as much as possible.
- Use retaining walls to protect important site features and sensitive areas.
- Develop grading solutions for parcels and lots to create smaller terraces instead of large, oversized "flat-pad" grading solutions.
- Clear only those areas needed for homes, roads, driveways, and so forth.
- Clearly mark on plans areas to be graded, and use field stakes or on-site flags.
- Review with excavation crews site areas to be graded. Monitor grading operations often to ensure adherence to the grading plan.

Cost Implications

- Reduced labor costs by decreasing the amount of land to be cleared. Possible increased planning costs associated with assessing the site's slope and optimizing the grading accordingly.

Wastewater Principles

6.1 Treatment of Wastewater Onsite for Small Communities

Intent

Onsite wastewater treatment systems for small communities may offer a less expensive, more environmentally benign alternative when compared to connecting a small number of homes to a municipal treatment system.

Considerations And Examples

- The viability of onsite wastewater treatment systems depends upon the site topography, depth of the water table, and soil characteristics.
- Onsite treatment takes advantage of the earth's natural capacity to process waste.
- Most onsite treatment systems require periodic maintenance.
- An example of an onsite treatment system is a septic tank and mound system, which is viable for a site with high groundwater levels or clay soils. Effluent waste from the septic tank is pumped to the top of a sand mound that has been constructed onsite. The effluent is treated as it filters down through the sand mound before infiltrating into the ground.

Cost Implications

- The cost-effectiveness of onsite treatment will weigh heavily upon the cost required to connect to a municipal system.
- Maintenance costs for onsite systems should be considered when compared to alternative approaches.

6.2 Collection of Wastewater Effluent for Offsite Treatment with Onsite Solids Collection

Intent

The use of a treatment system with both onsite and offsite components can help the developer realize savings and reduce environmental impacts by centralizing some treatment processes while conducting others at individual sites.

Considerations And Examples

- The decision to group homes together to utilize central treatment components (e.g., a central septic tank, a central pump for effluent) will depend upon the development's topography, excavation costs, and the number of houses and their proximity to each other.
- Treatment systems of this type may allow for higher density housing compared to a traditional onsite septic system because the need for absorption fields can be eliminated.
- Systems of this type will require central management and regular maintenance.
- One example of this category of system is a small rural development that slopes downhill. Each individual house is outfitted with its own septic tank to collect solids, while liquid effluent is gravity-fed through low-pressure, small diameter pipes to a centralized pump station located downhill. Houses below the sewer line elevation use auxiliary effluent pumps to rout their effluent to the low-pressure sewer line. At the centralized pump station the community effluent is pumped to a main sewer line which feeds into a treatment system.

Cost Implications

- The cost-effectiveness of this approach depends on several factors, including the cost to rout all waste to a municipal system, the added revenue that could result from higher density housing in the development, and the maintenance and management costs.

Site Selection Principles

7.1 Place a New Development in Existing Service and Infrastructure Areas

Intent

Building and construction on infill lots takes advantage of existing infrastructure and reduces the development of virgin sites (i.e., greenfields). Such development is often located near transportation systems and commercial amenities. Trips are shorter and lend themselves to walking, cycling, or using public transportation. People, especially children and the elderly, enjoy enhanced mobility, resulting in fewer vehicle miles traveled for necessities.

SITE SELECTION

Infill development helps preserve open space, reduce vehicle miles traveled, and limit the need to extend existing lines of infrastructure. In-fill developments help reduce "leap-frogging" development patterns and encourage the systematic extension of essential infrastructure. Such developments also encourage the use of vacant or dilapidated land in a development or city.

Considerations And Examples

- Locate new developments within planned service and infrastructure areas (e.g., water, wastewater, electricity, streets, public transportation, and schools).
- Locate new developments adjacent to existing population and business centers already served by community services and facilities. In addition, locate near existing open space or parks.
- Develop an infill subdivision. "Smart growth" development encourages people to live where expensive public services already exist rather than creating new demand at the edges of an urban area.

Cost Implications

- Locating within an area with access to urban services leads to greater efficiency, i.e., more people share the same sewer and water lines, roads, emergency services, and schools, resulting in lower per capita infrastructure costs.

7.2 Conduct a Site-Suitability Analysis

Intent

It may be worthwhile to consider the environmental impacts of development on various parcels of land if the developer has not already chosen a site on which to build. To balance market demands against site capacity, consider existing topography, soil, hydrology, microclimates, vegetation, wetlands, habitat, wildlife, and agricultural value.

Considerations And Examples

- Determine the community character and quality of life in adjacent neighborhoods.
- Consider the land's potential in terms of solar orientation, natural drainage, vegetation, winds, and other elements.
- Consider the ability to preserve wildlife corridors in conjunction with the development of pedestrian linkages.

Cost Implications

- Locating a neighborhood that is rich and diverse in natural resources (e.g., lakes, streams, trees) often results in higher property values when compared with similarly sized developments lacking such natural amenities.
- Locating a neighborhood near existing commercial and business centers leads to higher property values. People do not have to travel far for employment and basic needs.

7.3 Remediate Abandoned or Brownfield Properties Instead of Developing Open Space

Intent

This can be considered a subset of "infill development." Reclaim and repair blighted and abandoned areas within existing neighborhoods by using an infill strategy that conserves the previous economic investment and social fabric. That is, attempt to take advantage of changes in land use/economics, often with government subsidies. Preserve the quality and character of existing and historic buildings. Use brownfield remediation policies and techniques to reduce the need for development on greenfields.

Considerations And Examples

- Use infill and redevelopment strategies to reduce new impervious coverage.
- Use local, state, and even federal incentives for cleaning up potential contaminants.
- Take advantage of adaptive use strategies to preserve historic value and a sense of place.
- Expect a lengthy development approval process because of the need to coordinate the actions of a greater number of city and metropolitan agencies when compared to development in the suburbs. For instance, Historical Preservation officials may be involved in the development process in older cities that have maintained their historic districts.

Cost Implications

- If a site requires no remediation, a brownfield property can prove lucrative for a developer because it takes advantage of existing infrastructure and nearby business centers.
- Longer time frames that sometimes accompany brownfield development can tie up cash for longer periods than for other types of development.

Other Green Land Development Principles

8.1 Educate Homeowners on Transportation Options Such As Transit and Ridesharing

Intent

Some organizations believe that traffic levels can be reduced with higher vehicle occupancy levels. Car- and van-pooling programs can increase the number of persons per vehicle and reduce the number of cars on the road.

HOMEOWNER EDUCATION

Once the developer has created a resource-efficient community, the products, space, and amenities provided to the homeowners must be used optimally. To that end, homeowner education packets should be created to help residents establish a resource-efficient community for the long-term.

Considerations And Examples

- Educate residents on ways to organize their travel more efficiently by, for example, combining trips or carpooling.
- Provide information to residents explaining how mixed-use developments can reduce time in traffic.
- Highlight elements in the development's design, such as commuter parking areas, that facilitate the use of public transit.
- Educate homebuyers on the benefits of purchasing homes that are located near public transit/bus stops.

Cost Implications

- Cost of printing educational materials or providing education sessions.

8.2 Involve Public in Site Development Process

Intent

Integrate environmental issues into the public involvement process. Involve the public at all levels, including residents, adjacent neighbors, politicians, developers, community facility managers, and other institutions, in the planning process. Reduce differences between groups and neighbors to spur efficient and effective revitalization and development.

Considerations And Examples

- Conduct a workshop to gather ideas, concepts, and insights into longstanding problems and issues for an area.
- Conduct a workshop that tests alternative designs through models and drawings.
- Valley Green/Sky Tower Redevelopment Project, 314 new units of mixed-income housing for both rental and ownership. Work replaces traditional public housing. (Washington, D.C.).
- It has been suggested that disjointed projects contribute to community mistrust; thus, a cohesive and community-driven vision leads to long-term revitalization. In addition, by including stakeholders in the early stages of the development process, developers are apt to streamline the process. Empowering the stakeholders makes it less likely that they will delay the project later in the process.

Cost Implications

- Possibility of longer project approval time line.

8.3 Educate Municipalities and Homeowners on Green Land Development

Intent

To continue the resource efficiency of the development once the developer leaves the site.

Considerations And Examples

- Establish community involvement through education of residents about the development's achievements, what is expected of residents to ensure that the development retains its green focus, and how to create social initiatives to support the project and its principles.
- An explicit plan of resource-conserving goals accompanied by an implementation plan for how the community will meet its goals and create a self-sustaining program.
- Homeowner guidebook to efficient operation of home, with list of additional resources.
- Seminar or seminar series for each new family to explain efficient operation of home and the lot, and other programs to reduce resource use.
- Ongoing series of open-space habitat restoration programs.
- Community events/festivals/performances that help educate children and adults about the community's environmental mission.
- Environmental award program.
- Neighborhood information kiosk and signage to promote green initiatives (e.g., opportunities to exchange used appliances, cars; flea market/community garage sale; baby-sitter cooperative, and so forth).
- Produce a community newsletter.
- Establish and sponsor community meetings.
- Establish and maintain an Internet community communication/ education link.
- Establish ongoing education and awareness with community signage.
- Provide signage highlighting the development's environmental features.

Cost Implications

- Cost of printing educational materials or providing education sessions.

8.4 Educate Public on Wise Water Use and Resource-Efficient Lawn Care

Intent

Provide information on alternatives to chemicals, pesticides, and fertilizers for lawn and garden care in order to decrease pollution use and runoff and nutrient runoff.

Considerations And Examples

- Provide list of native and pest- and disease-resistant plants for consideration. Native plants often do not need additional fertilizer.
- Provide information about operation and maintenance of irrigation equipment to optimize their use.
- Provide information on the most resource-efficient methods to care for lawns and landscaping. Information would include items like when to water, mulching lawn mowers, and alternatives to chemical agents.
- Clearly label all storm sewer inlets. A visual reminder that storm sewer inlets lead to area waterways can help educate the community. For example, a simple stencil can read, "Caution–leads to stream!" In addition, develop an accompanying educational brochure to help residents understand the problems with dumping items like waste oil and antifreeze down the drains.
- Provide residents with a green building occupant's manual to help them understand the green benefits of their home.
- Provide homebuyers with a list of drought-resistant plants for arid or drought-prone areas.

Cost Implications

- Cost of printing educational materials or providing education sessions.

8.5 Promote green homes to lot buyers

Intent

The NAHB Research Center's *Guide to Developing Green Builder Programs* provides a wealth of information on the various aspects of green building. In addition, there are numerous local green building programs that have been developed by HBAs. This principle's goal is to not only make the land development aspects of the community "green," but to also make the homes that are on the land green as well.

Each house should direct roof-top runoff to pervious areas such as yards, open channels, or vegetated areas to minimize erosion, the amount of topsoil nutrients carried away, and the flow of runoff onto roadways and into stormwater systems. The availability and use of recycled-content building materials in turn conserves the use of natural resources. Reduced setbacks minimize yard and grass area as well as total road length and reduce a lot's impervious area. Incorporate plumbing in the house design that takes advantage of available greywater and roof-top runoff for irrigation use.

SITE GRADING AND SITE DESIGN

This section encourages waste minimization on the job site and preservation of on-site natural resources. Reducing setback requirements allows for minimizing driveway length and limiting overall development imperviousness. Reducing lot sizes and lot lines decreases lawn area and creates open space, allowing for increased groundwater infiltration and slower stormwater runoff stormwater.

Considerations And Examples

- Requiring that each home be built to "green" standards may limit the number of builders willing to build in that development.
- Each home in a Denver Built Green™ Community will be a registered Built Green™ Colorado home (Denver HBA prerequisite).
- Relax front setbacks, allow narrower frontages, and minimize driveway length to reduce total road length and site and lot impervious areas.
- Materials should be durable and require minimal maintenance. Appliances and fixtures should be energy and water efficient.
- Efficient framing techniques can be used to help reduce the amount of raw materials used and increase energy efficiency by using more insulation.
- Avoid routing roof-top runoff to roadways and stormwater conveyance systems to reduce ponding of water and ice formation on driveways and walkways and to promote localized ground water recharge.
- Driveways can be reduced in length by placing them behind units along an alley. Reduction of driveway length is a function of reducing setback requirements.
- Decrease lot size from a 40,000-square-foot minimum to a 10,000-square-foot minimum.
- Plumb housing and other development for greywater irrigation.
- Install rainwater collection system, or cistern, for reuse of water for irrigation.

Cost Implications

- Designating a development as "green" and establishing minimum building criteria may result in higher building costs. A perception of higher value will be gained as well, however.
- Typical requirements for fire protection allow detached housing to be as close as five feet from another house without fire-protection measures. If houses are fewer than five feet apart, protection is more than likely required. Such a requirement can increase construction costs; however, reduced road and driveway areas decrease material cost.
- Other "green" measures like greywater systems for water or efficient framing techniques may involve added initial costs or some savings. The long-term performance of a home implementing green features will be more efficient than a typical home.

8.6 Provide Access to and Incentives for Public Transit

Intent

Offering alternative transportation options can reduce vehicle miles, enhance air quality, and decrease infrastructure maintenance costs. It is estimated that private cars use 30 times more road space than trains or buses to move each person. Thus, the intent is to make both the existing road space and the existing public transportation network more efficient.

PUBLIC TRANSIT, AMENITIES, AND PARKING

Principles related to public transit, public amenities, and parking encourage the use of public transit by ensuring that public amenities locate along transit lines. Furthermore, the principles encourage the placement of facilities within walking distance of users or near transit lines. Parking at transit lines or centers should become a priority and should be convenient so as to encourage transit use.

Considerations And Examples

- Minimize walking distance from homes to public transit.
- Encourage new public transportation systems where existing systems are inadequate by:
    - Ensuring advanced coordination with local transport officials
    - Adding an internal bus system
    - Reserving land for future transit use
    - Creating nonmotorized, continuous, and connected open-space linkages between neighborhoods and basic services.
- Provide convenient access to transit stops.
- Provide incentives to increase public transit use and to reduce automobile dependency by:
    - Providing bicycle racks or lockers.
    - Routing bicycle/pedestrian paths to transit stations/stops.
    - Encouraging public transit groups to accommodate cyclists who want to bring their bike on the transit system.
    - Installing permanent signage for transit information and access
    - Covering transit stations/stops
- Provide a commuter lot located near major arterials or collector streets.
- Provide convenient access to transit stops.
- Provide a commuter lot near arterials or collector streets. Encouraging transit use and car pooling will help reduce vehicle miles traveled.

Cost Implications

- Time and effort to research the local public transportation options and schedules.
- Cost of creating on-site bus stops.
- Additional materials cost

APPENDIX A

Home Builder Association Green Land Development Checklists

This Appendix contains applicable elements of local HBA green building and green land development checklists. We have included only those checklist elements that pertain to green land development, and we have omitted the checklist sections that focus on making the house itself more environmentally friendly. You may contact the local HBA at the telephone numbers below if you would like a copy of their complete checklist.

- Build A Better Clark (360) 694-0933
- Evergreen Builders Guide (425) 391-4700
- Built Green (425) 451-7920

BUILD A BETTER CLARK DEVELOPER SELF-CERTIFICATION

Check items you will be including in this project to qualify your development for a *Build A Better Clark* certificate.

Requirements to Qualify (Minimum 30 Points):

- Attend a *Build A Better Clark* Program Orientation (one time only)
- Earn 15 points from Section One
- Earn 15 points from Section Two

(Note: The number of points given for each action item is noted in parentheses before its description)

Section One: Build Pedestrian/ Transit-Oriented Neighborhoods	
❑	(1) Provide proper street lighting.
❑	(1) Use fencing other than plain cyclone around detention ponds.
❑	(I) Connect to surrounding street network at 660-800 ft. intervals.
❑	(2) Provide tree-lined planting strips.
❑	(2) Provide shared parking
❑	(2) Provide narrower, slower, local streets.
❑	(2) Use traffic-calming devices, such as curb bulbs.
❑	(2) Provide for guest parking on street instead of on lot.
❑	(2) Provide convenient access to transit stops.
❑	(2) Provide a commuter lot near arterials or collector streets.
❑	(2) Preserve open space beyond required.
❑	(3) Orient over *50%* of lots for passive solar.
❑	(3) Provide crosswalks and bike lanes, paths, or routes.
❑	(3) Provide apartments and other multi-family housing.
❑	(3) Create a mixed-use (residential/commercial) development.
❑	(3) Provide attached parks or pocket parks.
❑	(3) Develop an infill subdivision.
❑	(3) Cluster homes on smaller lots in exchange for more public space.
❑	(3) Create a comprehensive “smart” development.

_____ Subtotal for Section One

Section Two: Protect Ecosystems, Conserve Natural Resources	
❑	(1-3) Preserve x% of lowlands and areas with mature vegetated soils (see text).
❑	(1) Use drought-tolerant groundcover in *50%* of all common areas.
❑	(1) Clearly label all storm sewer inlets.
❑	(1) Use infiltration basins and/or detention ponds.
❑	(1) Use small permanent check dams and level spreaders.
❑	(1) Use vegetated swales and small holding areas.
❑	(2) Grind land clearing wood and stumps for reuse on site.
❑	(2) Replant or donate removed vegetation.
❑	(2) Design for no curbs or gutters (where allowed).
❑	(2) Use planted “closes” instead of cul-de-sacs.
❑	(2) Implement storm water management beyond code.
❑	(2) Install vegetative buffers on downstream side of parking lots.
❑	(2) Provide signage highlighting development’s environmental features.
❑	(3) Phase construction so that no more than 40% of site is disturbed at a time.
❑	(3) Preserve 30% of existing native vegetation.
❑	(3) Provide wildlife corridors.
❑	(3) Construct multiple small pools and wetlands.

_____ Subtotal for Section Two

_____ **Total Points for Your Project**

Evergreen Builders Guide

Community Enhancement Checklist

One Star	★	**50 points**
Two Star	★★	**100 points**
Three Star	★★★	**150 points**
Four Star	★★★★	**200 points**

A strong sense of community and good proximity to transportation and shopping can increase the market appeal of residential real estate. Neighborhoods that include well-planned open space and amenities can result in significantly higher property values.

Neighborhood design can also impact infrastructure cost and availability, as well as affect the health and safety and level of interaction of residents with elements such as pedestrian friendly design. Communities that also include a mix of housing types, including affordable housing, will add to the diversity and vibrancy of the community. The overall goal of building a sustainable neighborhood includes providing for a thriving community that cares for and preserves the natural environment, for ourselves and future generations.

Two strategies for Community Enhancement have been identified. First, *Create Livable Neighborhoods* is a strategy that identifies the importance of social functions in new development. Measures that increase density, while at the same time maintaining public safety and preserving open space have been identified.

Many of these measures are related to the impact and use of the car. Studies have shown annual costs for owning and operating an automobile in a pedestrian friendly setting can be as much as $13,000 lower than in a car dependent suburb. Reduction of automobile trips in a community can lower demand for parking in commercial buildings ($20,000/space), and multi-family ($600/year). Including commercial space in the development allows residents to work and live in one community, also reducing travel miles and costs.

Secondly, by consciously following a strategy of *Connecting with Nature*, development can occur while preserving the natural beauty that residents in the Evergreen State value highly. Creating livable neighborhoods within a natural setting, as opposed to replacing nature with a uniform suburban plan, strengthens a resident's connection to nature and has been demonstrated to improve property values.

Builder

Points

❑ 5 **Green building occupant's manual**

Provide residents with a green building occupant's manual to help them understand the green benefits of their home. The manual will guide the homeowner through the functions, benefits, and life cycle considerations of the green features that have been built into the home. The projected benefits of the home can be used as a selling point.

❑ 25 **North lot area built first**

Build on the north area of the lot first when doing lot site planning. Place the home on the lot to leave as much as possible of the east, west, and south areas for outdoor use. The cooler, darker, north area of the lot is the least useful for outdoor activity areas such as gardens and patios.

Developer

❑ 25 **Existing service area location**

Locate the development in an existing infrastructure service area for water, wastewater, electricity, streets, public transportation, and schools. Utilizing existing infrastructure helps to keep development costs lower, and minimizes urban sprawl. Minimizing the need for new infrastructure can help to control municipal costs which are passed on to the consumer.

❑ 25 **Pedestrian & bicycle provisions**

Provide easy, safe bicycle and pedestrian circulation paths protected by neighborhood design and covenant. Link these to parks, schools, open space, and landmarks. Providing sidewalks, bicycle lanes, and separated bicycle or pedestrian corridors will enhance the value of the neighborhood and create a stronger sense of community. Refer to the Grand Ridge Guiding Principles Document under Circulation guidelines.

❑ 25 **Traffic-calming devices**

Install traffic calming devices such as traffic roundabouts and crosswalks to limit vehicle speed. Such devices increase pedestrian and vehicle safety in a neighborhood. Refer to the Grand Ridge Guiding Principles Document under Circulation guidelines.

❑ 25 **Diverse neighborhood**

Locate the housing development in a neighborhood with diverse housing types and economic value, or in a mixed use neighborhood with mixed use zoning. Mixed use neighborhoods provide employment and shopping opportunities located nearby. Diverse housing types can create the opportunity for granny flats, single and multi-family housing in one neighborhood, and a more diverse range of ages and backgrounds of residents. Refer to the Grand Ridge Guiding Principles Document under Housing Examples.

❑ 100 **Wildlife corridor**

Provide wildlife corridors by setting aside unfenced, contiguous land that is undisturbed or restored and linked to regional corridors. Wildlife habitat areas should contain native plants and understory for shelter possible. Wildlife can move about more easily by using corridors, which also provide valuable habitat area.

❑ 100 **Garden areas**

Provide garden areas on the site or within easy walking distance. Garden areas can be used to produce food, herbs, and flowers. Gardening is a good learning activity for children, and shared gardens help to bring neighbors together.

❑ 100 **Open space preservation**

Set aside and preserve as much contiguous open space as possible when planning a community. Preserving open space can help increase property values up to 15% for units facing the green area, and helps to preserve natural features such as trees and waterways. Open space becomes an amenity for the neighborhood, providing opportunities for recreation, gardening, and wildlife viewing. Clustering housing units is one technique for preserving open space. Open space to be set aside should not be disturbed or cleared.

❑ 100 **Easy access location**

Locate the neighborhood within an easy, safe ten-minute walk to amenities such as public transit, shopping, schools, recreation, and daycare. Easy pedestrian access to such features decreases the need for short automobile trips which clog traffic and create air pollution.

❑ 100 **Density 20 d.u./acre or higher**

For multi-family housing, create housing densities of 20 units per acre, or higher. Higher densities can be created by clustering or stacking units, building garden homes, or with sensible lot planning. Using higher housing density can save the developer on land and infrastructure costs, and create opportunities to set aside more green space or common areas. Smaller lots can save homeowners on maintenance costs.

Job Foreman

❑ 100 **Trees & natural features protected**

During construction, provide protection for large trees and other natural features. Use temporary fencing to protect trees in groups, setting aside as large an area as possible. Prohibit material storage, vehicle parking, and dumping solvents or paints under trees. Protecting trees in this way will help them through the shock of construction disturbance and help ensure their long term health and survival. Other natural features to protect include wetlands, landmarks, and significant outcrops.

730 Total Available Points for Community Enhancement

HOME BUILDER Self-Certification Checklist

Section One: Build to Green Codes/Regulations

(★) 1-1. Meet Washington State Wtr Use Effcy Stds
(★) 1-2. Meet Stormwater/Site Development Stds
(★) 1-3. Meet Washington State Energy Code
(★) 1-4. Meet Washington State Ventilation/IAQ Code

Section Two: Site and Water

SITE PROTECTION

Overall

(3) 2-1. Build on an infill lot to take advantage of existing infrastructure and reduce development of virgin sites
(10) 2-2. Build in a BUILT GREEN™ development

Protect Site's Natural Features

(3) 2-3. Limit heavy equipment use zone to limit soil compaction
(3) 2-4. Preserve existing native vegetation as landscaping
(3) 2-5. Take extra precautions to protect trees during construction
(3) 2-6. Preserve and protect wetlands, shorelines, bluffs, and other critical areas during construction
(5-10) 2-7. Set aside percentage of site to be left undisturbed

Protect Natural Processes On-Site

(1) 2-8. Install temporary erosion control devices and optimally maintain them
(1) 2-9. Use compost to stabilize disturbed slopes
(1) 2-10. Protect topsoil with mulch or plastic
(3) 2-11. Balance cut and fill, while maintaining original topography
(3) 2-12. Limit grading to 20 ft outside building footprint
(4) 2-13. Amend disturbed soil to a depth of 8 to 10 inches to restore soil environmental functions
(5) 2-14. Replant or donate removed vegetation for immediate reuse
(5) 2-15. Grind landclearing wood and stumps for reuse
(5) 2-16. Use a water management system that allows groundwater to recharge
(5) 2-17. Design to achieve effective impervious surface equivalent to 0% for 5 acres and above; <10% for less than 5 acres
(5) 2-18. Use pervious materials for at least one-third of total area for driveways, walkways, patios
(10) 2-19. Bonus Points: Install vegetated roof system (e.g. eco-roof) to reduce impervious surface
(10) 2-20. Bonus Points: Construct no impervious surfaces outside house footprint

Eliminate Water Pollutants

(1) 2-21. Take extra care to establish and maintain a single stabilized construction entrance (quarry spall or crushed rock)
(1) 2-22. Take extra precautions to install and maintain sediment traps

(1) 2-23. Establish and post clean up protocol for tire wash
(1) 2-24. Take extra precautions to not dispose of topsoil in lowlands or wetlands
(1) 2-25. Wash out concrete trucks in slab or pavement subbase areas
(1) 2-26. Prohibit burying construction waste
(1) 2-27. When construction is complete, leave no part of the disturbed site uncovered or unstabilized
(1) 2-28. Recycle antifreeze, oil, and oil filters at appropriate outlets
(1) 2-29. Dispose of non-recyclable hazardous waste at legally permitted facilities
(1) 2-30. Establish and post clean up procedures for spills to prevent illegal discharges
(2) 2-31. Reduce hazardous waste through good jobsite housekeeping
(2) 2-32. Provide an infiltration system for rooftop runoff
(2) 2-33. Construct tire wash
(2) 2-34. Use slow-release organic fertilizers to establish vegetation
(2) 2-35. Use less toxic form releasers
(3) 2-36. Use non-toxic or low-toxic outdoor lumber for landscaping (e.g. plastic, least-toxic treated wood)
(4) 2-37. Phase construction so that no more than 60% of site is disturbed at a time and to prevent adverse impacts on adjoining properties or critical areas
(5) 2-38. No clearing or grading during winter months
(5) 2-39. No zinc galvanized ridge caps, copper flashing or copper wires for moss prevention

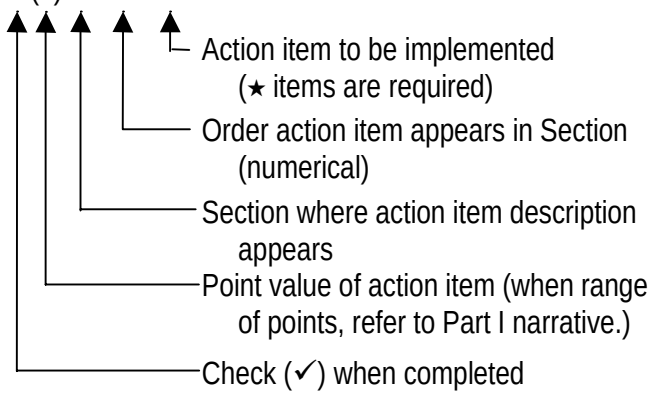
Section Three: Energy Efficiency

EFFICIENT DESIGN

(3) 3-35. Use building and landscaping plans that reduce heating/cooling loads naturally

HOW TO USE THE CHECKLIST

(2) **2—33. Construct tire wash**



Section Six: Promote Environmentally Friendly Homeowner O&M

HOMEOWNER'S KIT

(★) 6-1. Provide owner with operations & maintenance kit

WATER PROTECTION

Outdoor Conservation

(1) 6-2. Mulch landscape beds with 2 in. organic mulch
(1) 6-3. Use grass type requiring less irrigation and minimal maintenance
(3) 6-4. Use compost soil amendments to establish turf and other vegetation with less irrigation
(3) 6-5. Limit use of turf grass to 25% of landscaped area
(3) 6-6. Landscape with plants appropriate for site topography and soil types, emphasizing use of plants with low watering requirements
(4) 6-7. Plumb for greywater irrigation
(5) 6-8. Install rainwater collection system (cistern) for reuse
(10) 6-9. Bonus Points: Install irrigation system using recycled water
(10) 6-10. Bonus points: No turf grass

APPENDIX B

Home Builders Association of Metropolitan Denver Green Land Development Checklist

DRAFT

Denver's Built Green™ Communities Program

The Home Builders Association of Metropolitan Denver volunteered to use the draft list of green land development principles developed by the NAHB Research Center and apply them to local conditions. Metro Denver HBA members met several times and modified the list to meet local green development needs. Appendix B presents Denver's draft program checklist as of the time this guidebook went to press.

Planned for introduction in the first part of 2001, Denver's Built Green™ Communities program has been under development for the past 12 to 14 months as described below.

The 2000 president of the HBA, Bob Koran, appointed a task force to develop guidelines and operating procedures for a voluntary program to be offered to developers in metropolitan Denver. As a companion to Built Green Colorado, the program was envisioned as the next logical step to move the home building and development industry toward more resource-efficient practices.

The task force members represented several disciplines: land planning, development, water conservation, landscape architecture, architecture, energy efficiency, government, banking, engineering, and others interested in furthering the environmental responsibility of the building industry.

Initially, the group spent several meetings discussing the feasibility and challenges of, and the intent behind, a green building program. Members researched examples of sustainable development and shared their knowledge and experience with the group. They also discussed who else needed to be brought into the group as stakeholders. As a result, the group extended additional invitations for participation.

A subgroup of task force members assumed the task of drafting a mission statement to provide the larger group with overall guidance, to set forth the goals of the program to be formed, and to craft an introductory statement around which conversation could begin with others outside the task force in its efforts to align support for its mission and, ultimately, its product. The mission statement approved and adopted by the task force follows:

> "The Built Green™ Communities Program, through a partnership of planners, developers, builders, lenders and government agencies, will promote voluntary land use and community design guidelines that will minimize environmental impact, promoting the understanding and acceptance of responsible community design to benefit all citizens."

Specific objectives of the program call for preserving natural resources; balancing open space and density; reducing infrastructure costs through efficient design; encouraging cost-effective, innovative ideas and technologies; and creating diverse housing options.

Concurrently, the NAHB Research Center had launched its work with the U.S. Environmental Protection Agency to develop a list of green land development principles for use by all local home builders associations in implementing similar green development programs.

The NAHB Research Center provided the Denver task force with a checklist of possible features subdivided into green development categories (e.g., street design, curbs and gutters). The task force then broke into groups assigned to various development categories and began the task of critically evaluating the lengthy list of possible features.

Two clear developments emerged: a natural reduction in the number of task force participants because of time availability and recognition that the task force would become hopelessly mired in process and never arrive at resolution if it attempted too large a task.

The task force held a half-day focus group to identify which features on the initial checklist had both high value and high potential for acceptance/implementation by city planners and developers. The result was a greatly reduced, much more focused checklist that would become the starting point for development of the program's guidelines.

The task force next clarified the checklist's language and separated consolidated green land development concepts into single features. During this phase of its work, the task force returned repeatedly to two connected issues: the potential for developers to select inconsistent features from within the checklist and the group's desire to build into the checklist the concept of "systems thinking." The best solution, albeit not a complete one, was to use a system of point-weighting that encouraged the selection of some features over others.

The group stalled as it grappled with how to allocate points and create a structure so that the checklist would achieve its aims. It was of enormous benefit to the process when Robin Snyder of EPA provided the group with a copy of the "Smart Scorecard for Development Projects" authored by Will Fleissig and Vickie Jacobsen in collaboration with the Congress for New Urbanism.

With the language of the individual checklist features established, the format for the checklist finalized, and each feature assigned points, the task force presented its work to the board of directors of the home builders association to obtain its approval for moving forward with the development and introduction of the program. The board unanimously approved the program.

The checklist is currently undergoing a "road test" to score a variety of existing or on-the-board housing developments and to solicit feedback from the developers participating in the test. Further assessment and evaluation need to be completed before the checklist can be considered ready for introduction.

While the task force nears completion of its work, it must still refine further its allocation of points as well as define the minimum threshold for qualification.

Other tasks to be tackled primarily address the operational needs of the program and include but are not limited to the following:

- An analysis of the projected costs and levels of participation needed to arrive at appropriate participation fees;
- Establishing some form of compliance verification;
- Establishing a system to track and verify compliance with the requirement that all homes in a Built Green™ Community are registered in the Built Green™ Colorado program (the green home building program); and
- Developing program materials, including a "guide" to the checklist that clearly defines the qualifications for each point.

The task force is a committed group of individuals eager to deliver a viable, valuable program to serve the industry, the community, and all citizens in better managing growth and protecting the environment. Task force members look forward to success.

Built Green™ Communities Checklist (working draft)

January 23 weighting decisions; new scores reflect the valuations below

1. Buildings…….**10%**
2. Site selection…… **7%**
3. Transportation…….**18%**
4. Planning and design……**30%**
5. Preservation and conservation……**20%**
6. Community…….**15%**

100%

1. Buildings

Feature	Assessment	Possible Points	Your Score
All homes registered under Built Green Colorado (REQUIRED)	NA	NA	NA
All homes meet 83 points on the E-Star home energy rating point scale, 100% verified by E-Star Colorado		35	
All homes meet 83 points on the E-Star home energy rating point scale, 25% verified by E-Star Colorado		25	
All homes meet 85 points on the E-Star home energy rating point scale, 100% verified by E-Star Colorado		45	
All homes meet 85 points on the E-Star home energy rating point scale, 25% verified by E-Star Colorado		35	
All homes meet 90 points on the E-Star home energy rating point scale, 100% verified by E-Star Colorado		60	
All homes meet 90 points on the E-Star home energy rating point scale, 25% verified by E-Star Colorado		50	
	Subtotal Buildings		
	Maximum Possible	**60**	
	Minimum for Qualification	N/A	

*Remember that the Built Green Checklist energy requirement is under review. The point threshold for the minimum E-Star rating is not yet set.

2. Site Selection

Feature	Assessment	Possible Points	Your Score
Locate new developments adjacent* to existing population and business centers with existing community services and facilities, and with utility infrastructure within ¼ mile of property line. *Adjacent means the new development has a shared boundary with existing development. Boundary may be interrupted by a road or alley way.		7	
Promote infill development by locating new developments surrounded by existing population and business centers with existing community services and facilities.		14	
Promote brownfield development by remediating and building on a site classified as a brownfield.		14	
Participate in EPA's Brownfields Economic Redevelopment Initiative.		5	
Development is located within walking distance of existing open space or park (available to the public; assumes walking speed of 265 ft per minute)			
0 – 5 minutes		5	
6 – 10 minutes		3	
11 – 15 minutes		1	
	Subtotal Site Selection		
	Maximum Possible	**45**	
	Minimum for Qualification		

3. Transportation

Feature	Assessment	Possible Points	Your Score
Create a mixed use development with a variety of land uses and neighborhood gathering place (see Guide) and/or village centers within close proximity to minimize automobile trips, encourage walking and increase social and economic vitality			
Potential uses for the community: Single-family (for sale) residential; Multi-family (rental) residential; Retail; Business; Recreational; Educational; Cultural* (* Examples of cultural uses include theater, band shell, historical trail, museum, preserved historic site, etc.)			
Community include as mix of:	5 uses	17	
Community include as mix of:	4 uses	13	
Community include as mix of:	3 uses	11	
Community include as mix of:	2 uses	6	
Walking distance (assumes walking speed of 265 ft per minute) from 75% of the homes to activity center*, on or off-site, is:			
0-5 minutes		15	
6-10 minutes		11	
11-15 minutes		7	
* "Activity center" is defined as including 2 or more of the following: Retail; Business; Recreational; Educational; Cultural			
Provide incentives to increase public transit use and to reduce auto dependency			
Provide bike racks or lockers		1	
Bike/pedestrian paths to transit stations/stops		2	
Permanent signage for transit information and access		1	
Covered transit stations/stops		3	
Develop under or over pass elements for bike or pedestrian paths		8	
Public transit accessibility			
Walking distance (assumes walking speed of 265 ft per minute) from 75% of the homes to public transit) is:			
0-5 minutes		12	
6-10 minutes		8	
11-15 minutes		5	
Encourage new public transportation systems where existing systems are not adequate			
Advanced coordination with RTD		5	
Internal bus system		13	
Reserve land for future mass transit use		13	
Create non-motorized, continuous and connected open space linkages between neighborhoods and basic services			
Internal and External		12	
External only		5	
Internal only		5	
Develop under or over pass elements for open space linkages interior or exterior		8	
"Internal" is within the boundaries of the community; "external" refers to links with features and/or services outside the community boundary.			
Note: Points for individual options adjusted to maintain % relationship to total	Subtotal Transportation		
	Maximum Poss	**110**	

4. Planning and Design

Feature	Assessment	Possible Points	Your Score
Create efficient land use through developing land in higher gross residential density. (du/ac = dwelling units per acre of total acreage of development to be scored.)			
Average gross density (du/ac) is: 14 or more		31	
10 to 13.9		24	
7 to 9.9		16	
4 to 6.9		8	
The following percentages of gross development area are set aside as common-area open space.			
Percentage of common area open space to total area is: 40% or more		31	
35 to 39.9%		24	
30 to 34.9%		16	
20 to 29.9%		8	
10 to 19.9%		4	
Promote energy conservation by maximizing solar exposure through access and building orientation.			
85% of the homes have their front or rear facade facing within 15 degrees of solar south, and have 75% wintertime solar access (structural, see notes)		19	
75 to 84.9%		14	
65 to 74.9%		10	
55 to 64.9%		5	
Reduce areas of imperviousness by use of relaxed front setbacks, narrower frontages, and minimized driveway lengths.			
Push homes forward so that 50% of homes sit less than 18 ft from front property line		6	
Neck down driveway to maximum of 10 ft width @ street connection		6	
Use shared driveways to reduce impervious areas		6	
Efficient Street Design			
Construct residential streets to 24 foot back of curb to back of curb		10	
Construct residential streets to 28 foot back of curb to back of curb		6	
Construct residential streets to 32 foot back of curb to back of curb		3	
Provide detached walks on local streets		5	
Water conservation through appropriate landscaping			
Utilize the Principles of Xeriscape in landscape design and construction.			
Common areas:			
Improve the soil (Mix in organic material at 3 cubic yards/1000 s.f.)		4	
Select appropriate turf areas. Limit cool season turf to no more than 50% of landscaped area; use native/drought tolerant grasses in turf areas exceeding 50%.		4	
Use appropriate mulches in bedding areas to a depth of 3”		3	
Install efficient irrigation* as defined in the Guide		3	
Group plants according to moisture and sunlight needs		3	
Provide landscaping maintenance guidelines		2	
Individual residences, covenant required:			
Improve the soil (Mix in organic material at 3 cubic yards/1000 sf.)		3	
Select appropriate turf areas (Limit cool season turf to no more than 50% of landscaped area; use native/drought tolerant grasses in turf		3	

areas exceeding 50%.)			
Use appropriate mulches in bedding areas to a depth of 3”		3	
Install efficient irrigation as defined in the Guide*		3	
Group plants according to moisture and sunlight needs		3	
Provide landscaping maintenance guidelines		2	
NO FURTHER REVISIONS TO BE CONSIDERED ABOVE THIS LINE AT THIS TIME WITH THE EXCEPTION OF OPEN SPACE.	**********	********	*******
Common areas irrigated with non-potable** water		15	
Common areas irrigated with recycled water (greywater)			
In common non-turf areas only use native or bio-diverse plants to eliminate need for irrigation and to support native wildlife habitat		3	
50% of common area is restored or undisturbed native plant community, including a minimum of 6” topsoil, forbs, grasses, sedges, and woody plants			
In common non-turf areas only use climate-tolerant plantings (for example, drought tolerant)			
All private lots irrigated with non-potable** or recycled water (greywater)			
In private lot non-turf areas only use native or bio-diverse to support native wildlife habitat		10	
In private non-turf areas only use climate-tolerant plantings (for example, drought tolerant)			
Plant one 2-inch^ caliper, habitat-appropriate tree per house		4	
Plant two 2-inch^ caliper, habitat-appropriate trees per house		8	
	Subtotal Planning and Design		
	Maximum Possible	**185**	
	Minimum for Qualification		

*Definition of efficient irrigation: System is professionally designed for even application of water and includes separate zones for turf and non-turf planting areas, low-flow irrigation for non-turf areas (i.e. drip or micro spray), and rain or moisture sensors. Provide written maintenance guidelines for appropriate irrigation system management practices, such as regular adjustments based on changing seasonal needs of the landscape.

**Non-potable means any non-drinkable water and includes both untreated and recycled, but can also be treated to some extent but still non-potable

5. Preservation, Conservation, and Restoration

Feature	Assessment	Possible Points	Your Score
Perform natural resources inventory to identify important natural features, i.e. plant and animal habitat, agricultural uses, sensitive natural areas, etc. Set aside land for agricultural use or natural areas to encourage plant and animal (i.e. biological) diversity.			
Internal and External set asides		13	
External set aside only		6	
Internal set aside only		6	
Definition: An "internal " set aside is within the boundaries of the community; an "external" set aside refers to links with features and/or services outside the community boundary.			
Preserve sensitive natural areas and preserve open space for common space, recreation, buffers and habitats.			
Protect existing watercourses, riparian areas and wetlands		4	
Protect native growth in all open areas		4	
Save and reuse topsoil that has nutrient value based upon soils analysis. Remove, store, then replace topsoil in all disturbed areas (house pad and street excluded from replacement requirement)		4	
Include a tree expert on the development team; conduct a tree survey prior to planning and design, and create a tree conservation plan.			
Participate in the tree conservation program as defined in the *Building with Trees Program* created in 1998 by The National Arbor Day Foundation in cooperation with the Nation Association of Homebuilders (Kristin's recommendation – need points)		10	
Protect 66-100% of trees greater than 4-inch diameter		6	
Protect 25-65% of trees greater than 4-inch diameter		4	
Replace destroyed trees per caliper (i.e. 12-inch=6-2" new) @ 4 to 1 ratio		8	
Replace destroyed trees per caliper (i.e. 12-inch=6-2" new) @ 2 to 1 ratio		4	
Require builder compliance with tree preservation guidelines during construction and maintenance stages of the project.			
Implement landscaping techniques for energy conservation (e.g. evergreen trees for wind and snow breaks to reduce heating costs; deciduous trees for summer shading to reduce cooling needs/costs; vegetation and tree planting that encourages channeling of breezes for summer cooling; and the use of insulating shrubs and vines)			
Streets have deciduous trees planted for canopy cooling (see Guide to reference types of trees and proximity to street), 2-inch caliper diameter planted every 50 feet or as required by local jurisdiction, required by developer.		12	
Integrate wetlands and landscape areas to promote infiltration of storm water runoff.			
Create onsite mitigation for disturbed/destroyed wetland @ 1 to 1 ratio		3	
Create onsite mitigation for disturbed/destroyed wetland @ 2 to 1 ratio		6	
Create onsite mitigation for disturbed/destroyed wetland @ 3 to 1 ratio or greater		9	

Definition: Mitigation of wetland impacts can include: Avoiding the impact altogether by not taking certain action or parts of an action; minimizing impacts by limiting the degree or magnitude of an action and it's implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; compensating for the impact by replacing or providing substitute resources or environments. See Guide.			
Enhance/create non-required wetlands		12	
Create natural alternative to conventional stormwater detention (see Guide)		7	
Create sediment traps in detention ponds to filter water		3	
Create natural conveyance drainage system (e.g. eliminate curb & gutter and underground storm piping)		7	
Create retention pond to retain 50% of increased flow beyond historical rates		3	
Create retention pond for full retention of increased flow beyond historical rates		7	
Employ sensitive site grading practices.			
Create forms that step with the existing slope		5	
For sloping sites, follow natural topography (for example, develop parcel grading solutions to create smaller terraces)		5	
Protect sensitive areas (e.g., use retaining walls or other engineering solutions)		2	
Create on-site environmentally appropriate wastewater treatment facility.			
Constructed wetland, Living Machine, or other biological wastewater treatment facility (would need specific info for Guide)		6	
	Subtotal Preservation, Conservation and Restoration		
	Maximum Possible	**124***	
	Minimum for Qualification		

* Points in preservation, conservation, and restoration section have been adjusted to maintain the section's ratio to the overall point structure

6. Community

Feature	Assessment	Possible Points	Your Score
Establish community involvement through education of residents about what the development has done, what is expected of the resident to ensure that the development retains its green focus, and creating social initiatives to support the project and its principles.			
An explicit plan of resource conserving goals with implementation plan for how the community will meet the goals and create a self-sustaining program.		6	
Full time paid staff position dedicated to helping the community meet environmental goals		9	
Part-time paid staff or volunteer position dedicated to helping the community meet environmental goals		6	
Homeowner guidebook to efficient operation of home with list of additional resources		3	
Seminar or seminar series for each new family explaining efficient operation of home and other programs to reduce resource use (minimum 4 hours)		3	
Ongoing series of open space habitat restoration programs		1	
Community events/festivals/performances that help educate children and adults about the community's environmental mission		1	
On-going environmental award program		1	
Neighborhood information kiosk and signage to promote green initiatives (e.g.: sharing exchange for appliances, cars; flea market/community garage sale; baby-sitter exchange, etc)		1	
Produce and distribute a regularly scheduled community newsletter		1	
Establish and sponsor community meetings.		1	
Establish and maintain an Internet community communication/ education link		1	
Establish on-going education and awareness with community signage		1	
Create civic infrastructure by providing places for programs that bring people together, providing parks and land uses for the benefit of the overall community, and providing community facilities that are the heart of neighborhoods			
Parking is separated and residents access homes through a common green		1	
50% or more of residences look out to a common green/pedestrian area		1	
Provide developed parks within the community			
10-15% of total site		4	
16-20% of total site		8	
21% or more of total site		12	
Walking distance to developed parks within community from 75% or more of the homes (assumes walking speed of 265 ft per minute)			

0-5 minutes		8	
6-10 minutes		4	
Provide a community meeting center, club house or common house or other community owned space within the development with any of the following features:			
A place for community meetings within the development		3	
A place for residents to share common meals		3	
Guest rooms for community use		1	
An indoor children's playroom		1	
A common laundry room		1	
An office for community use		1	
A community library or media room		1	
A community teen room		1	
Provide land and an organized program for community gardens within the development		2	
Provide community recreation facilities within the development with any of the following features:			
A community swimming pool		3	
A community exercise room or fitness course		1	
Community tennis courts		1	
Provide neighborhood educational facilities within the development including any of the following:			
A public library		3	
A school		4	
A daycare facility		3	
Provide commercial facilities and uses that promote community interaction within the development including any of the following:			
A neighborhood coffee house or small restaurant		3	
Small office spaces for rent to resident businesses		3	
	Subtotal Community		
	Maximum Possible	92	
	Minimum for Qualification		

Final Score	
Maximum Possible	**613***

* The group has yet to determine where to set the threshold for certification.

APPENDIX C

Green Land Development Resources

The resources considered and used for in the creation of this green development guide and for the completion of this project include:

- *A Guide to Developing Green Builder Programs*, by the NAHB Research Center, Inc., for the United States Environmental Protection Agency, 1999.
- *Affordable Housing: Development Guidelines for State and Local Government*, by the NAHB Research Center, Inc., for the Office of Policy Development and Research of the United States Department of Housing and Urban Development, 1991.
- *Affordable Residential Land Development: A Guide for Local Government and Developers*, by the NAHB Research Center, Inc., for the Office of Policy Development and Research of the United States Department of Housing and Urban Development, 1987.
- *Better Site Design: A Handbook for Changing Development Rules in Your Community*, by the Center for Watershed Protection, 1998.
- *Build a Better Clark*, A Program of the Clark County Home Builders Association, 1998.
- *Consensus Agreement On Model Development Principles to Protect Our Streams, Lakes, and Wetlands*, by the Center for Watershed Protection, 1998.
- *Built-Green Program of King and Snohomish Counties, Washington*, 2000.
- *Evergreen Builder's Guide for the Issaquah Highlands, Issaquah, Washington*, 1998.
- *Granting Air Quality Credit for Land Use Measures: Policy Options*, by Jack Faucett Associates and Sierra Research, Inc., United States Environmental Protection Agency, 1999.
- *Green Building Options Study: The City's Role in Promoting Resource Efficient and Healthy Building Practices*, by the City of Portland (Oregon) Energy Office, 1999.
- *Green Development: Integrating Ecology and Real Estate*, by various authors for the Rocky Mountain Institute, 1998.
- *Growing Greener: Putting Conservation into Local Plans and Ordinances*, by Randall Aren't for the National Lands Trust, American Planning Association, and the American Society of Landscape Architects, 1999.
- *Land Development, Eighth Edition*, by D. Linda Kone for the Home Builder Press of the National Association of Home Builders, 1994.
- *Land-Use Regulations Handbook*, by the National Institute of Building Sciences, 1990.
- *Moving Toward Environmentally Responsible Development: Principles and Guidelines for the Real Estate Industry*, by the Urban Land Institute, 1995.
- *Proposed Model Land Development Standards and Accompanying Model State Enabling Legislation*, by the NAHB Research Center, Inc., for the Office of Policy Development and Research of the United States Department of Housing and Urban Development, 1993.
- *Site Planning and Community Design for Great Neighborhoods*, by Frederick Jarvis of LDR International, Inc., for Home Builder Press of the National Association of Home Builders, 1993.
- *Smart Growth Network*, http://www.smartgrowth.org
- *SMBIA Building Green Program*, Suburban Maryland Building Industry Association, Silver Spring, Maryland.
- *Stormwater Runoff and Nonpoint Source Pollution Control: A Guide for Builders and Developers*, by the NAHB Research Center, Inc.
- *Traffic Calming: The Solution to Urban Traffic and a New Vision for Neighborhood Livability*, by Citizens Advocating Responsible Transportation (CART) and Sensible Transportation Options for People (STOP), 1993.
- Various articles from NAHB and ULI publications, as well as Environmental Building News.

ENVIRONMENTALLY GREEN…ECONOMICALLY GREEN

NAHB Research Center, Inc.
400 Prince George's Blvd
Upper Marlboro, MD 20774-8731
1-800-638-8556 *fax* **301-430-6180**
http://www.nahbrc.org