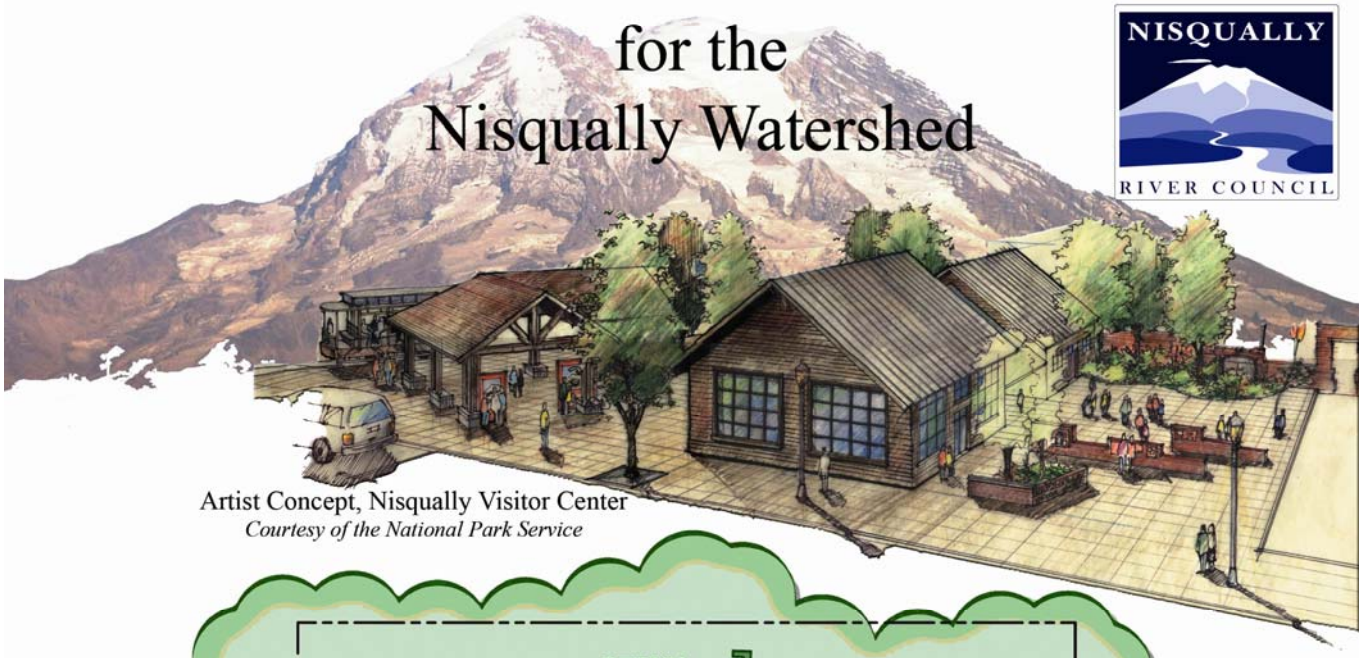
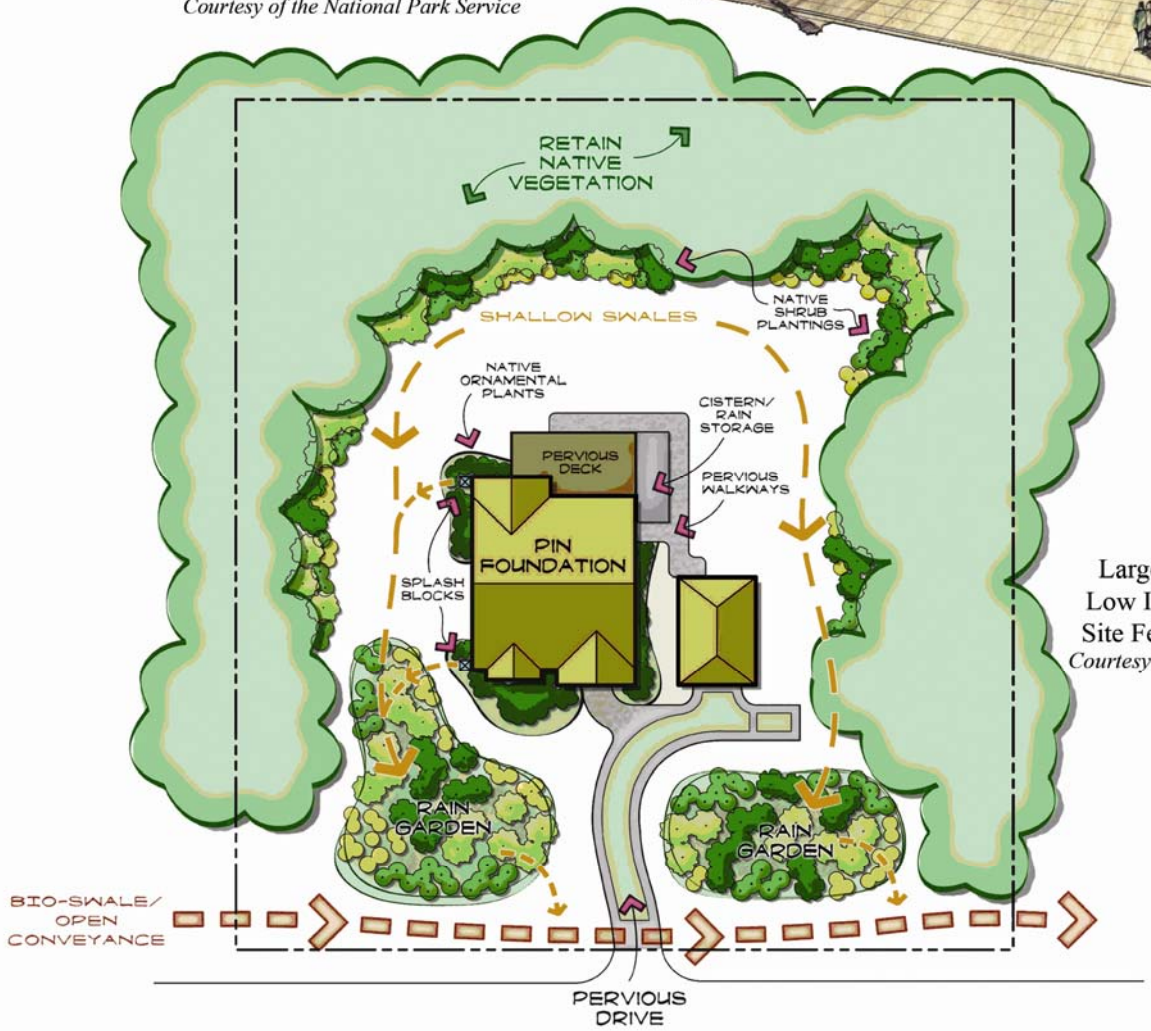
Low Impact Development and Architectural Guidelines for the Nisqually Watershed

NISQUALLY RIVER COUNCIL



Artist Concept, Nisqually Visitor Center
Courtesy of the National Park Service



Large Lot
Low Impact
Site Features
Courtesy of AHBL

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Community Development Advisory Team

Tiffany Speir	Master Builders Association of Pierce County
Joe Cushman	Nisqually Tribe Planning
Rick Adams	Mt Rainier Resort at Park Junction
Steve Lind	Eatonville Planning Commission
Don Carney	Yelm Planning Commission
Dick Roush	Roy Planning Commission
Steve Pruitt	Ohop Community representative
Kim Freeman	Pierce County Planning and Land Services
Justin Hall	Nisqually River Foundation
Willy O'Neil	Associated General Contactors of Washington
Tom Holz	SCA Consulting Group
Bryan Bowden	National Park Service
David Burger	Stewardship Partners

Reviewers

Bruce Wulkan	Puget Sound Action Team
Michael Welter	Thurston County Development Services
Doug DeForest	Olympia Master Builders
Curtis Hinman	Washington State University Pierce County Extension

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EXECUTIVE SUMMARY

Low Impact Development Design and Architectural Guidelines for the Nisqually Watershed represents the long term commitment to sustainable development by the Nisqually River Council, a locally-based management partnership of state and local governments, businesses and individuals. The Council's goal is to steward the Nisqually River watershed—its people, its businesses, its economy, its tourism, its wildlife habitat, and its water sources—in a sustainable manner. Steps in sustainability include--encouraging responsible site development and preservation of precious water resources through low impact development (LID) technology, designing homes and communities with unifying architectural guidelines, and building those homes and communities with sustainable materials and green technologies. The goal is that LID and sustainable building design and construction become the normal development practice in the Nisqually Watershed (map on page 4).

Low Impact Development Design Guidelines

Low impact development (LID) is a relatively new strategy to land development and stormwater management that mimics natural hydrology patterns in residential and commercial site development. LID planning protects and uses a site's natural features: native vegetation, well draining soils, topography, and natural drainages. It combines these features with a suite of small-scale stormwater practices to clean and infiltrate stormwater as close to where it starts on impervious surfaces.

LID Design Guidelines are appropriate for all parcels in the Nisqually Watershed, regardless of lot size or density. Also, financial advantages can be significant when LID is used to reduce the stormwater detention required in conventional construction. Documented studies have shown that low impact techniques are less costly to implement than standard development, with savings ranging from 10 to 20 percent depending on the LID techniques used.

The purpose of the guidelines is to provide homeowners, developers, site designers and stormwater managers with a common understanding of LID goals and objectives for site development work in the Nisqually Watershed. These guidelines developed by AHBL (Civil and Structural Engineers and Planners) draw heavily from and are consistent with the Washington Department of Ecology 2005 *Stormwater Manual for Western Washington* and the Puget Sound Action Team 2005 *Low Impact Development Technical Guidance Manual for Puget Sound.*

Here are key elements of low impact development for the Nisqually Watershed:

- Assess the site's topography, soils, natural drainage patterns, sensitive areas, and other key elements through site planning, analysis and design. Integrate stormwater management into site planning and design at the very beginning.
- Design the site to cluster buildings and other development in a reduced development envelope. Protect sensitive areas and a large percentage of the site's native vegetation and soils. Understand and work with the site's natural drainage features. Incorporating landscaping elements is key to the successful functioning of LID.
- Reduce impervious surfaces by reducing the footprint of buildings, reducing road widths and lengths, and using pervious pavement, minimal excavation foundations, rooftop rainwater harvest, and vegetated roofs. Disconnect impervious surface that is created by using bioretention or pervious pavement.
- Educate landowners and encourage local jurisdictions to adopt ordinances that provide incentives and encourage implementation of LID technologies.

Architectural Guidelines for the Nisqually Watershed

The character and design found within the Nisqually Watershed reflects the many aspects of the citizens who live there. That character and design reflects the heart and soul of the Nisqually River community. Some areas feel urban while others have a distinctly rural flavor. The Upper Nisqually area of Pierce County is a good example of a rural mountain region in the Nisqually Watershed that is working to protect and enhance its architectural character through design. This effort emphasizes the historic, rustic character of the area's communities and avoids the "corporate or franchise" style in the design of buildings. Accordingly, many of the design guidelines presented here are based on those adopted for the Upper Nisqually area.

The purpose and intent of the architectural guidelines are to: preserve, restore, and enhance the mountain-oriented, rustic, rural qualities found in the Nisqually Watershed; provide a menu of design guidelines that enable a project proponent to choose from a variety of styles suited to the overall character of the Watershed; and promote sustainable and green building design and material choices.

Key elements of the architectural guidelines include:

- Existing architectural character of the Nisqually Watershed
- Rural and commercial design guidelines
- Grading and stormwater management
- Parking and circulation
- Building placement and service areas
- Building design, roof forms, color and lighting
- Architectural character, building mass and size
- Community building and signage
- Planting design, lighting and street furniture
- Green building techniques

Green building produces safer, healthier and more efficient homes; reduce impacts of construction and development; and improve and protect valuable community and natural resources. Green building technologies are typically applied in conjunction with Low Impact Development (LID) technologies. Green building applies to the construction of the structure, while LID applies to the development of the building site. The incorporation of green building will further sustainability in the Nisqually Watershed.

Nisqually Watershed

Nisqually Indian Tribe

Cartography by: J.Cutler, July 2006

LOW IMPACT DEVELOPMENT DESIGN GUIDELINES FOR THE NISQUALLY WATERSHED

Introduction

Western Washington communities are in the early stages of transitioning to a more natural approach to land development and stormwater management. The approach – Low Impact Development (LID) – is in response to the need to significantly reduce the harm caused to our environment by traditional development practices, while accommodating growth and the need for affordable housing. To date, most LID projects have occurred in more urbanized areas, however, the techniques are also applicable to rural environments, such as the Nisqually Watershed, which has more extensive stretches of undisturbed forest. Natural, pre-developed watersheds achieve a balance between overland stormwater flows, infiltration, storage, and evapotranspiration. LID strategies apply site and building development techniques designed to maintain this natural balance. Illustrations of the hydrologic cycle under natural and developed conditions are shown on the following pages.

Citizens of the Nisqually Watershed now have the opportunity to understand LID, why it is important, and how they can implement its techniques at their homesites and in their communities.

What is LID?

Conventional land development typically involves clearing and grading a site, which results in the removal of all vegetation, and compaction of soils. It involves paving areas for roads and parking, building structures, and landscaping areas with minimal amounts of topsoil. Engineers design stormwater facilities, such as curbs and gutters, underground conveyance systems and detention ponds to remove pollutants and to rapidly and efficiently drain the site.

Research shows that these conventional techniques have not proven entirely effective at managing stormwater to prevent damage to water quality. Pavement and other impervious surfaces prevent infiltration. High stormwater flows cause flooding, damage public and private property, and harm wildlife habitats for salmon and other fish and wildlife.

In contrast, LID design uses a site's natural features and specially designed best management practices to manage stormwater and to preserve the natural hydrologic functions of the site. These principles include the following design steps:

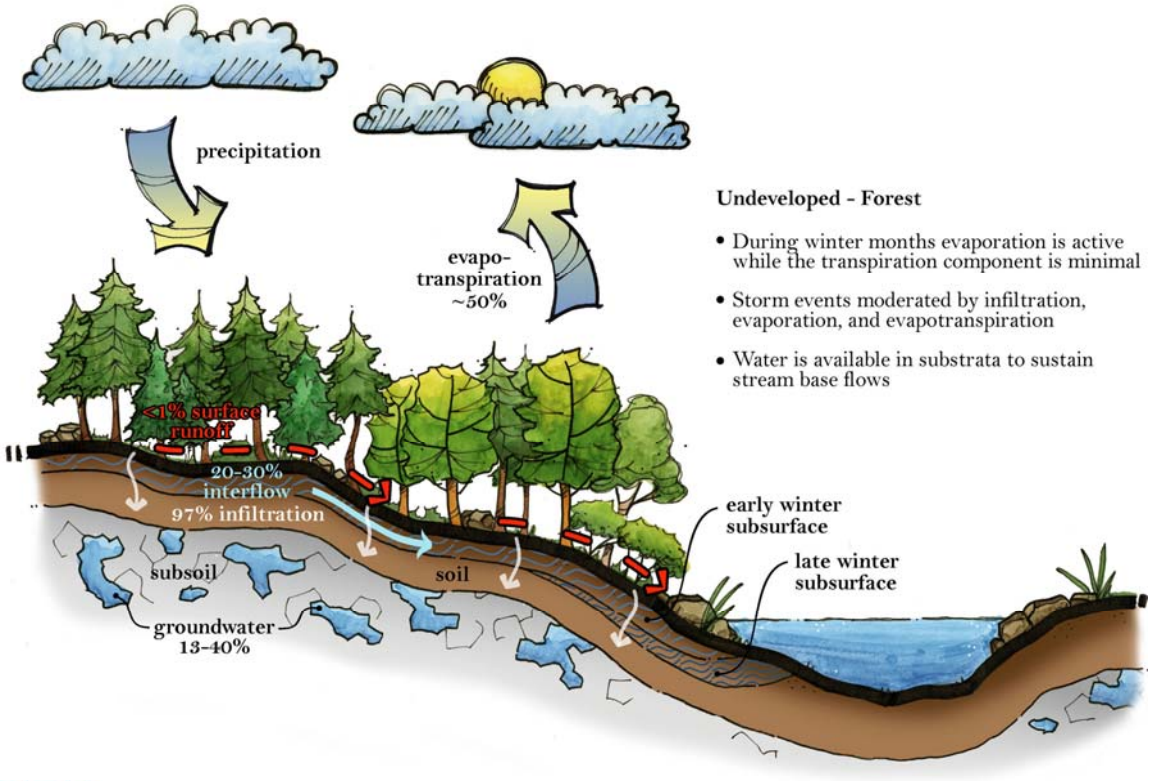
Assess and Understand the Site

Assess the site's topography, soils, vegetation and natural drainages, and divide the site into protected and developable areas. Protected areas include streams, wetlands, steep slopes and other critical areas. Apply adequate buffers to protect these areas.

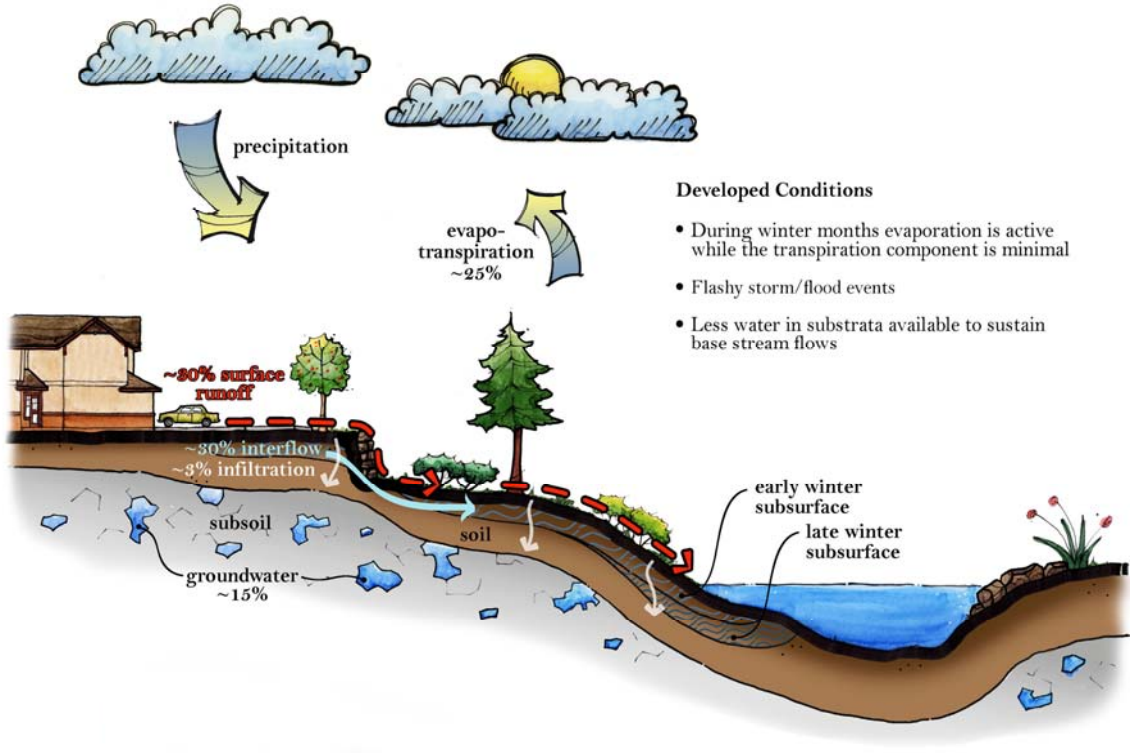
Protect Native Vegetation and Soils

Set aside a portion of the site's native vegetation and areas with soils that have a high infiltration capacity. These natural areas are nature's own excellent stormwater management systems, and if left undisturbed, will continue to manage runoff quite well. To protect native vegetation, clustered site planning is used.

Estimated Annual Water Balance for Native Puget Sound Lowland Forest

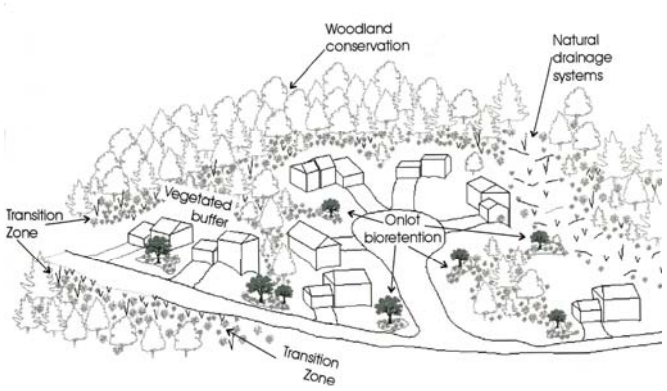


Estimated Annual Water Balance for Suburban Residential Development



Minimize and Manage Stormwater at the Source

Minimize areas of impervious surfaces such as roads, rooftops and parking areas by designing shorter, narrower roads, using various permeable pavements, and installing green roofs or rainwater catchment systems. Manage remaining runoff by disconnecting the impervious surfaces from one another, and directing runoff to bioretention areas (such as rain gardens), amended soils, native vegetation or other types of infiltration areas. This can greatly reduce the need for piped conveyance, as well as reduce or eliminate the need for large storm detention facilities.



LID Design Techniques

The home, business or development that includes LID design practices causes less harm to area streams, wetlands and wildlife habitat. Rainwater can better infiltrate into the ground to recharge drinking water supplies, streams and wetlands. The site is greener and more attractive, with open spaces that appeal to potential buyers.

Depending on the type of development and site constraints, LID techniques can reduce stormwater and site development costs by 10 to 25 percent compared to conventional approaches. LID designs reduce development costs by:

- Reducing impervious surfaces such as roadways, curbs and gutters.
- Decreasing the use of storm drain piping and inlet structures.
- Eliminating or decreasing the size of large stormwater ponds.
- Reducing the amount of clearing and grading.
- Enabling more efficient use of water for irrigation.

LID applications provide an avenue for communities to maintain Growth Management Act (GMA) mandated densities and many of the characteristics of truly livable neighborhoods. The concepts of clustering development were originally promoted for efficient provision of roads and utilities. Clustering also allows for retention of larger open space areas that can be left in their natural state, and reduced impervious areas. Since stormwater management is controlled on each lot using small dispersed and nonstructural systems, the portion of the buildable area that would have been used for stormwater ponds can now be recovered and used for buildings, parking lots, open spaces or habitat enhancements.

The most significant benefits of LID applications will be positive environmental effects on the Nisqually Watershed. Encouraging a site planning and design ethic that works toward maintaining the water balance achieved in nature will be the most significant contribution of LID projects.

Low Impact Development Tools for the Nisqually Watershed

Site Planning

LID site planning strategies and techniques facilitate the development of site plans that are adapted to natural topographic constraints; maintain lot yield; maintain pre-developed hydrologic functions; and provide for aesthetically pleasing, and often less expensive, stormwater management controls.

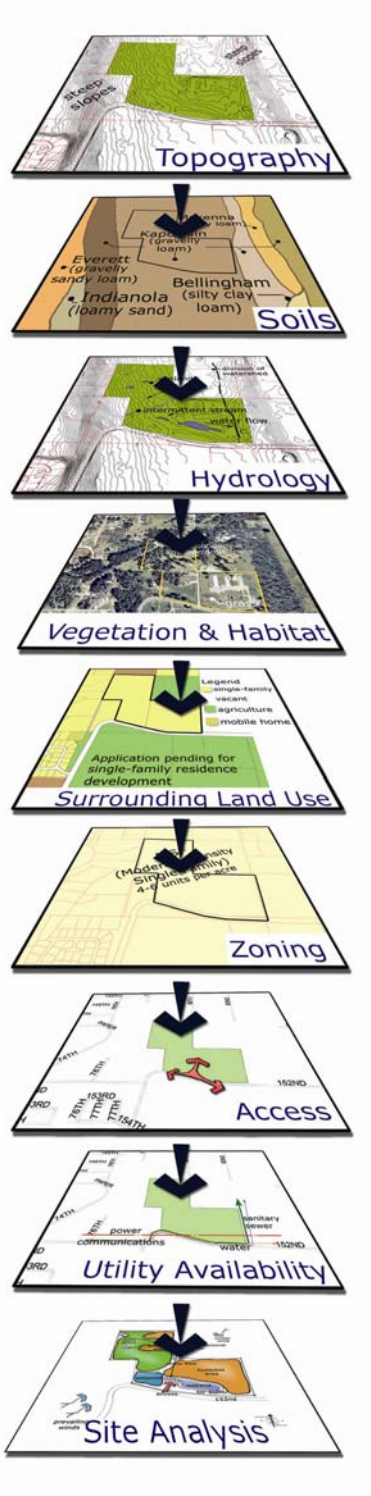
The LID design process assesses existing site soils, native vegetative cover, sensitive areas and drainage characteristics of both the site and surrounding watershed. Consistent with the overreaching goal of LID, the design process focuses on protecting, maintaining and/or restoring natural site features.

Site Analysis

The first step in LID site planning is to determine the attributes of a particular site. What are the primary site characteristics that must be identified to design the site for optimal functioning as a surface water system, as well as for habitat value and other public benefit? Areas of analysis include:

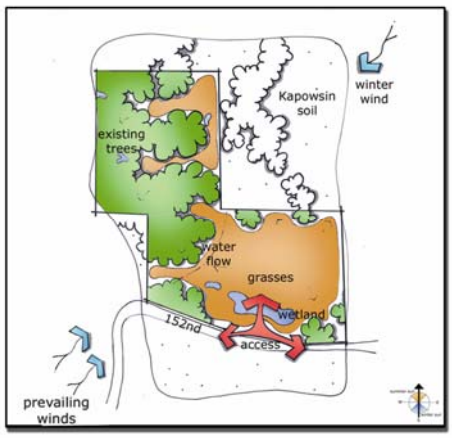
- Topographic analysis to identify areas most appropriate for circulation, buildings, natural cover and surface water flows.
- Geotechnical analysis, to highlight the most effective soils for stormwater storage, conveyance and infiltration; soils most structurally suitable for pavement and buildings; and the suitability of soils as a growing medium.
- Assessment of existing drainage patterns, including water bodies, streams, rivers, natural drainage swales, groundwater flows and any buffers that may be required under critical areas regulations.
- Delineation and classification of existing streams and wetlands and required buffers.
- Identification and inventory of existing vegetation and habitat areas, particularly those for critical wildlife species.
- Identification of other site features, such as aquifer recharge areas and areas of scientific or cultural importance.

The Site Analysis Process



- Analysis of the built environment, including land uses within and surrounding the site and available street and utility infrastructure.

- Analysis of the regulatory environment, including allowed uses, density ranges, development standards and critical areas requirements.



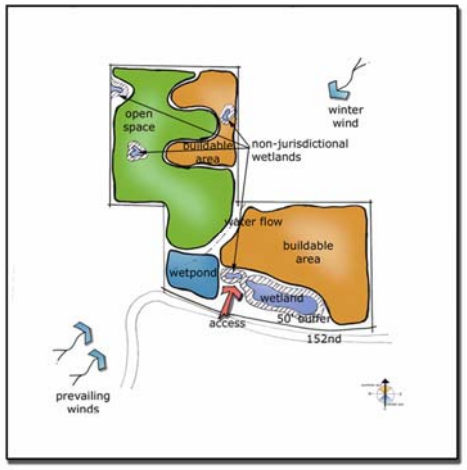
Composite Inventory

Site Design

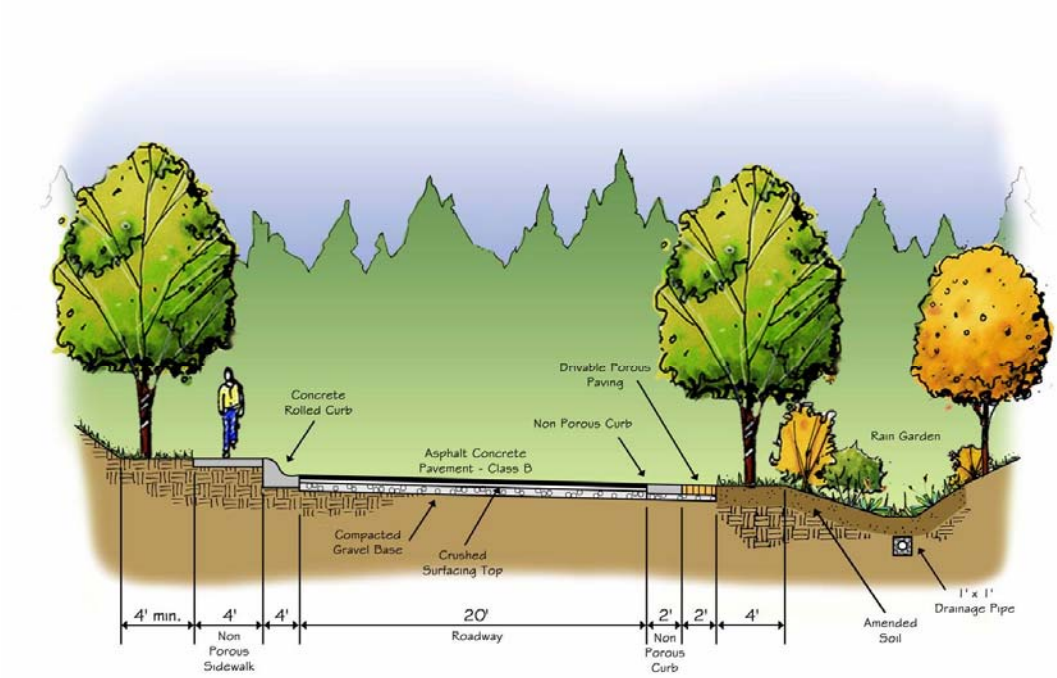
LID site design uses information provided by the site analysis to determine the developable area and areas to be protected. After determining the area of the site to be developed, a conceptual site design can be prepared to define the location of drainage features including bioretention areas, access and circulation facilities and building placement.

<u>Circulation</u>

Among the primary concepts of low impact development are minimizing impervious areas and eliminating effective impervious surfaces by providing alternatives to piped conveyance and traditional curb and gutter design. Among the design considerations are reduced roadway widths; use of pervious paving materials; and long, open paths for storm conveyance.



Composite Analysis



LID Roadway Cross Section

Site Clearing and Grading

Site preparation is an important element of LID to protect and maintain attributes that contribute to the natural surface water flows and infiltration functions. Areas for consideration include:

- Identification of site areas most conducive to infiltration via geotechnical survey.
- Strategies to limit topsoil removal and soil compaction.
- Strategies for preserving natural depression areas to maintain natural stormwater retention and infiltration areas.
- Strategies for erosion control during construction activities.
- Strategies to protect natural area vegetation during the development process.
- Strategies to rehabilitate soils in disturbed areas.

Each site has unique characteristics and opportunities for control. The LID concept encourages innovation and creativity in the management of site planning impacts.

Landscape Elements

Landscape elements are critical to the successful functioning of LID. Areas for consideration include:

- Soil amendment to increase its ability to hold water and reduce the need for fertilizers and pesticides.
- Reforestation of previously cleared areas to recreate forest cover conditions on portions of the site intended for natural open space.
- Biofiltration areas to remove pollutants and suspended solids in the surface water stream.
- Selection of native or ornamental plants to limit the need for supplemental watering, fertilizers and pesticides. Lists of recommended plants may be included as a reference.
- Irrigation strategies to make the most efficient use of potable water used as supplemental irrigation, as well as water collected from downspouts and used on-site.

Building Design

Building design may include standards and recommendations for employing LID technologies, including:

- Low Impact Foundation Technology (LIFT).
- Pervious pavement.
- Decks versus patios.
- Vegetated roofs and cisterns as strategies for minimizing or retaining roof runoff.
- A variety of green building technologies including more efficient building framing systems, recycled building materials, use of sustainable building products, and use of low-flow water fixtures

Soil Management/Conservation

Soils are unique ecosystems in their own right and provide important hydrologic and ecologic functions. Under conventional site development practices, topsoil is typically stripped from a site and disposed of or stockpiled. Often, very thin layers of topsoil are placed over hard-pan or compacted soils, then hydroseeded for lawn and yard areas. The result is removal of a functioning water quality and infiltration system and replacement with a lawn area that poorly infiltrates or tolerates drought and contributes to excessive storm runoff and poor water quality.

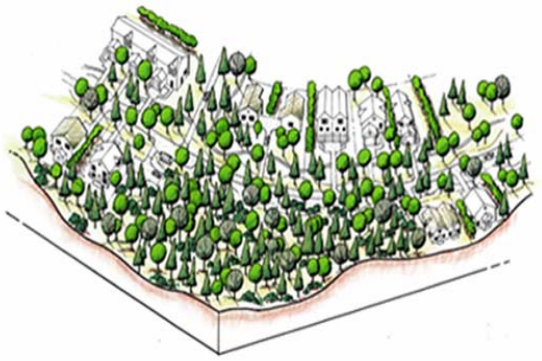
In LID practices, soils are preserved and rehabilitated to maintain their natural filtering capabilities for improving water quality, and regeneration of groundwater resources. Soils that are most conducive to infiltration are identified through geotechnical survey. Stripping of topsoil for the purpose of infiltration should be limited to areas identified as conducive to infiltration. Strategies are developed for preserving natural depression areas to maintain natural stormwater retention and infiltration areas; and to limit topsoil removal and soil compaction. During construction activities, erosion control strategies are adhered to and natural vegetation areas are protected.

Where soils are disturbed, they are later rehabilitated and/or enhanced through soil amendments. Amended soils have compost tilled in to restore natural capacities to treat, store and infiltrate water. The Stormwater Management Manual for Western Washington (Best Management Practice T5.13) recommends breaking up at least four inches of subsoil and tilling ten percent dry weight of compost into the top eight inches of topsoil.

Vegetation Retention

Vegetation plays an important role in controlling site hydrology. In addition to protecting sensitive areas, vegetation help to reduce stormwater runoff impacts by trapping sediment and sediment-bound pollutants, providing some infiltration, and slowing and dispersing stormwater flows over a wide area.

On the LID site, large, contiguous open space areas are preserved in their natural condition. Large vegetated buffers of sensitive areas are protected and enhanced; individual open infiltration systems are landscaped with native plants (rain gardens); and curbs and gutters are replaced with green roadway bioswales.



Vegetation plays an important role in controlling site hydrology

Minimizing Impervious Areas

Impervious areas in a conventional development typically cover more than 60 percent of a site and include roadways, driveways, sidewalks, rooftops and compacted soils. Minimizing impervious areas reduces the volume of drainage and required conveyance and infiltration systems.

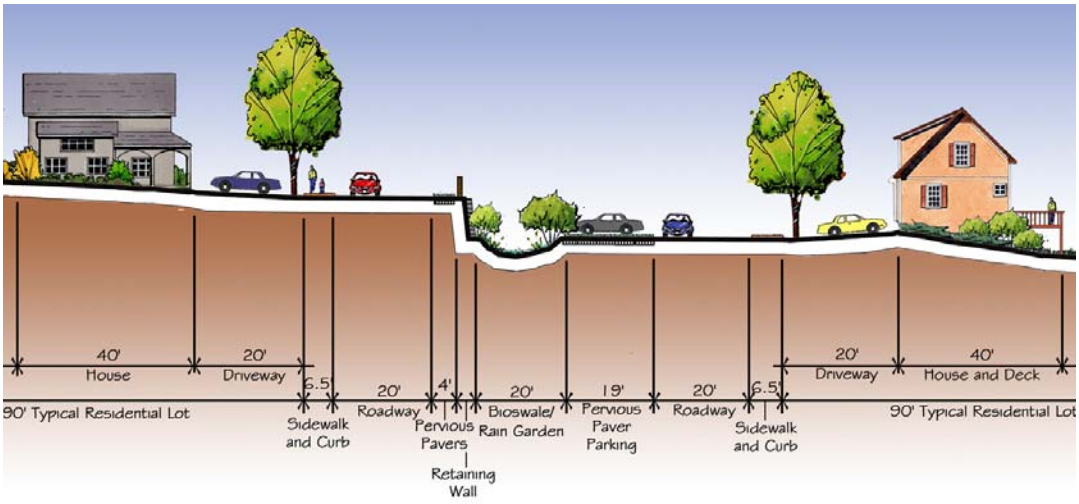
Development impacts can be reduced through minimal disturbance techniques that include the following:

- Reduce paving and compaction of soils.
- Minimize the size of construction easements, material storage areas, and site stockpiles within the developable area during the construction phase of a project.
- Site buildings, and clear and grade to avoid removal of existing trees, where possible.
- Minimize imperviousness by reducing the total area of paved surfaces.
- Delineate and flag the smallest site disturbance area possible to minimize soil compaction on the site, and restrict temporary storage of construction equipment in these areas.
- Disconnect as much impervious area as possible to increase opportunities for infiltration and reduce water runoff flow.
- Maintain existing topography and natural drainage courses to encourage dispersed flow.
- Dispersion from driveways and/or rooftops into native vegetation areas that are protected from future development by some type of legal mechanism, such as a covenant.

Narrower streets and pervious pavement reduce impervious areas.

Alternative Roadway Layout

Roadway layout can have a significant influence on the total imperviousness and hydrology of a site. Traditional rural roadways feature narrow streets and infiltration ditches or bioswales for runoff. This is a good low impact practice that has been replaced in urban areas with large, paved cross sections. A typical suburban residential roadway cross section is 60 feet, including 36 feet of roadway with curb and gutter, sidewalks on both sides of the road, side street parking and landscape strips. LID alternatives include reducing pavement widths to 20 feet, more or less; eliminating concrete curb and gutter; limiting sidewalks to one side; and reducing on-street parking by providing adequate off-site parking or limiting parking to one side of the street.



LID Roadway Cross Section

Driveways

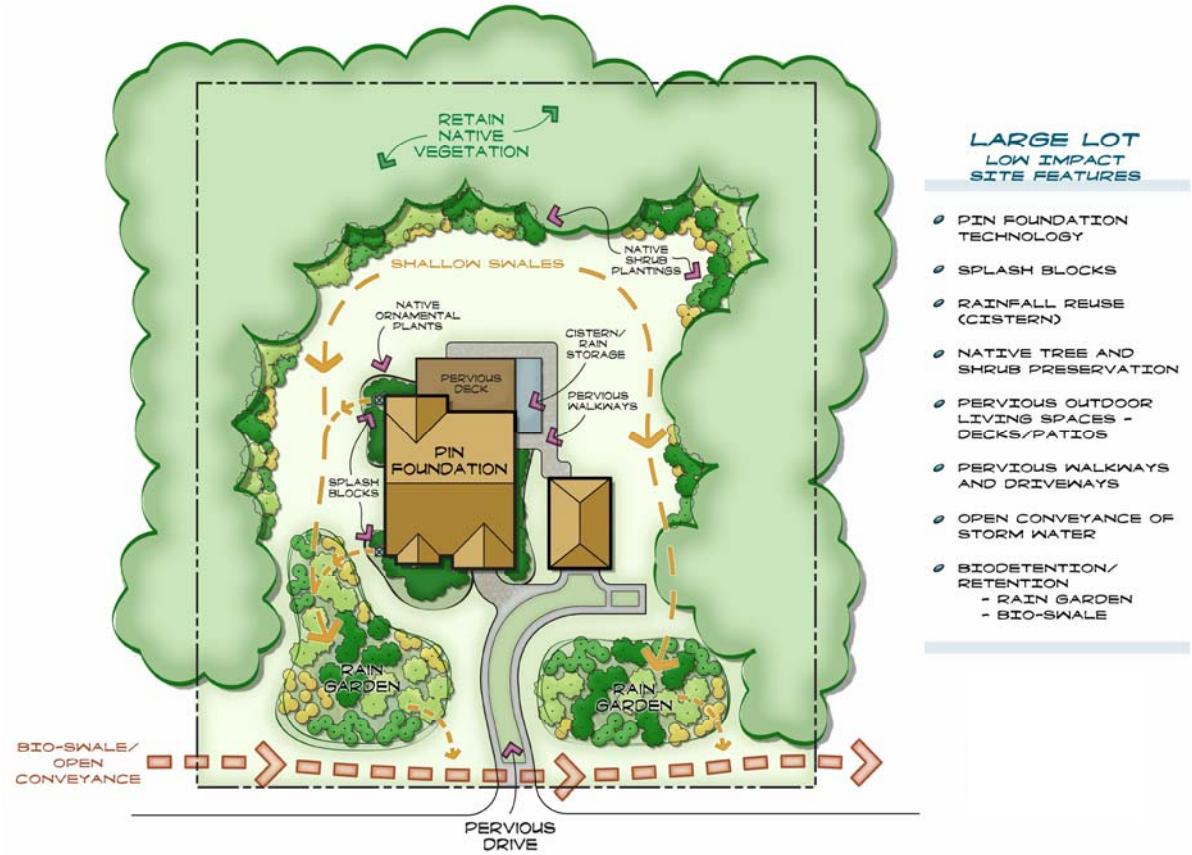
Driveways can also be designed to reduce imperviousness. Options include the use of shared driveways, limiting widths, minimizing building setbacks to reduce driveway lengths, and using pervious materials.

Pervious Pavement Technologies

Many products can replace conventional pavement surfaces to reduce impervious areas. The most common material is gravel, often used for private roads and driveways. Different pavement systems have different properties and ranges of suitable applications. Pervious concrete, for example, is a porous concrete paving material that permits rain and stormwater runoff to percolate through it, rather than running off into storm drains. It has a higher aggregate dimension and contains voids that add strength and allow water to permeate to the subgrade. It can handle from 2 to 10 gallons of water per minute, enough to manage almost any conceivable rainfall event. Its natural insulation factor reduces the temperature of paved areas, mitigating the heat of runoff to nearby water bodies. Benefits sited by the EPA include better infiltration, groundwater recharge, reduction in runoff volume, and treatment of stormwater for pollutants. Pervious concrete is best suited to low traffic areas such as driveways, sidewalks and parking lots. Other products that reduce imperviousness include brick pavers, plastic grid pavers with a grass surface layer, cement grid pavers, and cast-in-place concrete grid pavement. In all applications, proper preparation of the subgrade is imperative to performance.

Site Footprints

Development impacts can be reduced by minimizing a site's footprint. For example, homes that are built tall, rather than wide, have reduced rooftop surface areas and reduced impervious areas. Vegetating the rooftops also serves to reduce impervious areas (see Vegetated Roofs, below).



Managing Storm Drainage

The key to stormwater management on an LID project is to manage it where it falls, where the impact or disturbance is generated. LID focuses on the evaporation, transpiration and infiltration of stormwater on-site through small, disconnected and evenly distributed systems. This approach is one of the building blocks of low impact development.

The cost benefit of this approach can be substantial. Traditional stormwater management focuses on large, end-of-pipe systems and there is a tendency to overlook the consideration of small, simple solutions. These simple solutions and systems have the potential to be more effective in preserving the hydrologic landscape, and they can offer significant advantages over conventional engineered facilities such as ponds or concrete conveyances. By using materials such as native plants, soil and gravel, these systems can be more easily integrated into the landscape and have a more natural appearance than engineered systems.

Smaller facilities tend to feature shallow basin depths and gentle side slopes, which also reduce safety concerns. The integration of these facilities into the landscape throughout the site offers more opportunities to mimic natural hydrologic functions and add aesthetic value. The use of these landscape

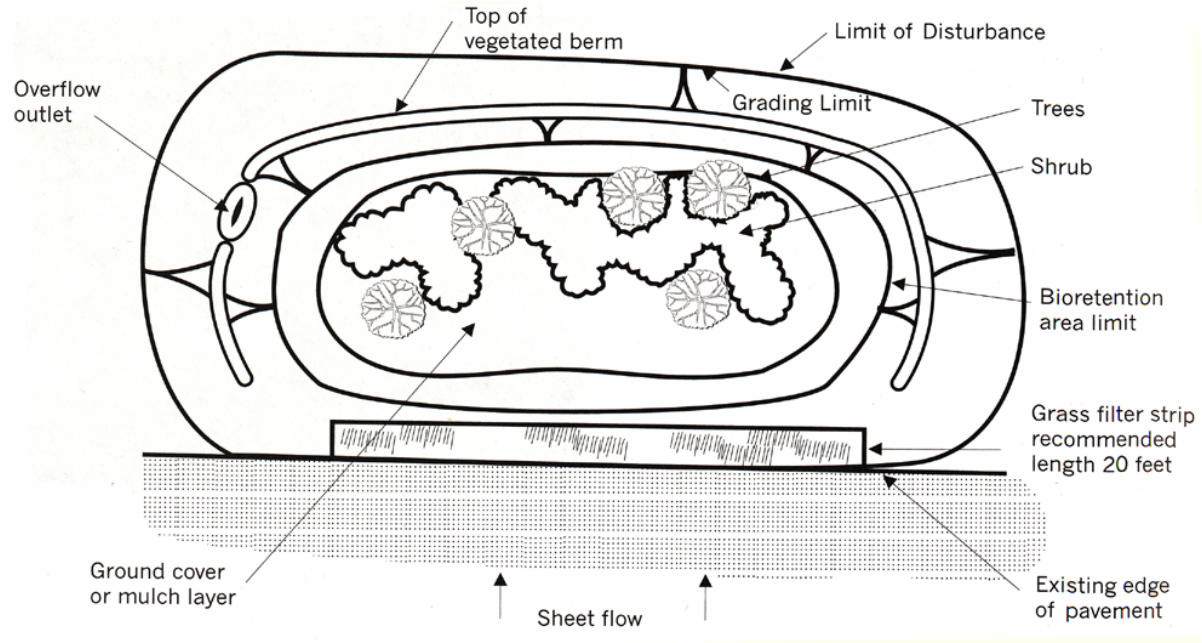
features can result in significant maintenance and upkeep savings to a homeowners association, municipality or landowner.

There are several techniques that can be adapted to a site, including:

- Open drainage systems such as roadway bioswales.
- Bioretention areas and rain gardens.
- Dry wells and splash blocks.
- Capture and reuse of roof drainage.
- Low Impact Foundation Technology.
- Vegetated Roofs.

Bioretention and Rain Gardens

Bioretention areas are shallow depressions with a conditioned soil bed and plantings that manage and treat stormwater runoff. This technique combines physical filtering properties of soil and vegetation, as well as adsorption with biological processes. The system can include components such as a pretreatment filter strip of grass channel inlet area, a shallow surface water ponding area, a bioretention planting area, a soil zone, an underdrain system, and an overflow outlet structure.



Bioretention Cell Design

The bioretention cell shown above is perhaps the best example of a multifunctional practice and illustrates a number of functions and benefits. First, the tree canopy provides interception and ecological, hydrologic and habitat functions. The 6-inch storage area provides detention runoff. The organic litter/mulch provides infiltration of runoff, removal of pollutants through numerous processes, groundwater recharge, and evapotranspiration through the plant material. Rain Gardens are bioretention areas that are designed to complement the landscape, such as yard areas or common open space areas.

Rain Garden on a Residential Lot

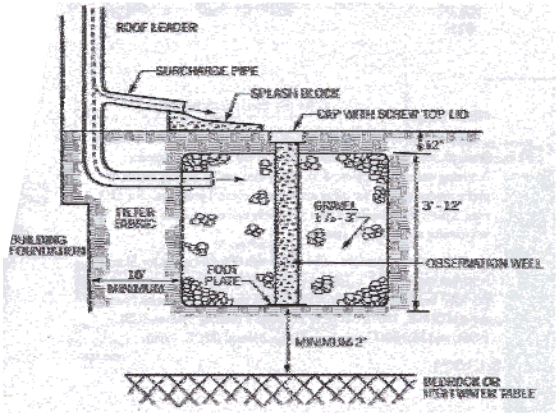
Many roadways in the Nisqually Watershed direct runoff to ditches lined with a combination of grass and gravel. This open drainage system provides some infiltration capacity, but is largely designed to convey runoff to a downstream source. Roadside bioswales that feature the use of soil amendments and native plantings are more effective infiltration systems.

Example of a roadway bioswale in urban area

Dry Wells and Splash Blocks

Conventional rooftops are constructed with gutter systems that are tight-lined to a stormwater drain for conveyance off-site. The LID option channels rooftop rainwater to a splash block that serves to disperse the runoff over a larger area for infiltration; typically, the area includes a dry well or rain garden.

A dry well consists of a small excavated pit backfilled with aggregate, usually pea gravel or stone. Dry wells function as infiltration systems used to control runoff from building rooftops. Dry wells also provide water quality treatment by processes related to soil infiltration, including adsorption, trapping, filtering, and bacterial degradation.



Dry Well Design

Splash Block

Roof Drainage Capture, Reuse

Rain barrels are low-cost, effective, easily maintainable retention devices applicable to both residential and commercial/industrial LID sites. Rain barrels provide storage of runoff for later reuse in lawn and garden watering.

Stormwater runoff cisterns are roofwater management devices that provide retention storage volume in underground storage tanks. On-lot storage with later reuse of stormwater also provides an opportunity for water conservation and the possibility of reducing water utility costs.

Rain Barrel

Low Impact Foundation Technology

Conventional foundations are constructed through a process that begins with clearing all topsoil and vegetation, wholesale grading, and soil compaction of the building site. These activities and conventional concrete slab-on-grade foundations decrease the soil's ability to naturally store and filter rainfall and disrupts or diverts natural drainage flow.

Using a "pin" foundation, existing soils remain in place, while small diameter steel piles reach to the deeper bearing material below - without ever digging down. The technology makes minimal impact and leaves the existing patterns of surface and ground-water flow undisturbed, allowing the soils to continue to absorb and process rainwater. Grading is left to smaller equipment, that "feathers" the existing surface soils without stripping them away. Lot by lot compaction requirements are reduced. Excavation is not necessary, and generating less dirt (and mud) means reduced erosion control. Homes built with a pin foundation are completely conventional.

The system uses 20 percent to 30 percent less concrete; reduces site materials such as drain pipe and imported gravels; and cuts trucking, excavator and dozer times.

Low Impact Foundations Reduce Site Disturbance

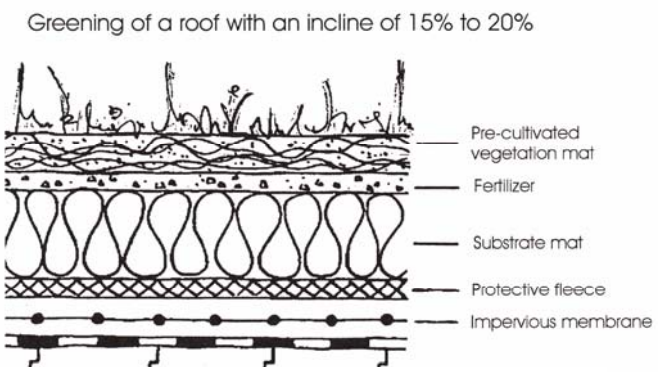
Vegetated Roofs

"Green" or vegetated roofs establish a foundation for native vegetation and ground-level life on the roof of a building. They increase the insulation value of the roof, thus reducing mechanical equipment size and operating costs. They also slow stormwater runoff from the roof of the building, decreasing the impacts of runoff.

Vegetated roofs consist of pre-cultivated vegetation mats which provide the following benefits:

- Air quality improvement - up to 85 percent of dust particles can be filtered out of the air.
- Cooler air temperatures and higher humidity can be achieved through natural evaporation.
- 30 to 100 percent of annual rainfall can be stored, relieving storm drains and feeder systems.

Vegetated roofs have structural requirements for roof design, including pitch and structural enhancements.



Rooftop Vegetation Cross Section

Vegetated Roof in Practice

Implementation

Despite the promise of LID, the vast majority of new development projects each year still rely on traditional stormwater management facilities without considering LID techniques. One reason is that most local government development regulations do not allow for certain LID practices, such as narrower roads or open road sections without curbs and gutters. In addition, many engineers and developers are not familiar with LID techniques and continue to rely on better-known conventional practices.

Some of the major components of implementing the LID approach include:

- Develop a hydrologic analytical methodology to demonstrate the equivalence of LID with conventional approaches.
- Develop new road standards which allow for narrow roads, open drainage and cluster techniques.
- Streamline the review process for innovative LID designs to allow easy modification of site, subdivision, road, and stormwater requirements.
- Facilitate public meetings and workshops with citizens and non-governmental organizations to determine the unique wishes and vision of the community.
- Develop a public education process to inform property owners about how to prevent pollution and maintain on-lot BMPs.
- Develop legal and educational mechanisms to ensure that BMPs are maintained.
- Demonstrate the marketability of green development.
- Demonstrate the cost benefits of the LID approach.
- Provide training for regulators, consultants, public and political leaders.
- Conduct research and monitoring to demonstrate the effectiveness of bioretention BMP's.

Training opportunities are available from sources such as the Puget Sound Action Team, Washington State University, and private consultants. In Western Washington, several local agencies are working to implement LID and have accomplished many of the above tasks. These jurisdictions include:

- Pierce County
- King County
- Island County
- Snohomish County
- City of Olympia
- City of Lacey
- City of Tumwater
- City of Issaquah

Adopt LID Zoning, Land Use, Subdivision, and Other Local Regulations

Zoning requirements are intended to regulate the density and geometry of development, specifying roadway widths, parking and drainage requirements; and defining natural resource protection areas.

The LID site planning process recognizes that in most instances, LID approaches need to meet local zoning requirements. However, typical conventional zoning regulations are often inflexible and restrict development options regarding certain site planning parameters. Consequently, local planning agencies that wish to optimize the environmental and economic benefits provided by the LID approach will want to consider adopting environmentally sensitive and flexible zoning options that facilitate the use of LID technology.

The LID approach employs a number of flexible zoning options to meet the environmental and financial objectives of development without impeding growth. The use of these options provides added environmental sensitivity to the zoning and subdivision process over and above what conventional zoning can achieve. Alternative zoning options, such as those summarized in the table below, include overlay districts, performance zoning, impervious overlay zoning, and watershed-based zoning to allow for the introduction of innovative development, site layout, and design techniques.

Alternative Zoning Options

Zoning Option	Functions Provided
Overlay District	Uses existing zoning and provides additional regulatory standards.
Performance Zoning	Flexible zoning based on general goals of the site based on preservation of site functions.
Incentive Zoning	Provides for give and take compromise on zoning restrictions to allow for more flexibility to provide environmental protection.
Impervious Overlay Zoning	Subdivision layout options are based on total site imperviousness limits.
Watershed-Based Zoning	Uses a combination of the above principles to meet a predetermined watershed capacity or goal.

The City of Tumwater has enacted a “”Zero Effect Drainage Discharge” design standard. The standards encourage developers to achieve “zero effective impervious surface”[1]. The ordinance provides provisions for deviations from standard development regulations that include the following criteria:

- The standards recommend that at least 65% of the native forested conditions be retained over the site; that the forest is used to buffer impervious surfaces and is not clustered on the site or segregated from impervious surfaces.
- Underlying zoning density be maintained.
- Local access streets (ADT less than 200) are allowed to be constructed as one lane, 13-foot roadways for looped road sections with additional 3-foot shoulders on each side; or two lane, two-way, 20-foot wide for dead end and cul-de-sac road sections.
- Curbs may be omitted.
- Road rights-of-way include forested buffer of 50 feet minimum. All roads, turnouts for emergency vehicles, on-street parking stalls and driveways shall be constructed with impervious surfaces.

[1] Zero Effective Impervious Surface is defined as impervious surface reduction to a small fraction of that resulting from traditional site development techniques such that traditional drainage collection systems are not necessary.

In the City of Olympia, the Council adopted mandatory low impact development regulations to prevent further damage to aquatic habitat from urban development in the Green Cove Basin. The comprehensive policy revision covers development density, impervious surface coverage, lot size, open space/tree retention, street design, street width, block sizes, parking, sidewalks, and stormwater management requirements.

Pierce County has developed an LID chapter for their Stormwater Management and Site Development Regulations, which is currently under environmental review. The chapter establishes a performance goal, objectives and prescriptive standards for LID. The chapter discusses how LID can be considered at each phase of development including site planning; vegetation retention and reforestation; site clearing and grading; roads, parking and sidewalks; and building design. It also provides best management practices and monitoring requirements. In addition, the chapter addresses ongoing management and maintenance needs, and education of homeowners.

Stormwater Management Policies

Stormwater regulations and design manuals govern the design of stormwater facilities calculated using mathematical models to forecast runoff volumes, peak runoff rates, flow frequency duration and water quality impacts. Conventional facilities are sized and designed based on this information.

LID techniques significantly reduce runoff rates and produce different results. LID stormwater policies and regulations can allow for modifications or deviations from standard design practices, and credits or incentives for their use. In Washington State, a new Stormwater Management Manual was completed in 2005 by Department of Ecology (Ecology). Ecology is in the process of evaluating LID and offering credits when the technologies are used, however, to date an LID hydrologic model has not been tested or adopted. Local governments can offer incentives for projects that propose LID stormwater practices, such as:

- Reducing stormwater utility fees.
- Establishing permit conditions that fulfill the best management practices for LID surface water rate control in lieu of submitting a drainage narrative.
- Allowing for submittal of a drainage narrative rather than a preliminary drainage plan.
- Eliminating the need for downstream analysis.

ARCHITECTURAL GUIDELINES FOR THE NISQUALLY WATERSHED

Introduction

Building and zoning codes have long regulated the use of property, and set density and dimensional requirements. Architectural design standards are another layer of regulatory control and a tool by which communities can establish and guide the desired character through uniform design. Architectural design guidelines are similar to design standards; however, they are not typically prescriptive in nature. Standards and guidelines describe the desired architectural features such as type of exterior materials, front porch requirements, arrangement and design of windows, placement of garages, etc. They also address location, orientation and relationships of buildings and parking lots; pedestrian circulation and safety; and character and qualities of landscaping. Although architectural styles have changed decade by decade, the principles of good design can be identified and applied to future development.

Architectural design standards and guidelines are not always a part of a jurisdiction's regulations, however. Some jurisdictions are short on resources to develop, adopt and implement them. Many citizens do not want government to dictate design and add another layer to the regulatory review process. Others, however, want to include environmental and aesthetic design as an integral part of the planning process in order to preserve, protect or create a "sense of place" that evokes either the history or uniqueness of their community. This may be a Northwest style, Mountain Lodge style, or Early America style. Extreme examples would include the Bavarian Village design standards followed by the City of Leavenworth and the Norwegian Heritage style of the City of Poulsbo. While most urban cities have architectural design standards and/or guidelines in place, particularly for special areas such as downtowns or master-planned communities, some rural communities have also established design control through various planning documents. Examples in the Nisqually Watershed are described below.

Upper Nisqually Valley Community Plan

The Upper Nisqually Valley Subarea covers approximately 27,000 acres in southeast Pierce County and includes the unincorporated towns of Elbe, Ashford and Alder. In the late 1990's, its citizens worked with Pierce County staff to protect the rural character and provide direction to development in response to burgeoning tourism in the Upper Valley. The Subarea Plan is an effort to balance environmental and economic factors by recognizing the abundance of local natural resources such as wildlife, water, and forests with the opportunity to enable local citizens to make a sustainable living from visitors to the area. The resulting design standards protect the historic, rustic character of the area's communities and avoid the "corporate or franchise" style in the design of buildings. While the use of these design standards is not required outside of the Upper Nisqually Valley Plan area, the standards are recommended in other areas of the Watershed to guide and protect the quality of design and character throughout the Watershed. A modified form of these guidelines follows this section for use by project proponents and local agencies in the Nisqually Watershed.

Yelm Vision Plan and Design Guidelines

The City of Yelm is the fastest growing city in Thurston County. They have developed the Yelm Vision Plan, which focuses on improving the commercial area's economic viability and convenience, as well as its appearance, by focusing on industry, retail, and commercial- and tourism-based economies. Yelm's downtown commercial zones have been divided into design districts, with design guidelines that apply to specific districts. The intent is to encourage innovative design that integrates new development into the downtown's existing structure and creates a pedestrian-oriented focus. The design guidelines set requirements and standards for site planning, pedestrian access, parking, building design, site design and landscaping. The City has established a Historic Commission that sets forth guidelines for the inventory of historic structures and reviews the architectural design for remodels to ensure that the buildings maintain their historic integrity.

Graham Community Plan

The community of Graham has initiated a planning process that includes the preparation of design standards. They have developed a vision statement that recognizes many of the important qualities and characteristics of the community, and the desire to preserve the rural feeling of the community:

> *"The greater Graham community, a vibrant, largely rural community, strives to enhance its country image while responding positively to the increasingly diverse needs and expectations of its citizens. It is a community that appreciates its history and maintains the best aspects of rural living – safe and peaceful neighborhoods, small town friendliness, affordability, and an abundance of natural beauty highlighted by the splendor of Mount Rainier."*

The design standards under development will serve to implement the qualities that contribute to the small-town character, encouraging a safe and peaceful place that is affordable. Natural resources will be protected and the scenic beauty of the town enhanced through further recognizing views to Mount Rainier and the surrounding landscape. The visual quality of the surrounding landscape will be protected through the preservation of open spaces, greenbelts and agricultural areas, as well as lakes, streams and wetlands. The rural atmosphere will be maintained through policies to preserve the compactness of the community; managing its growth and the current ease and convenience of travel; as well as developing the parks, trails and recreational facilities.

Eatonville Community Action Plan and Vision Statement

In 2000, the Town of Eatonville adopted a Community Action Plan, Vision Statement, and Design Guidelines. The goal is to provide clear direction and specific tools for attracting and maintaining economic growth and high quality of life. It focuses on the Town's downtown area, highway corridor, close-in residential neighborhoods, and an important historic mill site. The Town recognizes that preserving the quality of Eatonville's small-town character, improving local services and maintaining a healthy economy depend on attracting new businesses, expanding local markets, and increasing local investment. The design guidelines will implement the vision and shape the growth of the Town by strengthening its historic character and accentuating the community's positive attributes over the years to come.

City of Morton in Lewis County

Although the City of Morton is located outside of the Nisqually Watershed, it is a good example of a small mountain community that is interested in preserving and enhancing its existing character. The Lewis County Economic Development Council led an analysis of Morton's strengths, weakness, opportunities and threats to community revitalization. The Morton Chamber of Commerce was later awarded a grant by the U.S. Forest Service to build upon earlier planning initiatives. During the public facilitation process, the community identified a vision which included preserving the historic logging and small-town character. The goals identified include:

- Enhance the existing character of Morton to form a distinct identity.
- Connect and enhance existing resources within the community.
- Provide amenities for the enjoyment of the community's residents.
- Increase recreational opportunities for the community.

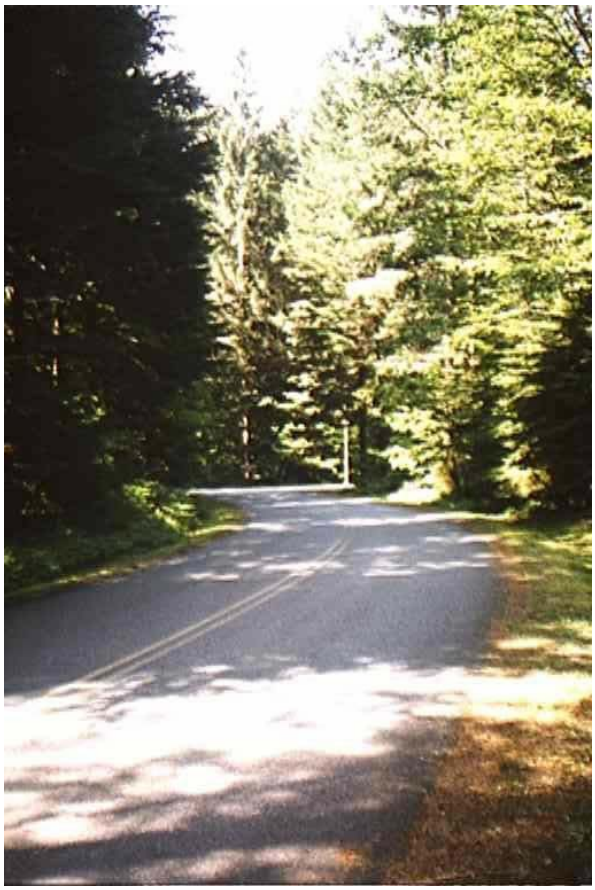
Design guidelines were developed to enhance the gateways to the area and provide street amenities such as sidewalks, lighting, trees, flower boxes and seating. Local citizens also worked to establish a building rehabilitation program to identify and preserve the historic character of buildings.

Existing Architectural Character of the Nisqually Watershed

Residential

Commercial

Streetscape



Lodging & Recreation

Signage & Fences

Other Examples of Existing Community Character

NISQUALLY WATERSHED DESIGN GUIDELINES

The Upper Nisqually Valley Subarea of Pierce County is a good example of a rural mountain region in the Nisqually Watershed that is working to protect and enhance its architectural character through design that emphasizes the historic, rustic character of the area's communities and avoids the "corporate or franchise" style in the design of buildings. While the use of their adopted design standards and guidelines are not prescriptive outside of the Upper Nisqually Valley Subarea, the desired character and outcome could be applicable and desirable on a broader basis in the Nisqually Watershed. Accordingly, many of the design guidelines presented here are based on those adopted for the Upper Nisqually Subarea.

Typically, design standards and guidelines are prepared following a community visioning process whereby key community members and stakeholders work together to identify the issues of their community and establish a vision for the future. Goals and policies are developed and used as initial guiding principles that provide the basis for the development of the standards and guidelines. In the case of the Nisqually Watershed, we are presenting one example developed for a local community that can be applied on a broader basis within the Watershed. These guidelines are presented as desirable options for new construction and remodels in the Watershed.

Within the Nisqually Watershed are areas that function as centers of activity. These may include a grocery store, lodging or gas station at a significant intersection; or, like the towns of Elbe and Ashford, commercial and tourist activity are evident. These areas would benefit from design guidelines that reflect the rural nature of the community and strengthen its historic character. They are referred to in the design guidelines as Rural Commercial Activity Centers.

Goals

The intent of design guidelines within the Nisqually Watershed is to:

- Preserve, restore, and enhance the mountain-oriented, rustic, rural qualities found in the Nisqually Watershed.
- Encourage enhancement and preservation of land and buildings of unique or outstanding scenic or historical significance.
- Encourage well-designed buildings and sites.
- Provide a menu of design guidelines that enable a project proponent to choose from a variety of styles suited to the overall character of the Watershed.
- Promote sustainable and green building design and material choices

Applicability

The guidelines presented in this chapter are appropriate for new construction and remodels of residential, commercial or industrial projects. They are not applicable to remodeling or rehabilitation of buildings and structures on the national, state, or local historic register.

Rural Residential Design Guidelines

The purpose of this section is to identify the architectural character of the Nisqually Watershed in order to encourage residential development that will contribute to, protect, and enhance the character of the Watershed.

The landscape of the Nisqually Watershed is characterized by a variety of topographic and vegetated conditions. These landscape types include wooded hillsides, open meadows, and the valley floor of the meandering Nisqually River shoreline. Similarly, the architectural character that exists throughout the watershed reflects the natural characteristics of these landscape units.

While the majority of residential development will occur in existing developed rural activity centers such as Eatonville, Elbe, Ashford, or Yelm, some residential development will occur throughout the rural areas of the watershed. The focus of these design guidelines will be for residential development that occurs in the rural, agricultural, or forest resource areas of the Nisqually Watershed.

The intent of these guidelines is not to limit the range of architectural choices, but to provide a menu of architectural design guidelines for consideration in the development or remodel of residential structures. The guidelines that follow suggest an approach to site development that is typical of development on large lot, single-family parcels. Further, these guidelines are intended to support the concept of low impact, sustainable site design in residential development.

Several site development characteristics exist in rural or forested areas such as the Nisqually watershed, including:

- Large lots, 2 to 20 acres in size
- Private potable water systems (wells)
- On-site sewage disposal systems
- Overhead power
- Locations near forest land

Site Planning for Rural Residential Buildings

Site planning for residential use in rural areas requires special considerations. The process requires a good understanding of a site's natural characteristics and the practical limitations for siting on-site water supply and sewage disposal systems. The site planning process for rural residential structures requires a thoughtful balance between the best locations for these important utility elements and the desire to take advantage of natural features such as topography, views, native vegetation, and/or solar orientation.

Site planning for rural structures often pursue the following sequence:

Domestic Water Supply/Well Location

The location of a domestic water supply system (private well) is the most important consideration siting residential structures in rural areas. The goal is to find a suitable location for a well that will produce the necessary water flow adequate to serve domestic and agricultural needs, as well as fire flow.

Homeowners should attempt to research existing wells in the vicinity of their proposed new home, talk to surrounding property owners, examine existing well logs, and talk to geologists and/or well drillers

who are familiar with the area in which they intend to drill a well. This research will give the homeowner the information needed to adequately budget for a domestic water supply system.

The location of the well will dictate the location of the home and sewage disposal system. Most jurisdictions require what is referred to as a "well-head protection area". The buffer around a well requires a typical setback of 100 feet. The well must be separated from any on-site sewage disposal system both vertically and horizontally. Sewage disposal systems should maintain at least a 100-foot setback from the well, and be located topographically below the well. Finally, the well location should be within close proximity to the proposed building site.

All of these considerations: potential well location, potential building site, and potential location for on-site sewage disposal system must be considered together when examining a site in the initial site planning stage.

On-site Sewage Disposal System

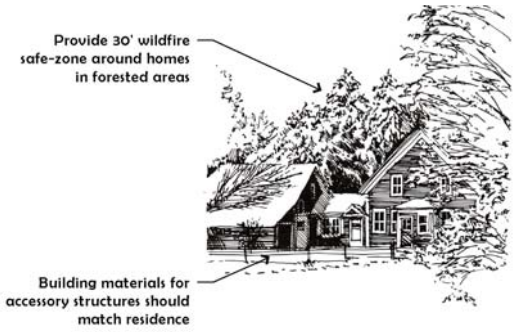
The on-site sewage disposal system must be located on soil that has not been disturbed and is deep enough to adequately treat sewage effluent coming from the home. Usually, test pits are dug and the size of the dwelling, in terms of the number of bedrooms, will be dictated by the soil conditions on the site. In planning for sewage disposal drain fields, septic tanks, and reserve areas, adequate separation must be provided from the on-site well. Again, usually a minimum 100-foot setback is required from on-site well systems.

Overhead Power

Most rural residential structures are served by overhead power. Since the extension of power to a rural residence can be expensive, consideration should be given to location of existing power and the length of run required to serve the proposed home. Where possible, homeowners should look to under-grounding power from the main public power source. Under-grounding is more expensive, however, it minimizes the risk of lightning-caused wildfire.

Site Planning for Wildfire

When citing a home in a rural forested area, consideration should be given to adequate safe clear zone from forested areas. Typically, a 30-foot minimum setback is provided between forested areas and a proposed new dwelling unit or accessory structures. Additionally, within the adjacent forest, litter should be removed, including dead branches or downed timber which could provide fuel to a fast moving forest fire. Finally, tree branches within the remaining forest should be trimmed to a minimum height of 12 feet to limit the possibility of fire from ground sources.



Building Mass and Size Guidelines

- One and two story single-family homes are encouraged in rural residential areas.
- Roof forms should be gable, gambrel, hip, or shed roof forms.
- When citing a residential or accessory structure in a rural area, avoid the absolute top of a hill for building location. Buildings should be located below the brow of the hill to help reduce the mass and scale of the structure when viewed in the landscape.
- Building design should incorporate architectural detailing such as dormers or other roof features, such as eyebrows. Shifts in roof plain also add interest to the roof form and reduce the scale of structures in the landscape.

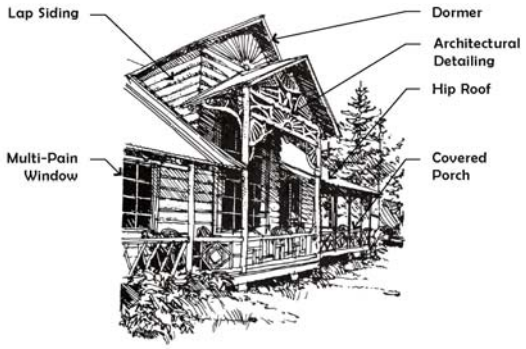
Residential Building Materials Guidelines

The use of natural materials such as stone, wood, and/or heavy timbers as exterior building materials is encouraged.

- Wood, shake, stone, brick, cedar shingles, or timber materials should be used in residential building construction. Roof materials should utilize raised seam metal, shake, shingle, or unglazed tile.
- In areas adjacent to forest land, encourage the use of raised-seam metal roofs to minimize the potential hazards of wildfire.
- Building materials used in the primary residence should also be used for accessory structures such as barns, outbuildings, or storage facilities.

Architectural Detailing and Window Treatment Guidelines

For guidelines associated with architectural detailing and window treatment, please see the General Building Design Guidelines in the Nisqually Watershed Design Guidelines.



Commercial and Industrial Design Guidelines

Site Inventory And Analysis

The quality of commercial and industrial design can be enhanced by guidelines that preserve the aesthetic character of the Nisqually Watershed. The integrity and functionality of on-site critical areas can be improved by minimizing impervious surfaces while providing for safe pedestrian circulation. In addition, standards for building placement aid in enhancing the pedestrian qualities of new developments.

Site design objectives and standards are intended to ensure that the built environment is integrated with the natural environment, and to provide connections (road, pedestrian and trail) to the surrounding land uses. Site inventory and analysis minimizes disturbances to natural features such as topography, hydro-geologic, geological hazard areas, wetlands, watercourses and trees.

Site Inventory

Site plans should address the following points:

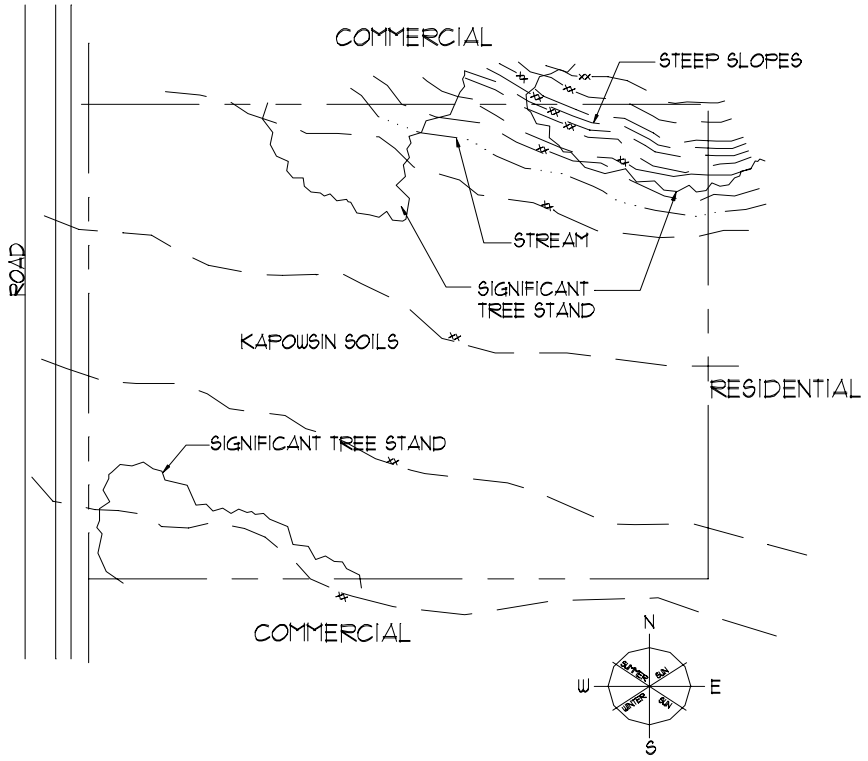
- The location of on-site natural features, including, but not limited to, soils, vegetation, hydro-geologic and geologically hazardous areas, wetlands, and watercourses.
- An inventory of all trees located on the site having a diameter at breast height (dbh) of 12 inches for conifer and 6 inches for deciduous, and masses of trees by outlining the drip-line of individual trees or tree masses. Tree masses should also specify the average dbh within the stand.
- The location of existing and planned roadways, interior and exterior sidewalks, open space and trail systems, utilities, and building placement.
- Surrounding land uses, zoning, and special overlay districts.
- How the project addresses view corridors and scenic vistas, if applicable.

Composite Site Analysis

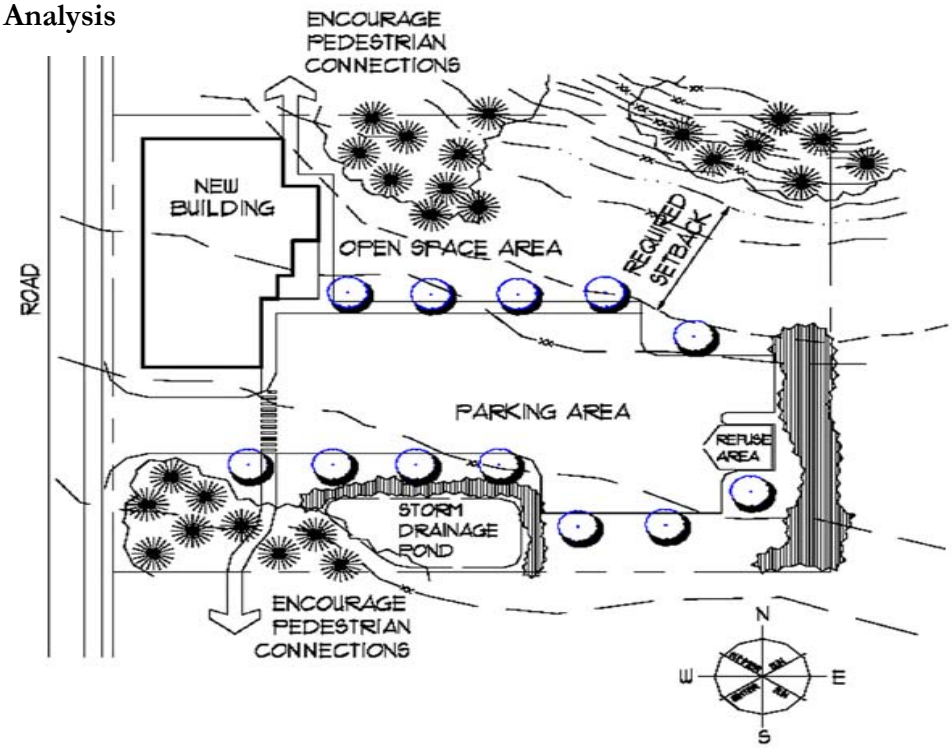
Site plans should demonstrate, through written and graphic illustration, the following:

- Preservation of natural features and critical areas, such as wildlife habitats; hydro-geologic and geological hazards; significant trees or wooded areas; and wetlands and watercourses, by incorporating them into overall site design. Project proponents should demonstrate that on-site project elements preserve or enhance the integrity and functionality of on-site critical areas.
- Compatibility with surrounding land uses and view corridors.
- Minimization of obstructions to view corridors by adjacent sites through appropriate landscape, building, and site design techniques.

Site Inventory



Composite Site Analysis



Grading and Stormwater Management

Impervious surfaces: Encourage design of projects to minimize and disconnect impervious surfaces.

Guidelines:

1. Preserve native vegetation, forest litter and surface topography; and minimize impervious surfaces by reducing building footprint and paved areas.

2. Utilize alternative pervious paving surfaces such as pervious concete, pervious asphaltic cement, paving stone, grasscrete, crushed rock surfaces, and pavers in the design of parking, driveway, and sidewalk/trail areas.

3. Grade lots appropriately (2-4 percent slope) to direct stormwater to adjacent undisturbed open space areas as low velocity sheet flow for infiltration.

4. Amend disturbed soils to regain pre-development stormwater storage capacity.

5. Drain rooftops to cisterns for non-potable reuse within the house or garden, or vegetated areas to evaporate and transpire stormwater. Roof drainage may be stored in vaults and utilized for landscape irrigation during low-rainfall summer months.

6. Use bio-retention or rain garden areas on individual lots, or near clusters of residential units or buildings. Rain gardens are designed to accept roof, parking, driveway, road, and property drainage through a filter of native vegetation. Rain gardens often include storage capabilities and are used to reduce the size of common storm drainage ponds.

Grading: Integrate buildings with the natural topography of the site; minimize grade and fill activities. Filling and grading should be done so as to not increase stormwater runoff impacts to adjacent properties.

Guidelines:

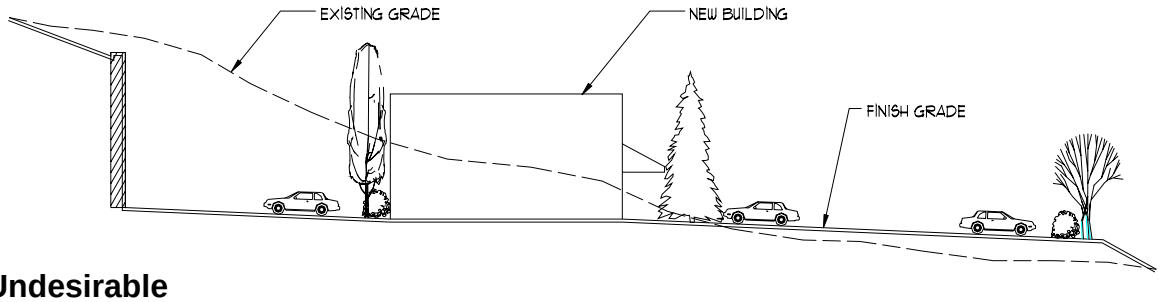
1. Project elements (lots, buildings, access drives, parking, walkways, and service areas) should be located in a manner that protects, enhances, or minimizes impacts to natural site features. For example, buildings should be designed to fit the natural slope, rather than forcing the slope to fit the building design. Terraced parking lots and multi-tiered buildings are other examples of effective design solutions that minimize impacts to a site's natural features.

2. The amount of material removed from one portion of the site (cut) should be equal to the amount of material added to another portion of the site (fill).

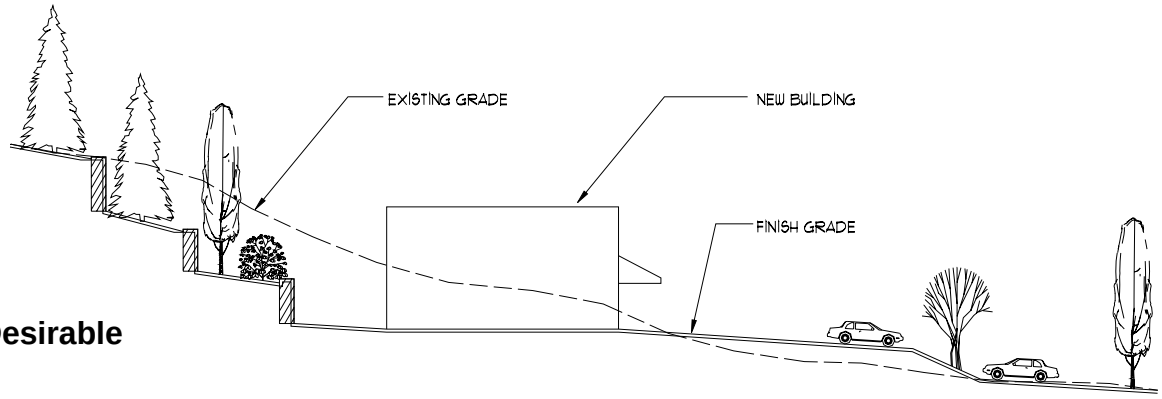
3. Structures, roadways and other site improvements should be designed to blend with the natural topography, with a minimum of site disturbance and grade changes. Large cuts and fills requiring tall or long retaining walls or rockeries are not recommended.

4. Cut and fills should be balanced across a site.

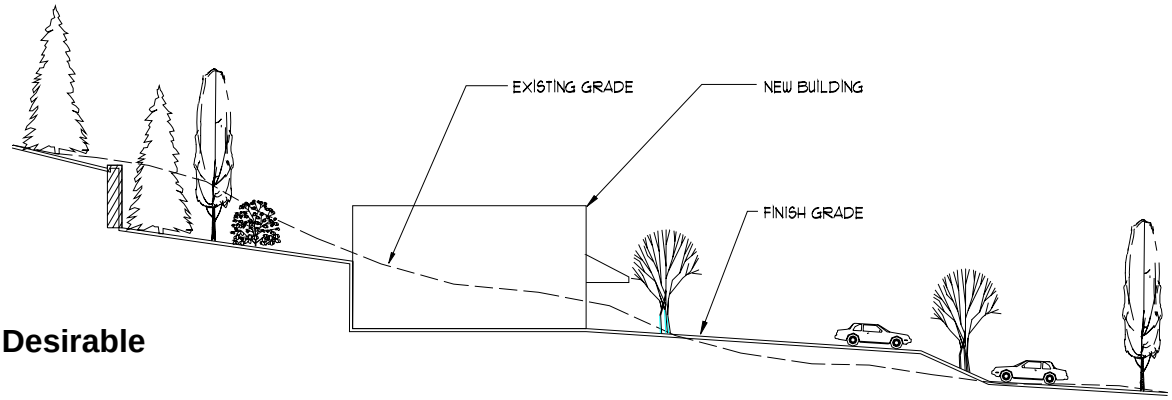
GRADING EXAMPLES



Undesirable



Desirable



Desirable

Site Drainage

Guidelines:

1. Storm drainage facilities should be screened with plant material.

2. Side slopes should be no steeper than a ratio of 4:1 (25%) to allow for mowing storm drainage facilities.

3. Wherever possible, contour ponds to simulate a natural feature of the site in conjunction with other landscape features.

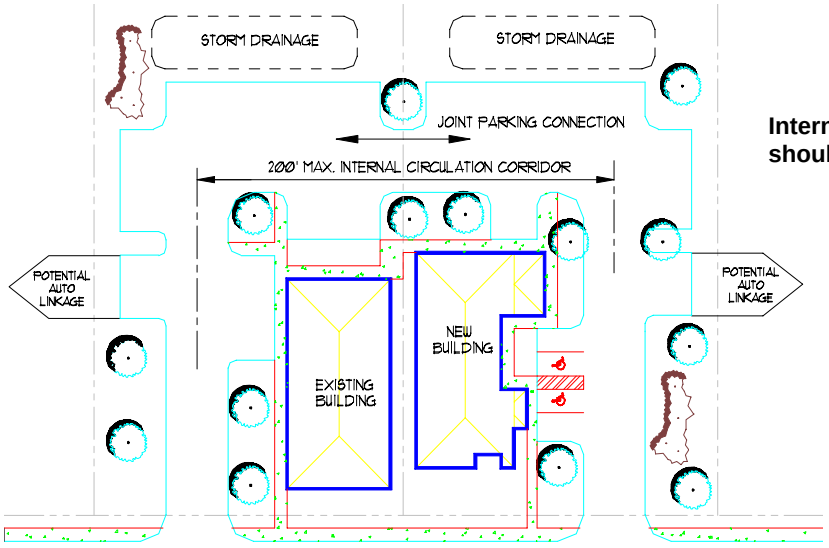
4. Wherever possible, use low impact development techniques to control site drainage.

Parking And Circulation

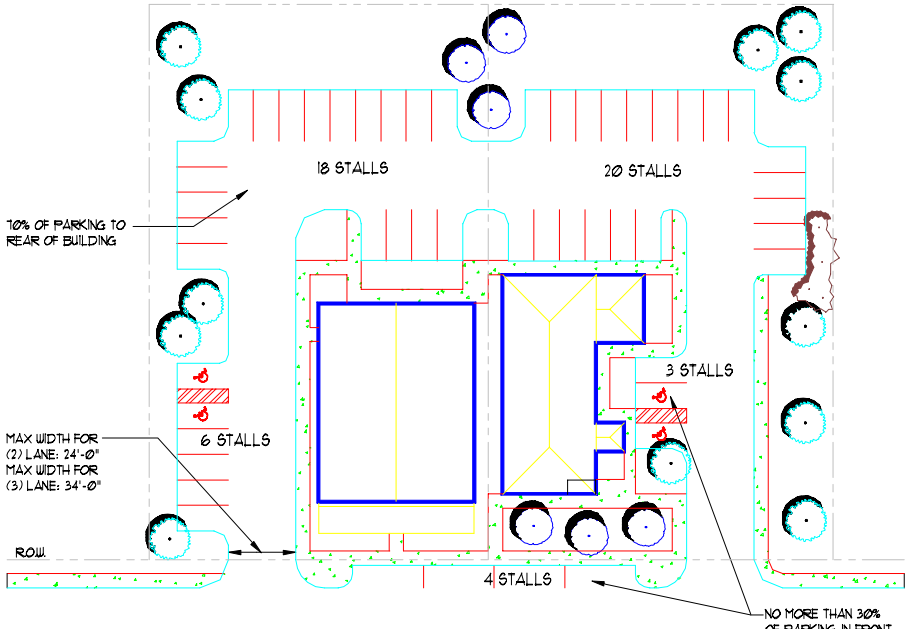
Provide visually unobtrusive parking facilities and circulation corridors. Use landscape and other design features to interrupt the visual appearance of large parking lots by creating smaller areas of connected parking facilities. The guidelines under this objective do not apply to mobile home parks.

Guidelines:

1. Parking facilities on one or more parcels connected by common driveways should be designed so that internal circulation corridors do not exceed 200 feet in length without interruption.



Internal circulation corridors should not exceed 200 feet



Desirable Parking Guidelines

4. On-site pedestrian facilities should be designed according to the following:

   a. Pedestrian facilities within parking lots should be a minimum of 4 feet in width.

   b. Pedestrian facilities immediately adjacent to buildings should be connected to the pedestrian facilities within parking lots, and should be a minimum of 6 feet in width.

   c. Pedestrian facilities should be provided and connected from the front and sides of the buildings.

   c. Minimize drive aisle sidewalks to one side to limit impervious surfaces.

5. Pedestrian paths should be provided and clearly marked through on-site parking, between buildings, and adjacent properties and streets with one of the following elements:

   a. Pervious pavement technologies

   b. Pavers

   c. Concrete

   d. Painted striping

6. Driveway widths should be limited to 24 feet for 2-lane and 34 feet for 3-lane driveways, so that sidewalks and other pedestrian facilities along the streets are not interrupted by expansive driveways.

7. In Rural Commercial Activity Centers, at least 70 percent of parking spaces should be located to the rear of buildings.

8. For parking spaces proposed between buildings and the rights-of-way, the depth of parking facilities should be limited to one aisle, or no more than 20 feet. Parking facilities may be oriented parallel, angled, or perpendicular to the right-of-way.

9. Parking stalls adjacent to sidewalks should be a minimum of 7 feet in width.

10. Minimize a site's access to the street to preserve and promote health, safety, and welfare. Minimize curb cuts and/or access approaches onto adjacent roadways wherever possible by using joint access.

11. Encourage automobile linkages between the parking facilities of adjacent sites.

12. Share parking facilities where possible.

13. Encourage new development abutting vacant land to provide for the opportunity for future connection to its interior road and pedestrian network.

14. Provide adequate parking and loading facilities for transit, tour and recreational vehicles.

15. Orient parking spaces between buildings and the right-of-way parallel to the right-of-way wherever possible.

16. Encourage the development of marked, paved bike lanes along State highways, per Washington Department of Transportation non-motorized standards.

Building Placement

Connect building and pedestrian pathways to the street and adjacent sites by locating the primary structure in proximity to the street and coordinating its placement with properties that conform to these design standards and guidelines.

Guidelines:

1. The portion of a building that faces the street should be located within 25 feet of the right-of-way in Rural Commercial Activity Centers. Where entrances are recessed, at least 70 percent of the building elevation should be located within 25 feet of the right-of-way. Where outdoor gathering spaces are provided between the building and the right-of-way, the building elevation need not be located within 25 feet of the right-of-way, so long as the building is immediately adjacent to the outdoor gathering space. Where parking is proposed between the building and the right of way, limit the parking to one aisle.

2. New building or other site improvements should be similar in relation to size, bulk, view blockage, and scale to adjacent developments where existing development conforms to these design standards.

3. Multiple buildings on a single parcel should be arranged to create outdoor gathering spaces by using one or more of the following elements.

    a. Courts

    b. Plazas

    c. Patios

    d. Covered space

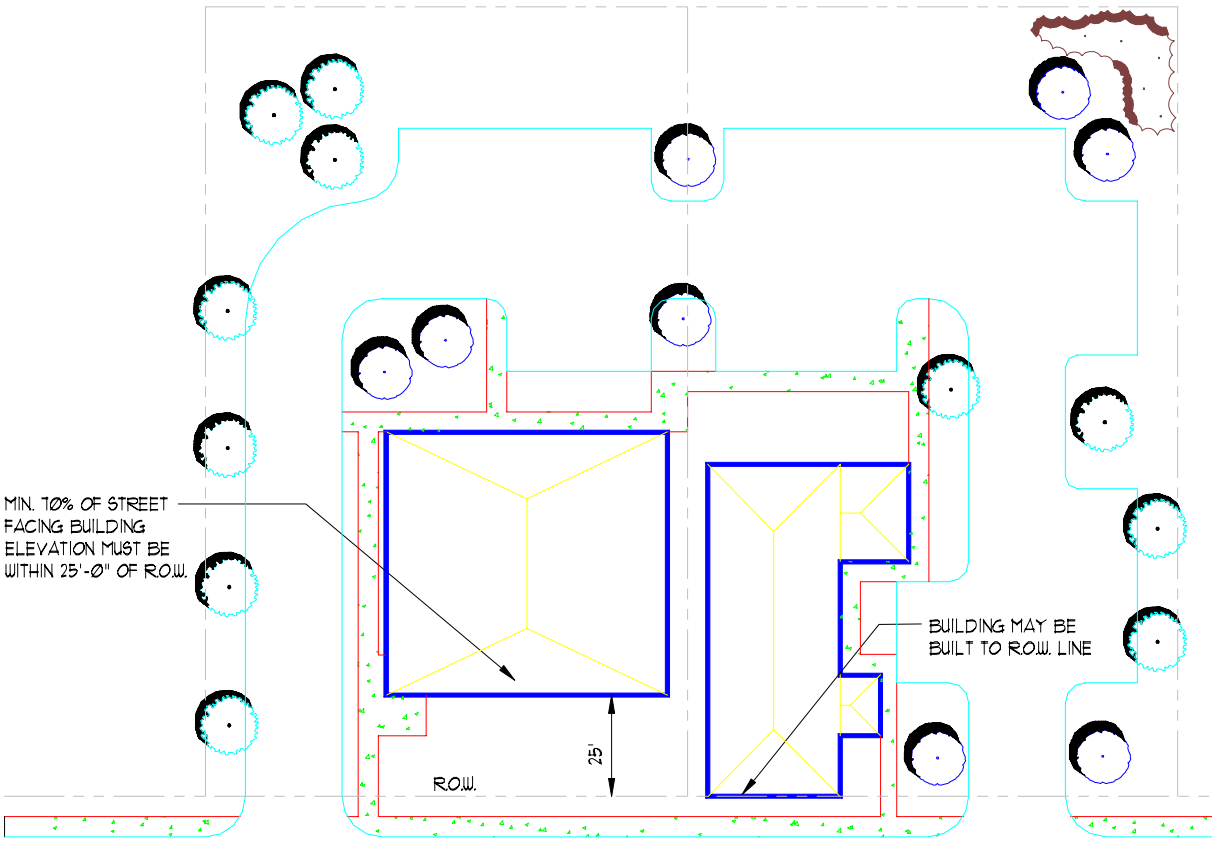
    e. Seating areas

4. Outdoor gathering spaces should not be less than 10 percent of the total floor area of the multiple on-site buildings.

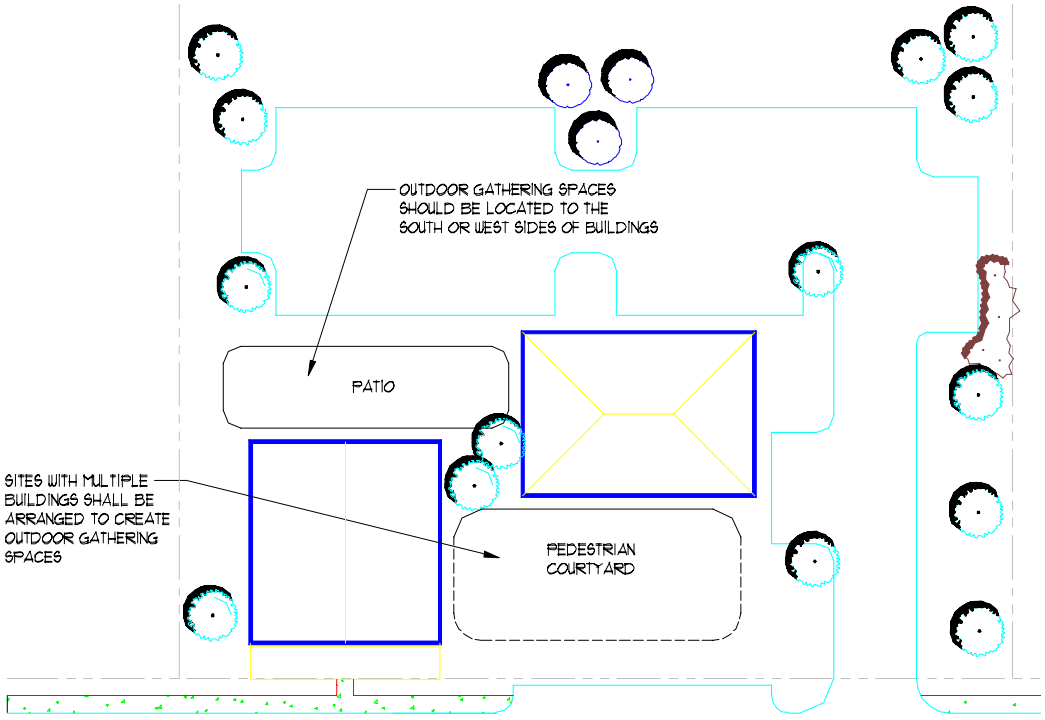
5. Locate outdoor gathering spaces to maximize sun exposure.

6. Plazas and courts should be accessible to pedestrians.

Desirable Building Placement



Emphasize Outdoor Gathering Spaces



Service Areas

Screen, enclose, or buffer site utility and service areas from the view of pedestrians.

Guideline: Service areas such as loading, garbage, or utility elements should be screened in one of the following ways:

1. Vegetative screen - no berms.

2. Wood fences.

3. Structural enclosures.

    a. Structural enclosures should be designed to be architecturally comparable to the primary structure with primary structures that conform to these design standards. Roof forms, building materials, and color should be comparable to the primary structure.

    b. Structural enclosures that are not accessory to a primary structure should be designed in accordance with these design guidelines.

4. The joint use of utility areas such as regional storm drainage facilities, water quality treatment facilities, and community sewage treatment facilities is encouraged.

Building Design

The purpose of this section is to improve the quality of development in the Nisqually Watershed by instituting design guidelines covering new building construction and remodels. The intent of the guidelines is to reflect the historic, rustic or rural character, and to exemplify the heritage and historic character observed in the Nisqually Watershed through human scale designs and natural building materials.

Architectural Character

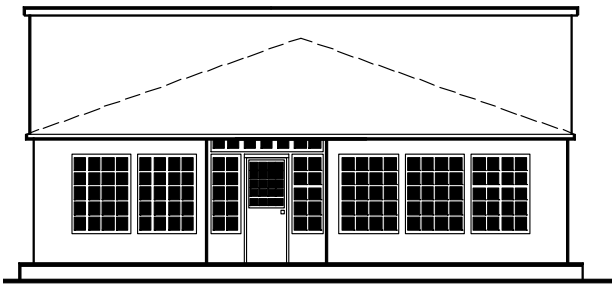
Design buildings to incorporate features such as facades, roof forms, porches, window treatments, and architectural detailing that exemplify the heritage and historic character of the Nisqually Watershed. Avoid using a standardized "corporate or franchise" style in the design of buildings. Note: for photographs of buildings that are desirable and undesirable examples of the architectural character in the Nisqually Watershed, refer to Pierce County Development Regulations Appendix 1, Chapter 18J.

Guidelines:

1. All building sides should be characterized by the same quality and type of building materials and detailing.

2. Accessory structures should be designed of the same building materials, roof forms, and color as primary structures that conform to these design standards.

3. Where building elevations are visible, architectural details and features should not be abruptly ended and should transition a distance equivalent to at least 20 percent of the adjacent building elevation.



Desirable - false-front and storefront windows

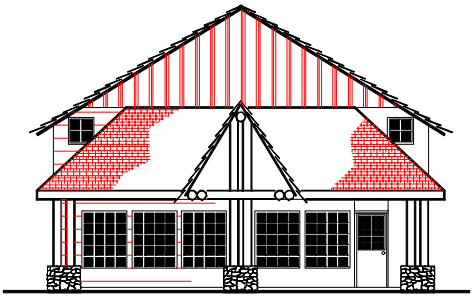
Desirable - false-front store front

Exterior Building Materials

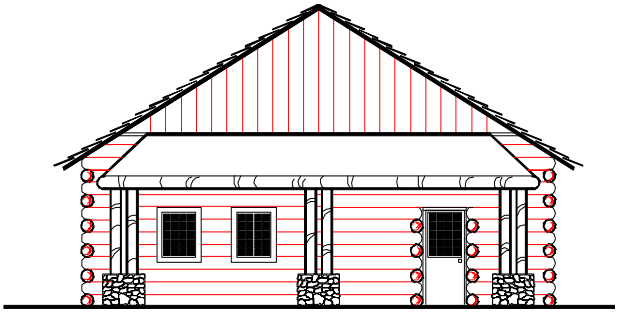
Use natural materials such as stone, wood, heavy timbers, and/or brick as exterior building materials. Wherever possible, use Green Building materials.

Guidelines:

1. Wood, shake, stone, brick, cedar shingle, or timber materials should be used for facade treatment.



Desirable - rural with natural materials



Desirable - log structure

2. Raised-seam metal, shake, shingle, or unglazed tile should be used for roof materials.

3. Spanish red clay, Oriental tile, or stucco are discouraged, as these materials do not reflect the context or historical character of the Nisqually Watershed.

4. Encourage the use of native stone or brick as an accent.

5. Building materials used for site features such as fences and screen walls should complement a primary on-site structure that conforms to these design guidelines.

Building Mass and Size

Design new buildings at a mass that is compatible with buildings observed in the Nisqually Watershed and at a pedestrian-oriented scale.

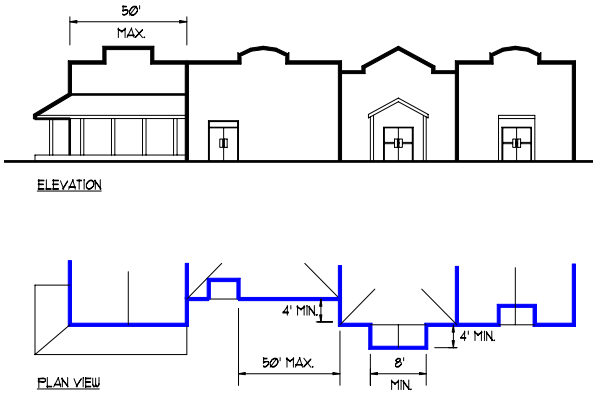
Guidelines:

1. Entrances should incorporate one of the following building elements:

   a. Doorways recessed at least 4 feet from the building façade.

   b. Dormers.

   c. Porches.



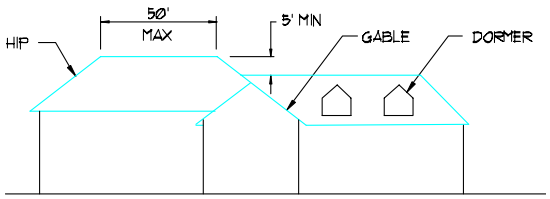
Desirable Building Modulation

2. Long, blank walls are discouraged. The maximum recommended length of an uninterrupted building elevation is 50 feet. Visual interruptions to the planes of exterior walls may be achieved through one of the following methods:

   a. Building facades modulated at a depth of least 4 feet and a width of at least 8 feet.

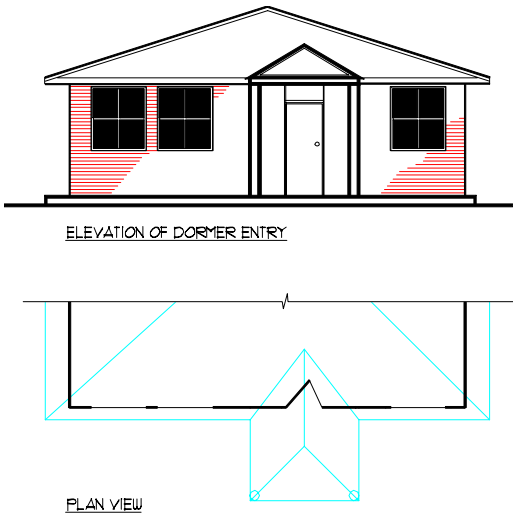
   b. Porches.

   c. Porticos.



Desirable Roof Lines

3. Roof lines should be interrupted every 50 feet with gable, hip, or dormer roof forms or a vertical shift of at least 5 feet.



Desirable Dormer Entry

Roof Forms

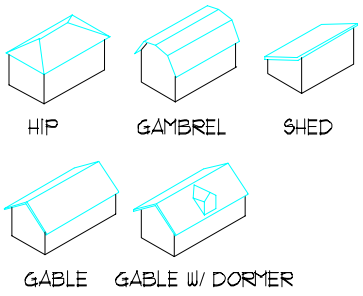
Encourage design of buildings to incorporate gable, gambrel, hip, dormer, or false-front roof forms.

Guidelines:

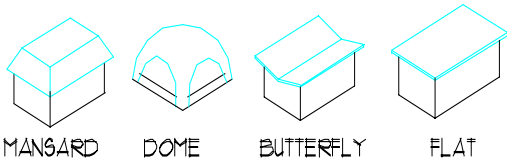
1. Buildings should be designed with gable, gambrel, or hip roof forms with a minimum 4:12 roof pitch. False fronts, giving the appearance of a flat roof, may be used.

2. Roof planes should be varied by using gable ends and/or dormers, unless a false front is used.

3. Flat, mansard, dome, or butterfly roof forms are discouraged.



Desirable Roof Forms



Undesirable Roof Forms

Architectural Detailing

Design new buildings and exterior remodels to include the architectural detailing prevalent in the Nisqually Watershed. These architectural details include, but are not limited to, cornice details, trim details, timber details, knee bracing, wood siding, logs, and covered porches. Examples of architectural details observed in the Nisqually Watershed are illustrated in the graphics and photographs in this chapter.

Guidelines: Historic architectural detailing should be incorporated into building design. At least one element from each of the following categories should be included in the design of all new buildings and accessory structures:

1. Details (examples are shown on the next page)

    a. Cornice details

        (1) Trim details

        (2) Timber details

        (3) Knee bracing

b. Porches and Entryways (See Figure 18J.20-26)

(1) Porches

(2) Porticos

(3) Entryways recessed at least 4 feet

c. Siding

(1) Board and baton

(2) Horizontal clapboard

(3) Beveled planks

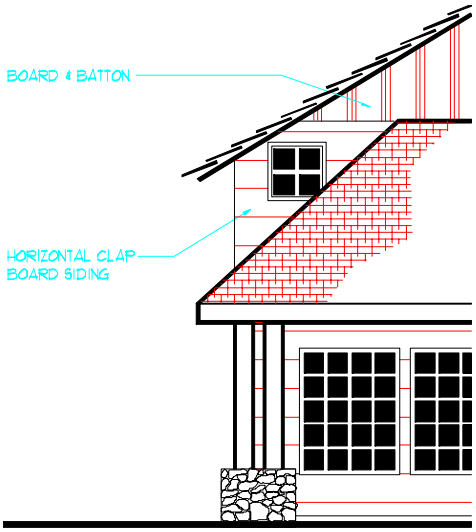
(4) Cedar shingle

(5) Stone

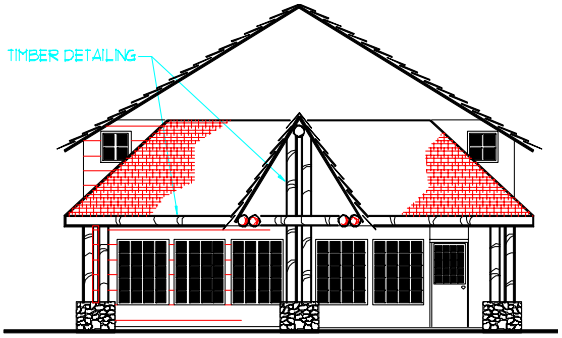
(6) Brick

(7) Timber

(8) Green Building materials

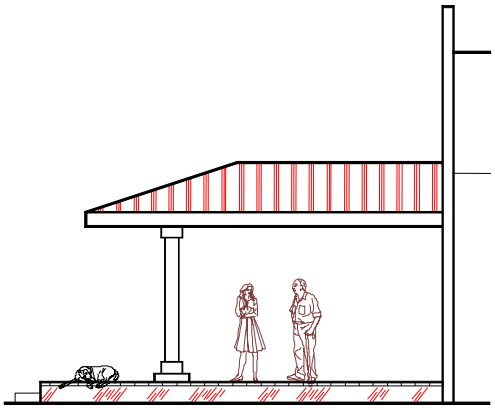


Siding detail

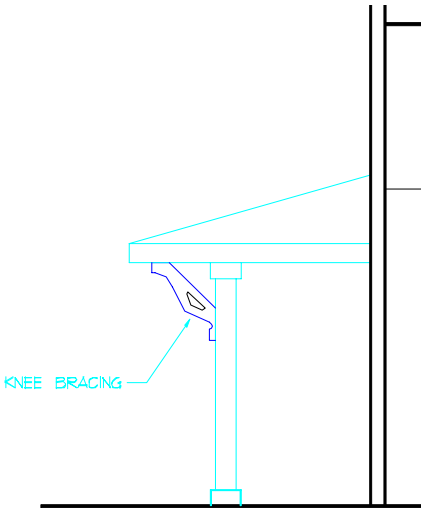


Timber Siding

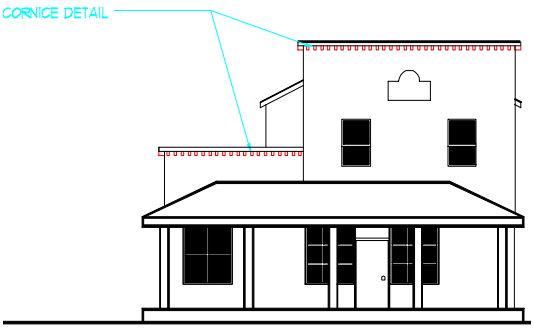
Desirable Architectural Details



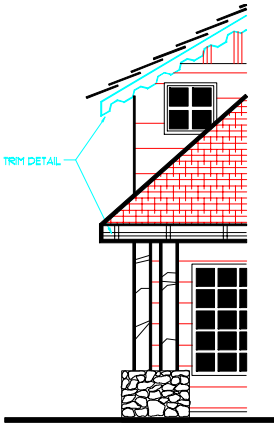
Porches & entryways



Knee Bracing



Cornices



Trims

Window Treatment

Encourage the use of windows that emphasize first floor turn-of-the-century storefront or mountain lodge architecture.

Guidelines:

1. Window patterns should be characterized by vertical proportions, with horizontally-oriented rectangular forms discouraged.

2. For business uses only, the area of first story windows on street front elevations should be at least twice the area of second story windows along the same side of the building. This guideline should not apply to multi-family development or employee housing.

3. One of the following window treatments should be used:

    a. Storefront windows

    b. Bay windows

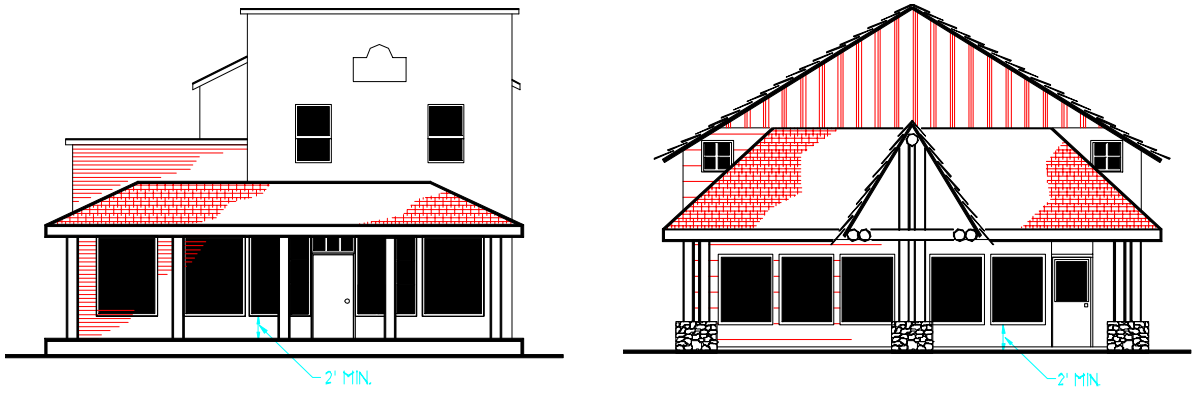
    c. Stained glass

    d. Multi-paned windows, or the appearance of multi-paned windows, in one-over-one, two-over-two, or four-over-four patterns

4. Windows sills should be situated at least 2 feet above the interior finished floor.

    a. Reflective or mirrored windows is discouraged.

    b. Window trim should be used.



Desirable Window Treatments

Building Color

Use building colors that are prevalent in the Nisqually Watershed.

Guidelines:

1. Natural woods are preferable to paint.

2. Facade colors should not be used to identify specific tenants as typified by national corporate fast food restaurants and gasoline stations.

3. Major architectural trim or details should complement the main building's base color. Color is normally applied to major architectural trim and details such as window trim, corner siding trim, doors and door frames, knee bracing, and columns.

4. Minor architectural details should be highlighted with minor accent color that complements base and major trim color. Minor accent color is normally applied to window sash, doors, storefront frames and small architectural elements.

5. Murals may be used on building facades and are encouraged to reflect the history or natural landscape of the Nisqually Watershed.

6. Tinting may be used as an accessory element to a desirable window treatment.

7. Earth-tone colors should be used for masonry building materials.

8. The base color of the main building or a complementary major accent color should be used for metal roofs.

9. Avoid bold or primary colors for the main body of buildings.

Building Lighting

Use exterior building lighting to accent and complement a building and its architectural details, but not to denote a corporate or commercial image.

Guidelines:

1. Exterior building lighting, if proposed, should be of an indirect source.

2. All indirect lighting should use cut-off lighting fixtures to conceal the light source from view.

3. Light fixtures that are not affixed to the building should be screened or hidden from view with plant materials.

4. Translucent panels or other features illuminated from behind are prohibited.

5. Avoid colored lighting on buildings except during holiday periods.

Signs

This section provides guidelines for the design and construction of signs in the Nisqually Watershed. Signs are critical to the success of local businesses, as well as to the visual quality of the Nisqually Watershed. Signs should reflect the rural and rustic character of the community, be expressive of the individual business, and be readable at the speed and distance at which they are viewed. Rural Commercial Activity Centers should be pedestrian-oriented hubs of local commercial activity with slower speed limits and sign sizes smaller than those outside.

All Signs: Provide the following guidelines for the design of signs in the Nisqually Watershed.

Guidelines:

1. Signs should be used for business identification purposes. Incidental information such as hours of operation, telephone number, credit cards accepted, merchandise available, and vacancy status is acceptable on free standing, monument, reader board, and wall signs.

2. Incidental information should not exceed 25 percent of the sign area.

3. One free-standing or monument sign is recommended for each street frontage.

4. No sign should exceed 32 square feet in the Rural Commercial Activity Centers or 48 square feet outside the Centers. Sign structures should not be included in calculating the sign area.

5. Double-sided signs are acceptable. The square footage calculation is applied to each side separately.

6. The use of more than two signs per business is discouraged.

7. The provisions of RCW 47.39, the Scenic and Recreational Highway Act; and RCW 47.42, the Highway Advertising Control Act – Scenic Vistas, should be met.

8. Signs should reflect the character and colors of the buildings and/or uses they identify. Color is appropriate to highlight and/or accent sign details.

9. Undesirable Signs. The following sign types are not representative of the Nisqually Watershed's historic development and are not recommended.

    a. A-board or sandwich board signs greater than 12 square feet in size on one side.

    b. Back-lit or internally lit signs.

    c. Business signs.

    d. Electronic signs, including time and temperature signs.

    e. Fluorescent signs.

    f. Monopole signs.

    g. Neon signs, except those denoting incidental information when designed within the area of a recommended sign type and occupying no more than 4 square feet of sign area. Neon should not be used for accent purposes.

    h. Portable signs.

    i. Projecting signs, except when designed as iconic signs.

Free Standing Signs: Design and construct monument signs with natural materials, and that are readable at the speed and distance at which they are viewed.

Guidelines:

1. Recommended maximum sign area: 32 square feet in Rural Commercial Activity Centers and 48 square feet outside the Centers.

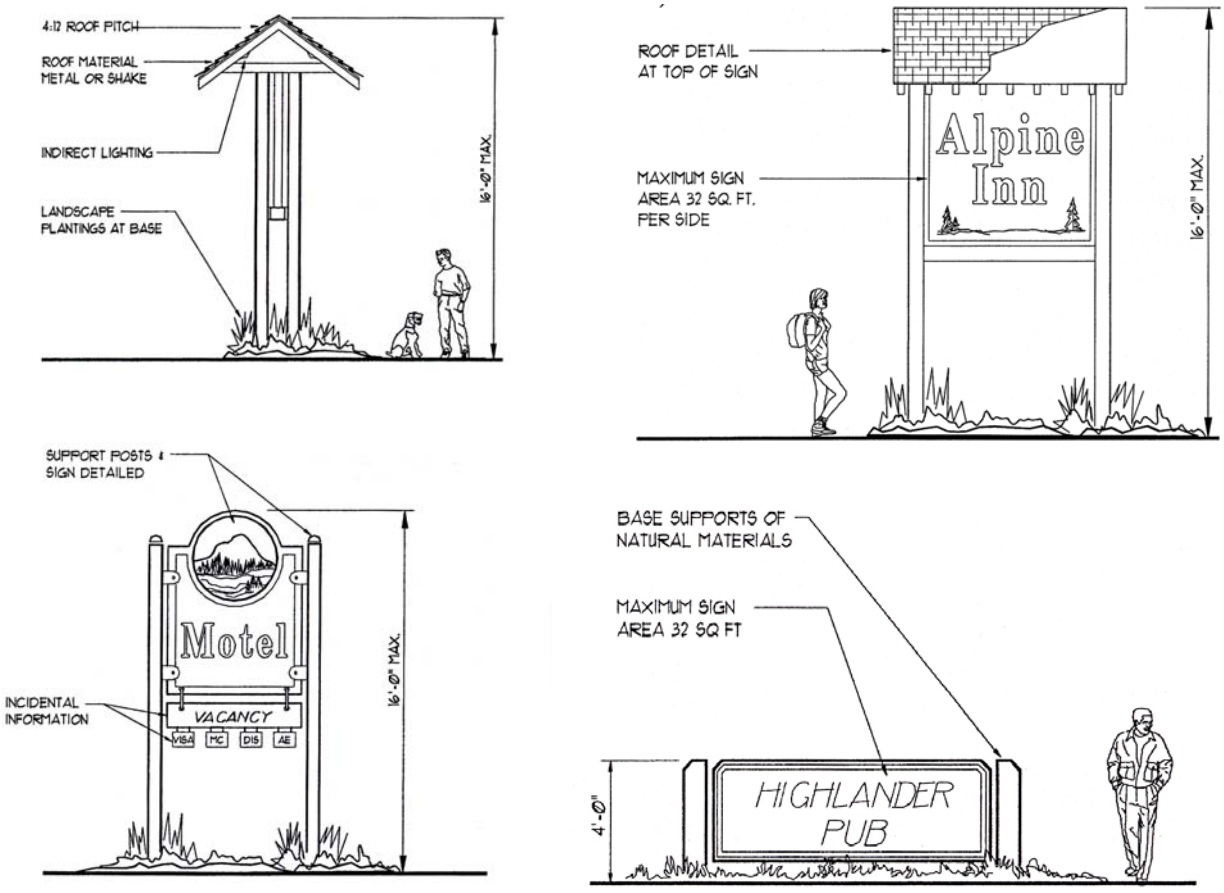
2. Recommended maximum height: 16 feet.

3. At least two support structures are recommended.

4. Support structures for free-standing signs should be made of or faced with natural materials.

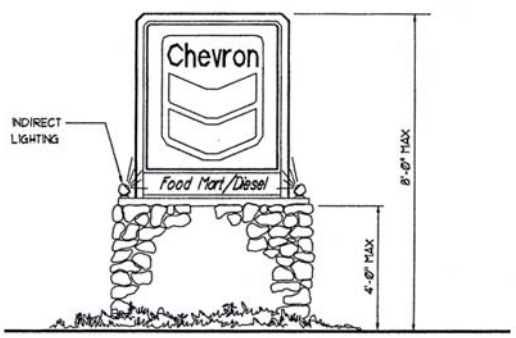
5. Roof, capital, landscape, or base details is encouraged.

Desirable signage details



Monument Signs

Design and construct monument signs with natural materials, and that are readable at the speed and distance at which they are viewed.



Desirable monument sign

Guidelines:

1. Maximum sign area: 32 square feet in Rural Commercial Activity Centers and 48 square feet outside the Centers.

2. Maximum recommended height: 8 feet.

3. Exterior base structures should be made of or faced with natural materials such as native stone, brick, wood, or timber materials.

Reader Board Signs

Encourage reader board signs for advertising or information dissemination only when designed to be an integral part of a free standing, monument, or wall sign.

Guidelines:

1. Reader board signs should be located within the main identification sign or sign support structure and not attached as an appendage.

2. Materials, colors, and letter styles should be similar to the sign of which it is a component.

3. Reader board sign area should not exceed 40 percent of the area of the identification sign.

4. The total area for reader board and identification signs should not exceed 32 square feet in Rural Commercial Activity Centers and 48 feet outside the Centers.

5. Reader board signs should not be back-lit.

Wall Signs

Encourage the design and construction of wall signs to complement the architectural character of on-site buildings and that conform to these design standards by using natural materials, indirect lighting, and limiting the number of signs.

Guidelines:

1. Wall signs should be affixed to the building.

2. No more than three wall signs should be affixed to a building elevation.

3. Wall signs should utilize natural materials such as native stone, wood, or timber materials.

4. Plastic signs are not recommended.

5. Wall signs should be indirectly illuminated.

6. The total area of wall signs should not exceed 32 square feet, or 10 percent of the total building face area on which it is located, whichever is less (building elevation area includes windows and doors, but does not include roof area).

Iconic Signs.

Encourage the design and construction of iconic signs that reflect the goods and services offered within the building to which they are affixed. Examples of iconic signs observed in the Nisqually Watershed include barber shop poles and ice axes.

Guidelines:

1. Iconic signs should not contain text

2. Iconic signs should not exceed a height of 6 feet and a width of 3 feet.

3. Iconic signs may be attached to a free standing or monument sign, or the building; but should not be attached to building extrusions such as eaves, overhangs, covered porches, roofs or other extruded architectural details.

4. Iconic signs should not project further than 6 feet from the building to which they are attached.

Marquee Signs

Encourage the design and construction of marquee signs with the architectural character of on-site buildings that conform to these design guidelines. Marquee signs should only be adhered to extruded architectural building details, such as porches, marquees, or porticoes.

Guidelines:

1. Marquee signs should be installed perpendicular to the front building elevation.

2. Marquee signs should not exceed 4 square feet in size.

3. Individual businesses should have no more than two marquee signs.

Planting Design

The purpose of this section is to encourage the use and preservation of native vegetation in plantings for commercial, industrial, and residential projects. Drought-tolerant plantings are recommended substitutes for native species to the extent that invasive species are not introduced into the Nisqually Watershed.

Guidelines:

1. Native plant species should be utilized.

2. At least 50 percent of all trees, shrubs, and/or ground covers should be native plant species. A waiver may be considered when in an area located in a forest fire hazard area. Any trees and vegetation that could accelerate a forest fire should be removed within 30 feet of a structure, or as determined by the local fire district.

3. Berms are not recommended for perimeter screening requirements in Rural Commercial Activity Center zones.

4. Long lines of tree plantings along street frontages are not recommended. Tree plantings should be grouped or clustered in natural, rather than formal, arrangements. No more than three trees should be planted in a row without an interruption of at least twice the distance of the tree spacing of that row.

5. Within Rural Commercial Activity Centers, any portion of a parking lot within 20 feet of a public road right-of-way should contain a vegetative screen along the right-of-way line. The perimeter street landscaping for the parking lot should not count toward the total interior landscaping recommended for the parking lot.

6. New surface parking lots with 10 or more spaces; or additions to existing lots 10 spaces or greater, should provide interior landscaping that complies with one of the following standards (planting islands or canopy trees). When a parking lot is divided into distinct areas, the project proponent may utilize different landscape options in distinct areas of the lot. Parking lots should be located no closer to the interior lot line than the minimum width of recommended perimeter landscape buffer. If the calculation of the number of trees or shrubs results in a fraction of less than 0.5, the project proponent may round down to the nearest whole number.

7. **Option 1 - Planting Islands**

    a. Interior landscaping area should be provided at the rate of 40 square feet per stall, or 15 percent of the total parking area ("parking area" includes the parking stalls, aisles, entryways), whichever is greater. At least one tree should be planted for every 200 square feet of landscaped area.

    b. Planting islands and areas that include trees should contain a minimum of 64 square feet, with a minimum width of 8 feet.

    c. Parking rows should have planting islands at the end of each row.

    d. When no planting island is provided, the number of parking stalls should be limited to 16.

8. **Option 2 - Canopy trees**

   a. Trees should be spaced at distances not to exceed 12 parking spaces.

      (1) Plant character within parking areas should be as follows:

         (i) **Trees.** A minimum of 70 percent required parking area trees should be deciduous or broad leaf evergreen, except if existing evergreen trees are retained, the percentage of deciduous trees should be decreased accordingly. Deciduous tree species should be selected based on their parking lot compatibility, i.e., high branching, no release of sticky substances, deep rather than shallow rooting, etc.

         (ii). **Shrubs.** Shrub and hedge material used should not have mature heights that exceed 36 inches, to provide ease of vehicular sight distance and pedestrian safety.

         (iii). **Vegetative ground cover/turf.** Vegetative ground cover/turf material should not have mature heights that exceed 36 inches, to provide ease of vehicular sight distance and pedestrian safety. Vegetative ground covers that are sensitive to foot traffic should not be used in landscape areas where foot traffic is likely.

   b. No parking space should be further than 60 feet from a parking lot landscape island.

   c. Landscape strips should be installed along all State highway frontages of non-residential uses in Rural Commercial Activity Centers and rural residential areas, except for a distance of 45 feet from the edge of each access point onto the highway.

9. Landscape areas should be distributed evenly throughout the parking are, where possible. Clustering of landscaping is acceptable to preserve existing vegetation or accommodate specific design objectives (e.g, solar access, water conservation, passive recreation, transit facilities, or architectural design).

10. Sodded or seeded lawns should be avoided in industrial and commercial projects, except where necessary for recreation or outdoor gathering places.

11. Ponds should be contoured in conjunction with other landscape features for an aesthetically pleasing appearance.

Significant Trees Retention

Encourage retention of significant trees to preserve the natural characteristics of the Nisqually Watershed.

Guidelines:

1. In required perimeter landscape areas, healthy, significant trees over 12 inches in diameter for conifer and 6 inches in diameter for deciduous should be preserved.

Lighting

The purpose of this section is to offer design guidelines for lighting that enhance visibility and security while accenting key architectural elements and landscape features.

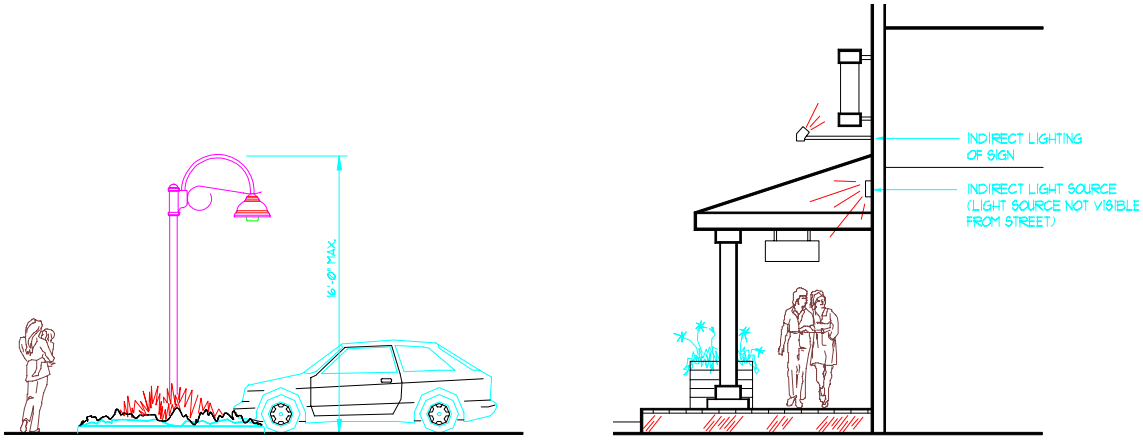
Lighting Orientation

Encourage lighting orientation in a manner that will accent buildings and landscape features while minimizing glare.

Guidelines:

1. All lights more than 7 feet above the ground should be cut-off or downward directional lighting.

2. Lighting should be of an indirect source.



Desirable lighting details

Lighting Intensity

Encourage the illumination of large areas with multiple, low-intensity light sources rather than single, high-intensity light sources.

Guidelines:

1. Illumination should not exceed an average of 1.2 foot-candles along street frontages

2. Illumination should not exceed an average of 0.6 foot-candles within parking facilities.

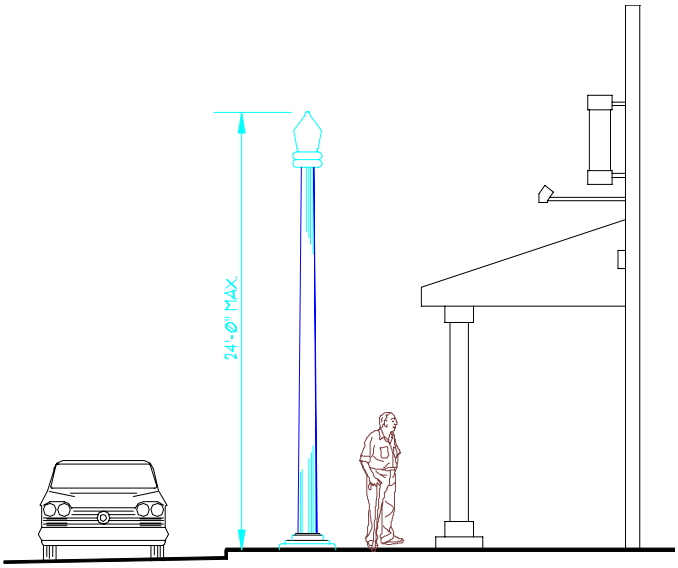
Lighting Design

Encourage the use of lighting fixtures of a traditional color and design that will accent and complement on-site buildings that conform to these design guidelines.

Guidelines:

1. Ornamental pole lamps that approximate the Nisqually Watershed's historical character should be used.

2. On-site light standards should not exceed a height of 16 feet.



Street Furniture

The purpose of this section is to improve the quality of development in the Nisqually Watershed by instituting standards for street furniture that enhances the pedestrian quality of sidewalks and outdoor gathering spaces, and be consistent with the character identified in these design guidelines.

Encourage the use of street furniture that reflects the historic, rustic or rural character observed in the Nisqually Watershed.

Guidelines:

1. All furniture within the public right-of-way should be approved by the Washington State Department of Transportation or the Pierce County Public Works Department, depending on the jurisdiction of the road, as to its type, style, function, and color.

2. Outdoor furnishings should be of a commercial grade designed for heavy public use.

3. Where proposed, street furniture should be supportive of the character and design of the building, facility, or site upon which it is located. The following styles may be chosen, but should be consistent with and supportive of the primary structure:

    a. Rustic

    b. Heavy timber/log

    c. Historic - Victorian or Turn-of-the-Century

    d. Rural

    e. Northwest Cascadian

4. Benches, tables, trash receptacles, planters, shelters, gates, fences, bicycle racks, bollards, and kiosks should be constructed of materials that are characteristic of the architecture they support.

5. Street furniture may be selected from catalogs, or custom constructed, and should utilize the following materials or material combinations:

    a. Concrete

    b. Dimensional lumber

    c. Iron (decorative)

    d. Iron and wood

    e. Log

    f. Native stone

    g. Timber

    h. Timber products

Street Furniture Quantity

Encourage the use of street furniture within Rural Commercial Activity Centers that accommodates the volume of pedestrian traffic a business generates.

Guidelines:

1. All new commercial development should incorporate outdoor seating areas. Seating areas may include any one or combination of the following:

    a. One bench per 2,000 square feet of floor area.

    b. Six feet of seating wall for every 2,000 square feet of floor area.

    c. One table with a minimum of four seating spaces (bench or chairs) per table for every 2,000 square feet of floor area.

2. All new commercial development should include at least one trash receptacle and one bicycle rack (2 stations).

3. New commercial development should include planters and overhead shelter as a part of pedestrian walkways, plazas, courtyards, or open spaces. Overhead shelter may include:

    a. Fire-resistive timber roof structures

    b. Arbors

    c. Trellises

    d. Gazebos

Green Building Techniques

Green building techniques produce safer, healthier and more efficient homes; reduce impacts of construction and development; and improve and protect valuable community and natural resources. Green building promotes energy efficiency, good indoor air quality, site ecosystem protection, water conservation, and use of "green" building materials.

Green building technologies are typically applied in conjunction with Low Impact Development (LID) technologies. Green building applies to the construction of the structure, while LID applies to the protection of the building site. The incorporation of green building in the Nisqually Watershed will further sustainability of the environment.

Built Green™ Home Building Program

Built Green™ is a voluntary home building certification program that has a defined, easy to understand rating system that quantifies environmentally friendly building practices. The program uses a variety of building materials and practices from which a homeowner can choose to enhance the home's performance and value. The program's rating system ranges from one to five stars, depending on the extent of technologies used.

Green Building Features

The following is a list of some of the green building practices that are applicable to new home construction, multi-family and commercial projects and remodels that can be applied in the Nisqually Watershed. The practices generally fall under the following categories:

- Energy Efficiency
- Indoor Air Quality
- Resource Conservation
- Waste Management
- Water Quality Protection

Many of the guidelines and principles listed below can exist in multiple categories. Green building is founded on an integrative principle of multiple systems working together toward a common goal, versus multiple systems working separately – potentially against one another – to reach an uninformed whole goal.

Energy Efficiency

The benefits of an energy-efficient home include cost savings, comfort, and protection of the environment. A well-insulated, well-sealed home with efficient windows, appliances, lighting and equipment is a basic green building. Incorporating passive solar designs and solar water heating is cost effective and a prudent investment to reduce exposure to future energy cost increases and to protect our environment. An *integrated mechanical system* works in concert with other systems of the building to use less energy and create a comfortable interior environment.

Building Orientation

The surrounding and climatic features of the building site can provide zero cost energy, or *borrowed* energy that reduces monthly energy bills – the wind, the sun, shade from large trees can temper the environment against which the HVAC (heat, ventilation, cooling) plant is working. The right orientation of a home on a lot can create year-round comfort and reduce energy costs. Home orientation encourages solar heating and reduces the potential for overheating while. The location of windows or window treatments both minimizes and maximizes solar gain; and can maximize passive ventilation and daylighting. Determining optimal orientation is influenced by several site factors, such as topography for breezes, major trees for shading, landscaping and views. To reconcile all of the influences, careful site, architectural, and interior floor planning are encouraged to take advantage of solar benefits.

Mechanical Systems

Design and installation of mechanical systems often leads to unwanted heat loss through poorly designed, or uninsulated, unsealed ductwork. Many mechanical systems are oversized, which results in frequent cycling, thus lowering unit efficiency. An energy-efficient integrated mechanical system decreases annual operating costs and reduces energy load. Examples of energy efficient mechanical features include:

- Centrally located furnace.
- 90%+ energy efficiency furnace.
- Thermostat with "fan only" switch.
- Sealed-combustion gas or wood-burning fireplace or stove.
- Setback thermostat.
- Active solar heating system.
- Two or more thermostats controlling separate zones from a single heating and/or cooling system.
- In-floor heating system, insulated slab (for new construction) underneath and perimeter.
- Heat recovery ventilation systems
- Whole-house fans (for summer ventilation)

The assembly of the walls can assist in the efficiency of the mechanical system. Minimum stud cavity insulation established by local building codes with an exterior thermal break increases the ability for the house to retain heat in the winter months and remain cooler during summer.

Efficient Household Appliances

Appliances use electricity and water with varying degrees of efficiency. Some refrigerators today can use twice the energy of others. Electric heating and cooking is inefficient compared to gas or solar. Every kilowatt-hour (kwh) used adds over 2 pounds of C02 (coal generated electricity) to the atmosphere, the largest contributor to global warming. Builders are encouraged to use appliances that have "Energy Guide" or ENERGY STAR® labels to insure that they meet energy efficient criteria.

Energy efficient appliance methods include:

- Front loading clothes washers – use half the water of top loaders, less soap, shorter cycle, drier clothes reduce dryer load
- Natural Gas or Propane clothes dryers
- Solar hot water preheating
- A clothesline for drying clothes – simple and no-tech
- On demand water heater, gas or propane fired – uses energy only when hot water is required

- High efficiency dishwasher – Energy Star, water / energy efficient
- High efficiency refrigerator – Energy Star, high insulation, efficient compressor, high performance seals

High Efficiency Water Heater

Water heating impacts both water consumption and energy use. Heat is lost from hot water pipes as the water travels from the tank to the shower or sink. If it is a long distance, water is wasted while waiting for the water to warm up at the faucet or showerhead. Inefficient hot water heaters use fuel that can be offset by solar energy.

Lighting

Incandescent light bulbs are an inefficient means of generating light using four times the electricity of compact fluorescent bulbs. Naturally daylit buildings, through ample windows, clerestories, or skylights reduce the lighting load and improve the interior environment. Motion sensors and timers on interior and exterior lights reduce wasted energy.

Air Sealing

Advanced caulking is part of the airtight drywall approach (ADA) for framed structures, which is an advanced sealing package that goes beyond basic practice. Caulk or gasket drywall is installed on exterior walls at the top and bottom plates; windows and doorframes; on interior walls at intersections with exterior ceilings; and at electrical, plumbing or mechanical penetrations in the drywall.

Indoor Air Quality

Air in new homes can be more polluted than outdoor air. Many products are manufactured with urea formaldehyde, a suspected human carcinogen. Cabinets, countertops, shelving and furniture are made from particle board glued together with urea formaldehyde that is released into the home for years. Paints and floor finishes also contain chemicals that are not healthy to breathe.

The construction industry has watched the evolution of these indoor air problems and in response has developed alternate products to remedy the conventional indoor toxicity situation. For example, not only do solvent-free adhesives eliminate many of the suspected and known human carcinogens, but they also adhere better. Paints that are free of volatile organic compounds are commonly available. New construction materials such as OSB and Medite that contain no urea formaldehyde are entering the market.

Providing good ventilation is critical to good indoor air quality. A number of techniques and products are available to provide an exchange of fresh air, isolation of combustion by-products, and the active ventilation of moisture and other indoor pollutants. Ventilation of attached garages reduces the quantity of automobile or chemical byproduct from entering the home, and elimination of cigarette smoke inside the building greatly reduces the risk of asthma, cancer, and respirator problems of inhabitants.

Existing or historic buildings may be drafty or "loose", allowing air and heat to escape the building envelope. In many ways, this is a component of their longevity, allowing them to move with seasonal temperature and humidity fluctuations, and drying out in the summer. However, uninsulated wood buildings do no perform very comfortable in the cool, damp, northwest winters. When insulating such buildings, care must be taken to preserve or introduce ventilation at wall cavities, attics, crawl spaces, and basements, while increasing water tightness of the exterior envelope. Care must also be taken in selecting replacement windows and doors for historic structures. While a new product may perform better with a decreased aesthetic, an improved weather stripping or storm window can retain the historic character and double the life of a century-plus year old Douglas fir window.

Carpet

Using low pile or natural fiber carpet and pad can greatly improve indoor air quality. Installing carpeting by tacking rather than using glue also reduces air pollutants. There are also natural fiber carpets available, such as jute, sisal and wool that many builders offer to improve air quality. Reduction of the amount of carpeting and use of alternate flooring made from sustainably harvested wood or bamboo reduces the ability of allergens or mold growth to occur in high traffic areas.

Paints and finishes

Many Built Green™ homes use low-VOC and low-toxic interior paints and finishes to reduce toxins ordinarily associated with other paints. Using these types of paints helps to improve the overall indoor air quality of the home. Clean up of such water-borne finishes are less toxic than conventional oil based paints.

Ventilation

Greater air tightness creates a need for mechanical ventilation to avoid potential indoor air quality problems. Balanced or slightly positive ventilation keeps outdoor pollutants from being drawn into the house, prevents back drafting or spillage from combustion appliances (due to under-pressurization), and prevents moisture migration into structural cavities (due to over-pressurization). Ventilation can be provided by quiet fans with automatic controls or by heat-recovery ventilators. In a balanced system, air brought indoors by one fan is exhausted outdoors at the same rate by another fan.

Resource Conservation

Resource Conservation occurs at multiple scales. At a regional scale, the impacts of development can conserve, deplete, or restore the natural resources in the development area. At a building scale, Resource Conservation can reduce the impact internally and externally. Well managed site design through procurement of materials and reduced waste can reduce the impact of construction on the regional character, waste stream, and health of the inhabitants. Green building technologies promote resource conservation through a reduced use of timber and emphasis on sustainably procured or recycled materials. They promote simple, more durable systems that are easy to maintain and repair.

Resource conservation is many things, including:

- Preservation of open, natural, undisturbed land and protection of wildlife and timber resources.
- Understanding the life cycle capacity of materials and construction systems.
- Conservation of water resources for its habitat and hydrologic values.
- Reduction in solid waste to reduce the rate of replacing open spaces with landfills.
- Well managed waste and recycling strategy during and after construction
- Utilization of materials that are sustainably harvested to reduce environmental impacts
- Regional materials promote local business and reduce transportation dependency.
- Low impact development models preserve the development area

Regional development scale – where are we?

- Understand the beauty, features, and ecological functioning of the watershed

Local development scale – which part of the geography are we in?

- Understand the local topography, major forests, rivers, ridges, valleys - where, how, and why it is –
  - Access to the site - roads
  - Access to the river - paths
  - Runoff
  - Existing habitat
  - Special features to the site
  - Microclimate
  - Solar aspect

Immediate development scale – how do the development actions directly impact the health of the place?

- Understand and quantify uses and their impact on the local (forest, meadow, watershed) ecosystems
  - Scale of development – is it appropriate or too much?
  - Balanced use
  - Appropriate function
  - Contextual compliance
    - Ecological and Aesthetic
  - Watershed checks and balances
  - Comparisons of positive growth vs. habitat removal / relocation

Advanced Framing/Extra Insulation

Advanced framing is a technique used by builders help reduce construction costs and increase energy savings. On average, advanced framing uses 30 percent less lumber, takes less time to construct, and costs less to build because the reduced use of lumber more than offsets the additional cost of extra insulation. Construction cost savings is estimated at $0.29 per square foot of wall area. Total savings for this measure alone are 2 percent to 4 percent of total energy use.

Certified Wood

The world has lost nearly two-thirds of its original forest cover, and what remains is disappearing at the rate of more than 2.3 acres per second – more than 42 million acres annually. Certified wood products are grown and harvested through sustainable forest practices. This includes conserving bio-diversity and providing equity for local communities, fair treatment to workers, and creating incentives for businesses to benefit economically from responsible forestry practices.

Certified forest products come from "well-managed" forests. Candidate sources may include a natural forest, a plantation, a large commercial operation or a small-scale community project. In short, certification:

- Ensures that timber harvesting is ecologically sound, and socially and economically beneficial to local communities.
- Creates market incentives for producers to responsibly manage forests and harvest timber.
- Gives consumers the power to positively "vote" for conservation when they buy certified wood products.
- Contributes to the preservation of forests and forest wildlife worldwide.

To date, nearly 25 million acres of forest worldwide have been certified according to FSC standards, including 3.5 million acres in the United States. Although costs and lead times may be higher than standard wood products, the ecological benefits over the long run outweigh the immediate costs.

Engineered Wood

Engineered lumber products are an innovative alternative to the solid sawn lumber materials that are harvested from diminishing old-growth forests. Twenty years ago, the average tree harvested from our National Forests was 24 inches in diameter. Today the average is 13 inches. We have depleted the resource. Forest products companies have responded to the situation by developing engineered products to utilize fast growing farm trees to supplant the reduced harvest from old forests. These products are stronger, straighter and lighter, while using less wood fiber to perform the same structural functions as solid sawn lumber. Fast growing tree farms are an example of a renewable resource in our lifetime.

Plastic Lumber

There are many manufacturers of plastic lumber nationwide. Recycled plastic lumber or plastic/wood composite lumber provide durable alternatives to solid wood for exterior applications such as fences, benches, decking, docks, retaining walls, picnic tables, and landscape borders. Due to its weather-and insect-resistant nature, plastic lumber can readily substitute for treated wood in non-structural applications. Plastic lumber is also rot- and corrosion-proof, and it will not crack, splinter, or chip. It has a long life expectancy in exposed, sub-grade or marine applications, and does not leach chemicals into ground or surface water or soil as treated wood can.

Plastic lumber is resistant to vandalism and does not require painting. It is available in a variety of colors, including white, although many companies have a standard color of either brown or black. These products can be nailed, screwed, sanded, glued, or turned on a lathe with standard woodworking tools. One challenging aspect of working with plastic lumber is its high expansion coefficient, which must be considered during installation; manufacturers will provide structural support specifications.

Fiber Cement Siding

Traditional wood siding contributes to the over-harvesting of our forests because, to be effective, it requires either clear material free of knots or large cedar or redwood trees to be harvested. Pine siding is a poor alternative, as it can warp, split or crack and needs to be repainted frequently.

Fiber-cement composites are resource-efficient, and in addition to durability and low maintenance, offer a very good fire rating when compared to wood or metal siding. The wood fiber in these products is reclaimed from wood processing waste. It can also be harvested from small diameter, fast-growing species. Minimizing the need to replace any siding product offers a maximum consumer benefit to the homeowner, in addition to the environmental impact. Many of the fiber-cement composites offer a 50-year warranty.

Natural Materials

Durable natural materials, such as stone or brick masonry, age well and retain beauty without excessive maintenance while reflecting the regional Pacific Northwest character.

Waste Management

Americans today generate over four pounds of household waste per person per day; only 17 percent of that is recycled. Waste generated goes to increasingly crowded landfills and some waste virtually never breaks down. Typical new construction creates literally tons of debris. Home construction can produce up to 5 tons of waste per house. Job site wastes include metals, wood and cardboard, which represent over 50 percent of the debris normally taken to landfills. Green building options include:

- Provide a built-in kitchen recycling center.
- Provide outdoor worm bins or compost bins
- Minimize job site waste by using materials wisely and prohibit burying construction debris.

- Recycle job site waste. Using materials effectively increases the value of the home. Recycled waste diverts trash from the waste stream and is used converted into new, usable materials.
- Composted waste. Composting reduces the waste hauled to the landfill. Compost, turned to soil, is beneficial to gardens.
- For development projects that employ multiples of the same product, request the manufacturer to reduce packaging or employ reusable protective shipping containers.
- Work with product representatives to ship products in recyclable packaging.

Water Resource Protection

Conserving water use within the home is accomplished by utilizing high efficiency plumbing fixtures, which include harvesting rainwater to flush toilets. They also include use of low-flush or dual flush toilets.

Water resource conservation as it relates to the natural environment is discussed in further detail in the Low Impact Development section of this chapter.