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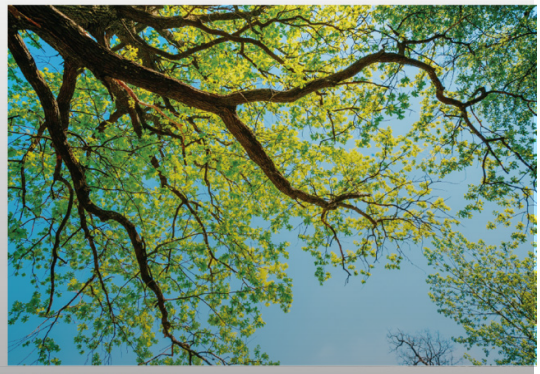
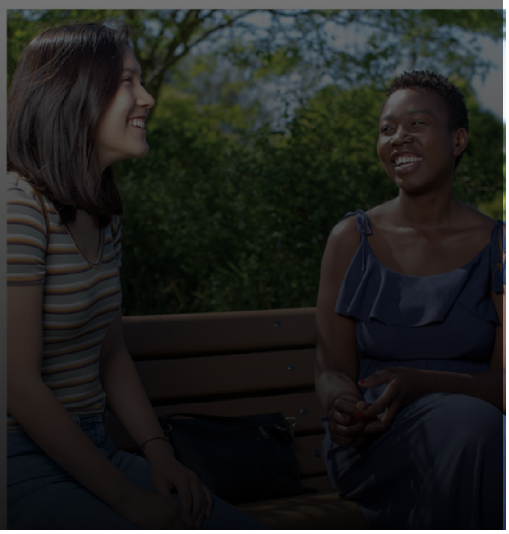
We strengthen communities



Incentivizing low-impact development

Beyond permit requirements

GUIDANCE FOR LOCAL JURISDICTIONS



GROWTH MANAGEMENT SERVICES

Going above and beyond

Guidance for local jurisdictions in influencing developers' decisions to incorporate additional LID solutions

This guidebook is designed to help jurisdictions develop incentives to increase developer use of Low-Impact Development (LID) "above and beyond" existing stormwater permit requirements. LID helps filter and clean stormwater, improving Puget Sound waterways and quality of life for all who call the region home. The Washington State Department of Commerce and Puget Sound Regional Council convened the Building Green Cities Advisory Committee with representation from cities, counties, local developers, universities, the environmental community, and state and federal agencies to expand LID implementation. Over the course of three years, the advisory committee guided the scope and research of the project, resulting in the contents of this guidebook and its supporting documents. This guidebook includes tools to help incentivize municipal staff, developers, and technical consultants to implement LID "above and beyond" practices.

Washington State Department of Commerce mission: The Department of Commerce (Commerce) touches every aspect of community and economic development. Commerce works with local governments, businesses, and civic leaders to strengthen communities so all residents may thrive and prosper.

Puget Sound Regional Council: PSRC develops policies and coordinates decisions about regional growth, transportation, and economic development planning within King, Pierce, Snohomish, and Kitsap counties. PSRC is composed of over 80 jurisdictions, including all four counties, cities and towns, ports, state and local transportation agencies, and tribal governments within the region.

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Introduction

Definitions and acronyms

BGC
Building Green Cities. A project of the Washington State Department of Commerce in partnership with the Puget Sound Regional Council to research and identify incentives for developers to go beyond municipal stormwater permit requirements.

BMP
Best Management Practice. A practice, or combination of practices, that is determined to be an effective (including technological, economic, and institutional considerations) means of preventing or reducing the amount of water pollution generated by nonpoint sources.

LID
Low Impact Development. A green infrastructure approach to stormwater management that integrates on-site natural features with distributed stormwater BMPs. Sometimes referred to as green stormwater infrastructure (GSI).

New Development
New development refers to the construction of structures, creation of hard surfaces, or other land-disturbing activities, as defined and applied in Chapter 58.17 RCW. Projects meeting the definition of redevelopment (see below) shall not be considered new development.¬

NPDES
National Pollutant Discharge Elimination System. A permit program through the U.S. Environmental Protection Agency (EPA) that addresses water pollution by regulating point sources that discharge water pollutants to U.S. waters.

Redevelopment
Redevelopment refers to the creation or addition of hard surfaces; the expansion of a building footprint or addition or replacement of a structure; structural development including construction, installation or expansion of a building or other structure; replacement of hard surface that is not part of a routine maintenance activity; and land-disturbing activities on a site that is already substantially developed (i.e., has 35% or more of existing hard surface coverage).

Retrofits
Retrofit projects involve installing new stormwater BMPs or modifying existing stormwater BMPs to manage runoff from existing developed areas that are not associated with new development or redevelopment activities. Retrofit projects are implemented voluntarily with a goal of mitigating impacts from existing conditions.

Social Marketing Report
Social Marketing Reports present research focusing on the behavior of a particular target market, identifying information relating to the opinions, needs, attitudes, and motivations of a group of people.

Stormwater Runoff
Stormwater runoff is generated from rain and snowmelt events that flow over land or impervious surfaces—such as paved streets, parking lots, and building rooftops—and does not soak into the ground.

Advancing Low-Impact Development (LID)

Washington's Puget Sound region is one of America's fastest growing areas. Local jurisdictions direct new development primarily into urban growth areas due to geographic constraints and Growth Management Act policies. While this growth brings many benefits to the region, the increasing amount of hard surfaces can strain the environment by preventing water from absorbing into the ground, increasing the risk of polluted stormwater runoff that threatens local waterways. To protect the health of our streams, rivers, lakes, and Puget Sound, local jurisdictions can build cities that more effectively manage stormwater runoff, while increasing density and livability for our growing population.

Why cities?

Redevelopment in cities—especially **urban centers**—is a regional priority because of the environmental benefits to Puget Sound from reducing sprawl and redeveloping existing polluting development. In rapidly growing urban centers, the increase in hard surfaces from development such as roofs, sidewalks, and roads prevents water from absorbing naturally into the ground. Instead, stormwater travels over hard surfaces, collecting toxic metals, oil, grease, pesticides, herbicides, bacteria, and nutrients along the way. Due to a lack of pervious or permeable surfaces in dense urban areas, much of this toxic stormwater flows directly into the region's streams, rivers, and into Puget Sound, contributing to the more than 14 million pounds of toxic pollutants that enter Puget Sound annually (Ecology, Toxic Chemicals in the Puget Sound). These pollutants are highly toxic to fish, leading to death and species decline for native species like coho salmon, an important part of the culture, history, and economy of the Pacific Northwest. These pollutants can also pose human health risks. Cities have a unique opportunity to help reduce these impacts by exploring creative LID solutions with developers that go beyond permit regulations.

Why LID?

LID offers stormwater management and filtration benefits that can reduce pollution in Puget Sound waterways and help protect our native animal, plant, and fish species. Encouraging developers to implement LID solutions in their projects will help to reduce the water quality impacts of urban stormwater runoff to freshwater and marine waterbodies while also increasing the attractiveness and livability of urban centers for residents and visitors. However, these benefits and other incentives for redevelopment need to be explored, explained, and emphasized for the market to respond more quickly and keep pace with region-wide growth.

Given the environmental need and social benefits of LID BMPs, it is critical that jurisdictions have tools to incentivize "above and beyond" regulatory requirements in order to meet water quality goals.

What is Low-Impact Development?

Low-Impact Development (LID) is a green infrastructure approach to stormwater management that integrates on-site natural features with distributed stormwater best management practices (BMPs). These LID BMPs can prevent clean stormwater from becoming contaminated, slow stormwater runoff at its source, infiltrate water into the soil, and mitigate toxics through soil microorganisms. This process removes pollution from the water by mimicking natural conditions. LID practices include rain gardens, cisterns, trees and plants, permeable pavement, green roofs, and minimal excavation foundations. LID practices can help reduce the

quantity and improve the quality of stormwater flowing off impervious surfaces, thereby reducing pollutants and ultimately shifting less cost to the public.

In addition to filtering stormwater, LID solutions offer co-benefits by building natural habitat, attracting pollinators, and improving air quality. LID solutions can add site amenities by enhancing landscaping and creating pleasant environments with beautiful flowers and plants and creating natural gathering spaces that increase property values while helping properties meet landscape and stormwater requirements. These social and environmental benefits can increase the value of a property to the developer, owner, or tenant.

The Washington State Department of Ecology (Ecology) requires developers to evaluate and implement LID BMPs for new development and redevelopment in the majority of the cities and counties in Washington. Although many jurisdictions have focused their LID programs and efforts in the public right-of-way, many of the impervious surfaces in a jurisdiction are on private property. As such, **jurisdictions have a significant opportunity to increase installation of additional LID by working with private developers, engineers, and property owners to share information about LID benefits and incentivize its use in new development, redevelopment, and retrofit projects.**

Vision 2050

PSRC has developed a regional growth strategy through 2050 to balance growth with sustaining a healthy environment, thriving communities, and a strong economy. Vision 2050 goals around development and stormwater include:

Reducing stormwater impacts from transportation and development through watershed planning, redevelopment and retrofit projects, and LID.

Maintaining and restoring natural hydrological functions and water quality within the region's ecosystems and watersheds to recover the health of Puget Sound.

Locating development in a manner that minimizes impacts to natural features.

Promoting the use of innovative environmentally sensitive development practices, including design, materials, construction, and ongoing maintenance.

What is “above and beyond?”

The Building Green Cities Advisory Committee has developed this LID Guidebook for Jurisdictions to provide tools and resources to local governments to encourage developers to incorporate LID in (re)development projects “**above and beyond**” what is already required for municipal stormwater permits in urban areas.

Current stormwater regulations require developers to use LID BMPs onsite and to go through a mitigation process when designing and developing projects. However, there are many instances where permits are not required, portions of the land on site are not subject to LID, or there are existing areas that could incorporate additional LID BMPs above what is already required. By working with developers before projects are fully designed, local jurisdictions can increase the likelihood that sites will implement LID “above and beyond” the National Pollutant Discharge Elimination System (NPDES) municipal stormwater permit requirements, bringing cost benefits to the developer, improving site conditions and aesthetics for tenants and communities, and improving water quality and quantity in the region.

In this context, “above and beyond” could refer to any of the following situations:

Using LID when a project is otherwise under the size thresholds.

LID solutions that manage runoff from surfaces smaller than the required thresholds can be compact and cost-effective while offering ecological and aesthetic benefits to building occupants, customers, and neighbors. Even when not required, LID can improve onsite drainage patterns, reduce the risk of a clog or pipe failure, mitigate local heat island effects, and add value to a project.

Using infiltration when measured rates are below the infiltration rate threshold (based on the technical infeasibility criteria included in the Stormwater Management Manual for Western Washington – SWMMWW).

Sites with native soils below the infiltration rate threshold can still infiltrate runoff from hard surfaces. LID solutions can reduce infrastructure costs to convey runoff far from the source and may eliminate the need—and related costs—to connect to a storm drainage system.

Using optional BMPs (e.g., vegetated roofs, rainwater harvesting, and minimal excavation foundations).

Although optional BMPs are not required to be evaluated as part of most onsite stormwater management lists, they can provide flow control and many other benefits to a project. For example, vegetated roofs can offer insulating value to a building and reduce heating/cooling loads. Vegetated roofs can also add aesthetic value to neighboring buildings, as well as tenants/customers. Rainwater harvesting can reduce potable water demand. Minimal excavation foundations can extend down to bearing soil without excavation (potentially saving on excavation and foundation costs). Other benefits for optional BMPs are detailed in Section 2.

Using bioretention or permeable pavement in a drainage basin that is flow control exempt (e.g., Puget Sound).

A basin is considered flow control exempt when it drains to a receiving water listed in Appendix I-A of the SWMMWW, which are typically large water bodies deemed by Ecology to be less susceptible to impacts due to increased flowrates.

Bioretention can provide water quality treatment and aesthetic benefits to a neighborhood. It may also reduce the need for stormwater management infrastructure and reduce the frequency of localized flooding. Permeable pavement manages rain where it falls, reducing the need for costly infrastructure to convey runoff further from the source, and potentially eliminating the need (and related cost) to connect to a storm drainage system. Permeable pavement can also reduce vehicle noise, puddles/splashing, and localized heat island effects.

Using BMPs to accommodate unmanaged runoff from offsite areas or existing surfaces, in additional to what is required for onsite stormwater management.

Constructing BMPs larger than the minimum area required provides capacity to accommodate changing rainfall patterns, reduces risk of overflow or clogging, adds resilience to onsite infrastructure, and may eliminate the need (and related cost) to connect to the storm drainage system. Constructing BMPs that manage stormwater offsite can support neighborhood aesthetics, drainage improvements, and provide educational opportunities for the community in public spaces.

On the following page, read about how one local jurisdiction went "above and beyond" implementing LID BMPs in its own municipal projects.

Leading by example

Jurisdictions can lead by example by going "above and beyond" and implementing LID BMPs in their own projects. When jurisdictions adopt LID BMPs, they help build public knowledge and support for green infrastructure, showcase LID reliability, and model maintenance techniques.

CASE STUDY from the City of Tacoma (WA): Tacoma Cheney Stadium

TACOMA CHENEY STADIUM

- 6 acres of permeable pavement
- Expected reduction of site stormwater volumes of 53%
- 96% regionally sourced materials (within 50 miles of site) by cost
- 14,680 square feet of sidewalk area, including crosswalks and wheelchair ramps

Photos from: www.cityoftacoma.org/government/city_departments/environmentalservices/surface_water/green_stormwater_infrastructure__gsi_/gsi_projects/cheney_sustainable_stormwater_project; greenroads.org/141/38/cheney-stadium-sustainable-stormwater-project.html

The Cheney Stadium site was rebuilt using green infrastructure and power conservation solutions. **The project includes approximately six acres of permeable pavement, an infiltration trench, three bioretention rain gardens, sustainable landscaping, and seven acres of new tree canopy.** Initially this project was estimated to reduce the stormwater leaving the site by 66%. However, over the past two seasons, **the site has far exceeded the modeling predictions.**

This project is part of a larger initiative in the Flett watershed to infiltrate stormwater wherever possible, thereby removing it from the system and reducing the volumes discharged through the Flett Holding Basin, which is increasingly limited in capacity. This project was constructed in two phases with a total of $3.1 million in construction costs. **Traditional stormwater improvements to achieve equivalent mitigation would cost nearly double that amount.**

The result exceeded the city's vision of sustainable stormwater management for a large impervious commercial site by taking a holistic view of the site and incorporating other sustainable elements. This project

demonstrates that a sustainable approach can exceed a property owner's needs, benefit city infrastructure, and do so at an affordable price.

Who should use this guidebook?

Jurisdictions

This guidebook is intended for municipal staff. Municipal staff, specifically those involved in permitting, planning, stormwater management, green infrastructure, and incentive programs, can use this guidance to encourage and incentivize developers to incorporate as much LID as possible on new and redevelopment sites. This guidebook offers staff resources to facilitate and support conversations with private developers, engineers, designers, and property owners about LID BMPs. It also provides a set of tools to identify, evaluate, and implement incentive programs.

Whether a jurisdiction is refining existing tools and talking points for meeting with developers, leading by example on "above and beyond" installation, or implementing a new incentive program, this guidebook has tools that can help staff in the process.

Developers

This guidebook also provides **tools and resources that may be valuable to developers** who are proactively seeking out LID information, training, and partnership opportunities. If you are a developer, please use the table below to jump directly to the resources most relevant to your work.

BMP Factsheets
These factsheets are designed to make selecting, installing, and maintaining LID solutions easier and more affordable for developers.

Western Washington Stormwater Code Matrix
This matrix identifies the relevant stormwater manuals in Puget Sound jurisdictions and highlights jurisdictions with additional requirements.

Western Washington Incentives Matrix
This matrix highlights current incentive programs throughout the region.

Directory of LID vendors and contractors, BMP costs, and tools for financing
This directory offers an up-to-date picture of the LID marketplace in Washington state.

Directory of LID trainings, certification, and technical assistance resources
This directory links to free LID and stormwater management technical manuals, and LID, Green Building, and industry-specific trainings and certifications.

Using this guidebook

Responding to the need for advancing low impact development (LID) throughout the region, the Washington State Department of Commerce (Commerce) and Puget Sound Regional Council (PSRC) initiated efforts to develop a **guidebook** that would help local jurisdictions develop incentives to increase the use of LID solutions, going "**above and beyond**" existing stormwater permit requirements. Going above and beyond offers both immediate and long-term benefits to both developers and jurisdictions, as installing additional LID best management practices (BMPs) at the time of new or redevelopment **reduces the need for future retrofits** to maintain and improve water quality.

Commerce is responsible for providing technical assistance and resources to local governments. This guidebook addresses elements of the Growth Management Act (GMA) as it applies to LID onsite stormwater management practices in urban growth areas. This effort was funded by the United States Environmental Protection Agency's (EPA) National Estuary Program through the Puget Sound Partnership and the Washington State Department of Ecology. As such, this guidebook focuses on regional urban centers within the Puget Sound region, though much of the guidance and included resources can be applied statewide.

The purpose of this guidebook is to provide tools for local jurisdictions to partner with developers, engineers, and property owners to go "above and beyond" the National Pollutant Discharge Elimination System (NPDES) municipal stormwater permit requirements for low-impact development (LID).

The objectives of this guidebook are to:

- Help developers overcome LID BMP barriers and capitalize on motivators.
- Support jurisdictions in implementing incentive programs that motivate developers to use LID BMPs.
- Provide resources and training materials for LID implementation.

- Share tips on communication framing and messaging.

Grounded in research

To inform this guidebook, Commerce, its partners, and the Building Green Cities Advisory Committee initiated social marketing research on developer motivators and barriers to LID implementation. This research included a thorough literature review, a series of interviews with municipal staff and developers, and a survey to nearly 100 jurisdictions, which together informed the structure and contents of this guidebook. The table below provides an overview of how these findings align with core guidebook contents. To learn more about the project research team, methodology, analysis, and findings, please see Appendix A: Incentivizing LID for Developers: A Social Marketing Report.

Needs identified through research	Guidebook element
Explain costs and benefits of LID solutions Emphasize LID value to developers and their clients Communicate the reliability and durability of LID solutions	BMP Factsheets
Offer financial incentives Identify and evaluate new incentive programs	LID Incentive Factsheets Western WA Incentives Matrix
Increase technical assistance resources Increase training opportunities for industry professionals	LID Information and Resources
Clarify stormwater requirements across jurisdictions	Stormwater Requirements Matrix

What's inside

This guidebook includes a series of tools, including LID BMP factsheets, information about incentive programs, and general LID-related resources. Each of these elements is designed to address a need identified during the project's initial research and interviews with developers and local jurisdictions (See Appendix A. Social Marketing Report). This guidebook is organized into the following three sections:

SECTION 1. Overcome barriers and capitalize on motivators. This section provides a series of factsheets and talking points that jurisdictions can use to break down commonly cited barriers by developers to using specific BMPs.

SECTION 2. Provide incentives. This section provides an incentives evaluation tool and a series of factsheets to summarize incentive options that jurisdictions can use to motivate developers to increase the use of LID.

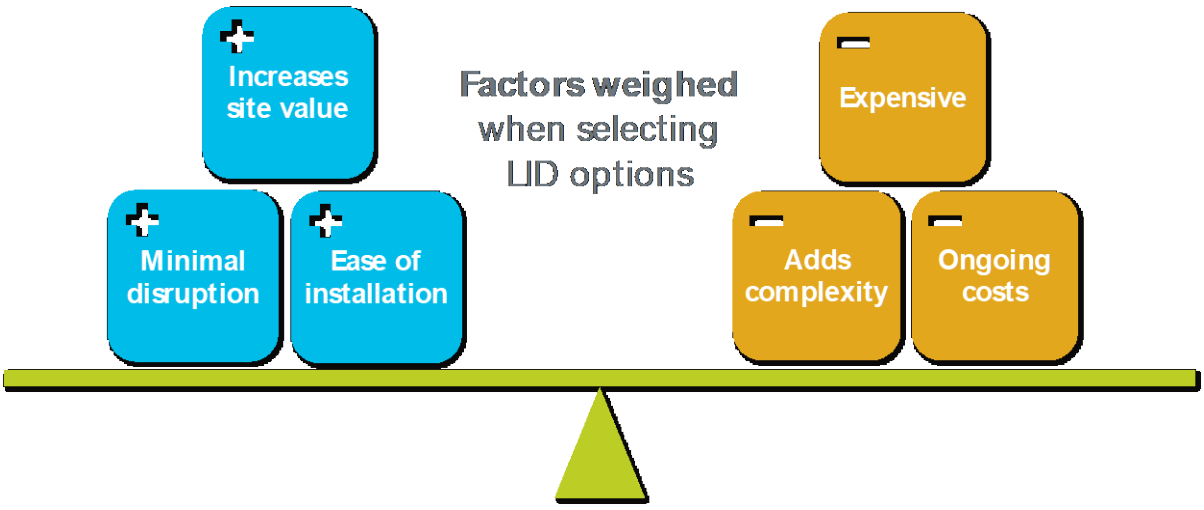
SECTION 3. General LID information and training resources. This section provides relevant training opportunities, certifications, and other LID resources for local governments, developers, and engineers.

Section 1. Overcoming barriers and capitalizing on motivators

The purpose of **Section 1** is to address LID BMP barriers and motivators for developers. As explained in the Social Marketing Report, developers prefer LID BMPs that increase site value, cause minimal disruption, and are easy to install. Conversely, developers avoid LID BMPs that they perceive will add complexity to the project, require ongoing maintenance, and/or are relatively expensive.

Section 1 includes tips for municipal staff when discussing these factors and communicating the benefits of LID to developers and technical consultants.

Figure 1. Factors developers weigh when selecting LID BMPs.



The factsheets in Section 1 directly respond to developer barriers identified in the Social Marketing Report (Appendix A. Social Marketing Report) and can be used by municipal staff to facilitate conversations with developers and technical consultants. They are intended to support the talking points in Section 1, help developers implement BMPs across projects, ensure buy-in from engineering and maintenance staff, and encourage developers to research, discuss, and plan for BMPs early in the project. Each factsheet includes information about (1) the benefits of each BMP, (2) design and maintenance tips, (3) what is new in design, code, and installation, (4) case studies, and (5) additional technical resources.

Section 1 includes the following BMP Factsheets:

Click the links below to jump directly to those sections

Section 2. Providing incentives

The purpose of **Section 2** is to help municipal stormwater staff understand, evaluate, and develop incentive programs to encourage LID installation beyond NPDES requirements on private property.

This section includes a step-by-step approach with key questions for a jurisdiction to ask when developing an incentive program, followed by a factsheet specific to each type of incentive. Each incentive factsheet includes information about (1) its advantages and disadvantages, (2) suitability for jurisdictional circumstances, (3) recommendations for design and implementation, and (4) case studies of specific programs currently offered in Washington jurisdictions.

Many developers named incentives as a primary motivator for "above and beyond" LID installation.

Section 2 includes the following Incentive Factsheets:

Click the links below to jump directly to those sections

Section 3. General LID information and training resources

The purpose of Section 3 is to support the identified need for technical assistance by providing in one place relevant training opportunities, certifications, stormwater requirements, and other resources for local governments, developers, engineers, and other industry professionals.

This section includes information about stormwater requirements in western Washington, a comprehensive list of local incentive programs within the Puget Sound region, general information about certification programs, resources for updating codes, and more.

Developers and jurisdictions desire regionally relevant training and reliable information about state certifications and requirements.

Stormwater requirements matrix:

- Resource for city and county stormwater requirements in western Washington.
- Links to relevant city and county stormwater and surface water codes.
- Links to relevant jurisdiction-specific addendums, manuals, and engineering standards.

Western Washington incentives matrix:

- Showcases the variety of incentives that jurisdictions across western Washington offer to encourage developers, property owners, and engineers to implement LID BMPs.

General information and LID code:

- General information on LID and stormwater management
- Certification programs in western Washington
- Technical assistance on LID code integration for jurisdictions
- Technical manuals on LID implementation for developers and planners

LID vendors, costs, and financing:

- Directory of LID vendors and contractors
- BMP cost estimates
- Tools for financing

Certifications:

- Trainings, certifications, and technical assistance resources for developers, civil engineers, geotechnical engineers, landscape designers, planners, and architects

Section 1: Overcoming barriers and capitalizing on motivators

This section is intended for use by municipal staff and developers and addresses commonly identified barriers to BMP selection, offers design and maintenance tips, and provides case studies from around the region. As noted in the Social Marketing Report, affordability, site feasibility, and return on investment are the primary factors that influence developers' decisions to incorporate additional LID solutions. The following LID BMP factsheets showcase what is possible and encourages developers to go "above and beyond" existing stormwater permit requirements by installing more LID solutions on new and re-development projects across western Washington.

This section includes a set of factsheets that directly respond to the barriers and leverages the motivators identified in the social marketing research. Each factsheet includes:

- The benefits of each LID BMP and its value to developers
- Design and maintenance tips to simplify upkeep
- What's new in design, code, and installation
- Case studies from around the region
- Additional technical assistance resources

The factsheets address the following LID BMPs:

Click the links below to jump directly to those sections

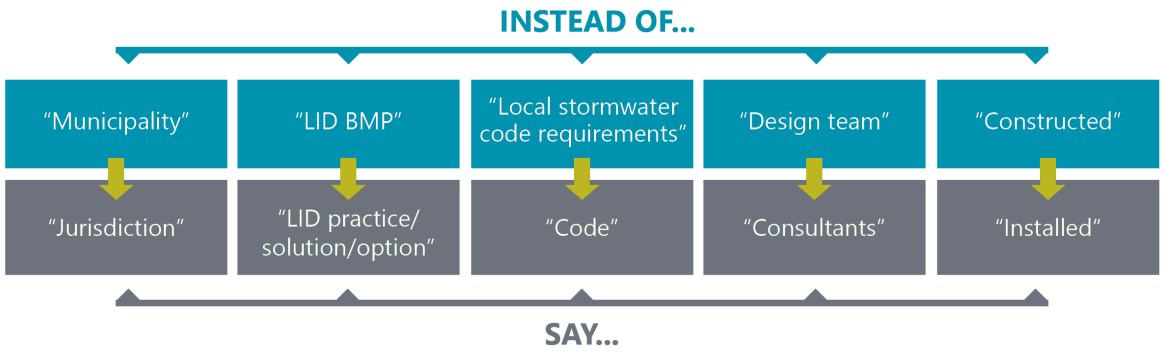
How to use the BMP factsheets:

- Developer meetings: Municipal planning staff and project team members can invite developers to a preapplication meeting to share LID BMP factsheets and discuss applicability for the specific project. Planning staff can use the meeting to identify which LID solutions are feasible, and which types of requirements or incentives are available to manage stormwater runoff from the roadway, or adjacent parcels. Staff can research priority sites that would benefit from additional LID and select factsheets based on the specific project characteristics, the developers perceived barriers for the project, and alignment with local jurisdiction LID goals. Upfront integrated design can lower expenses and provide increased returns on their investments, so it is important to have these conversations early.

Tips for success

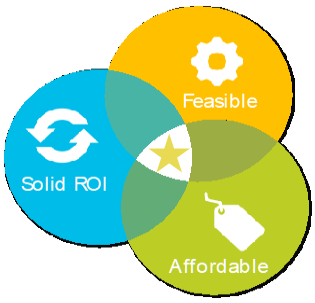
Interviews conducted during the social marketing research revealed that developer language differs from the prevailing technical language. Developer meetings may be more successful if common terminology is used (Figure 8).

Figure 2. Developer terminology for LID



- Technical consultant meetings: Developers noted they often consult with a geotechnical engineer, civil engineer, architect, landscape designer, or a LEED consultant regarding stormwater management. Providing resources to these key players on proven and new LID solutions ensures developers have all options available to them. Municipal planning staff and project members can work with these players to share the BMP factsheets, educate them on existing jurisdiction incentives, and offer technical assistance for future projects.
- Planning department offices: Planning departments can offer factsheets in a document organizer on their counter or waiting room to make them accessible to office visitors.
- Permitting packets: Include factsheets along with the materials shared with developers at the onset of the permitting process.
- Municipal webpages: Post factsheets on relevant municipal webpages, including permitting and any stormwater management/LID program pages.
- Incentives requirements: Include factsheets in the application process for incentives, providing guidance to developers on meeting the application requirements.
- Proactive outreach: Research who is doing work in your area and conduct a marketing blitz on programs, incentives, and/or assistance you can provide developers to encourage "above and beyond" LID installation.
- Mailings: Include factsheets in utility bills and other jurisdictional mailings for a variety of audiences, including the public and commercial real estate sites.
- Workshops: Host a workshop targeting developers, engineers, landscape architects, consultants, and/or other professionals to share the factsheets and additional toolkit resources.

Influencing developers' decisions to incorporate additional LID solutions



As noted in the Social Marketing Report, affordability, site feasibility, and return on investment (ROI) are the primary factors that influence developers' decisions to incorporate additional LID solutions. When talking with developers, engineers, and consultants, emphasize the benefits of LID to their projects by proactively speaking to key concerns and motivators evident in the social marketing research.

Affordability

Developers are ultimately responsible for each project's budget and see their role as protector of the bottom line. Developers consider costs beyond the initial installation fees (e.g., additional costs of maintenance) when deciding which solution to use and whether to go above and beyond a jurisdiction's stormwater code requirements. Cost was the most commonly cited barrier to using LID solutions, and financial incentives were the most popular motivator among developers.

Figure 3. Barriers and motivators related to affordability

Barriers (-)	Motivators (+)
Expense	○ Tax credits (e.g., property tax abatement) ○ Grants or refunds for innovation or "above and beyond" ○ Reduced stormwater utility rates ○ Reduced permit fees

Tips for addressing affordability with developers

- Emphasize cost savings:
  - A LID approach often results in infrastructure cost savings by reducing costly excavation and stormwater piping needs (versus conventional catch basin, pipe, and pond options).
  - As conventional stormwater infrastructure becomes more costly—and the value of land required for these facilities appreciates—LID becomes a more attractive stormwater management option.
  - LID can reduce site grading and building preparation costs.
  - Preserving natural site features can increase the value and sale or rental price of the development.
  - Using existing trees and vegetation saves money by reducing landscaping costs and decreasing stormwater volume.
- Provide case studies on projects in your jurisdiction highlighting the life cost savings of a project using LID compared to traditional stormwater infrastructure.
- Provide any existing LID budgeting or cost planning tools, as well as template designs, to mitigate uncertainty regarding design and installation costs.
- Direct the developers to financial incentives offered for LID use and explain how they will contribute to the affordability of the project.
  - If your jurisdiction does not currently offer any financial incentive programs, explore the resources in Section 2.
  - Highlight the benefits section of the LID BMP factsheets, and orient them to the specific cost-saving benefits associated with each LID BMP.

Feasibility

Stormwater management is among the first things developers consider when evaluating a project. However, managing uncertainty is one of the most important aspects of running a development business and installation of many LID solutions can insert an additional layer of complexity and risk to projects. Developers avoid LID when they perceive it will:

Extend or complicate the permitting process

Require installing new and less proven technology

Require substitute maintenance

Involve sub-optimal (in terms of cost or complexity) installation procedures

Figure 4. Barriers and motivators related to feasibility

Barriers (-)	Motivators (+)
Building site limitations Site or jurisdiction requirements Jurisdictional staff or code inflexibility Burdensome permitting and approval process	Expedited permitting process Code variances Training and resources

Tips for addressing feasibility with developers:

- Communicate the reliability and durability of LID solutions, pointing to the case studies in the factsheets and other known examples.
  - Provide an interactive map of the jurisdiction highlighting BMPs that developers can visit to see what works well. One regional tool is SoundImpacts.
  - A list of all Guidebook Case Studies can be found in Appendix B. LID success stories.
- Provide to developers upfront any existing geotechnical information to mitigate risks.
  - Provide mapping and/or information showing infiltration rates for areas in your jurisdiction.
  - Orient developers to factsheets for the BMPs that work well for the specific soil drainage and surrounding geology and topography considerations for the site.
  - Share BMP factsheets for solutions that work well when site size is small or restricted.
- Identify process or permitting incentives that may apply to the site and include them in pre-permitting conversations.
  - Determine which code requirements could be flexible and revise them to either provide a range of acceptable options or accept minor variances.
  - If your jurisdiction does not currently offer any process or permitting incentive programs, explore the resources in Section 2.
- Provide example designs and/or standard design details.
  - Examples of standard design details can be found in Section 3. LID general resources.
- Highlight the design and installation sections of the BMP factsheets.

Solid Return on Investment (ROI)

LID BMPs are still evolving, and developers are not as aware of proven solutions (compared to traditional development options). The lack of knowledge on how to install some LID solutions properly and the perceived lack of "proven" (quality and correctly functioning) products directly affect the calculated ROI and influence whether developers would include LID solutions that go "above and beyond." Providing information on LID solutions that are tried and true (with problem-free installation and very minimal maintenance issues) is an incentive to developers.

Developers noted they prefer to spend money on LID solutions that are visible to tenants and aesthetically pleasing, such as trees or vegetated roofs. Many developers are already building LEED or green-certified buildings, as these certifications attract tenants and investors. Developers are interested in benefits or recognition for going above and beyond a jurisdiction's stormwater code requirements.

Figure 5. Barriers and motivators related to ROI

Barriers (-)	Motivators (+)
Ongoing maintenance needs Evolving technologies	LEED or green certification LID points program Awards or recognition

Tips for addressing return on investment with developers

- Emphasize the value of public demand from tenants and owners. There is a market demand for green buildings.
  - LID solutions can provide value by attracting tenants, earning certification points, or improving aesthetics.
  - BMPs like bioretention, rain gardens, vegetated roofs, and new/retained trees can be touted as site amenities. Educational signage for these features can help convey their value to future tenants or property owners.
- Inform developers of available certification and recognition incentives available in their jurisdiction and how LID can help them qualify.
  - If your jurisdiction does not currently offer any award or recognition incentive programs, explore the resources in Section 2.
  - For a list of regional certification programs visit Section 3.
- Emphasize long-term utility rate discounts for property owners, and note any jurisdiction specific incentives.
- Communicate the reliability and durability of LID solutions and share any local examples.
- Highlight the maintenance and technical assistance sections of the factsheets.
  - Note that installation of any kind needs maintenance, and there are many lower maintenance LID BMP options.
  - Once established, LID practices can often be maintained in the same manner as other landscaping elements that require mowing, weeding, and debris removal.
  - Share additional technical assistance resources from Section 3.

BMP Factsheets

Bioretention and rain gardens

Bioretention is a shallow landscaped depression with a designed soil mix (the bioretention soil mix or "BSM") and plants adapted to local climate and soil moisture conditions.

Bioretention can be designed as a cell, a swale (conveying stormwater in addition to treating it), a planter (with impervious sides and an open bottom), or a planter box (with impervious sides and a bottom). Bioretention facility designs are required to be stamped by a professional engineer.

Benefits

- Can be designed to create an attractive landscape feature.
- Provides habitat for beneficial insects and birds.
- Can help meet requirements for on-site stormwater management, water quality treatment, and flow control.
- Increases property values through social, economic, and environmental benefits that help offset design costs.
- Can be used as a traffic-calming feature.

Design tips

- Provide a 4- to 6-inch drop from the curb to prevent sediment and debris clogging the inlet and stormwater from entering the facility.
- Include a concrete pad or rock at the bottom of the inlet to prevent erosion.
- Facilitate easier long-term maintenance by adjusting curb cut openings and the curb bulb radius to accommodate available sweeping and vactor equipment.
- Incorporate maintenance or pedestrian pathways through bioretention areas to reduce future soil compaction.
- Test soil permeability to ensure bioretention is feasible for your site.

CASE STUDY

In 2003, the Seattle Housing Authority worked with developers to redevelop the High Point neighborhood in West Seattle to increase housing density. A primary feature of the project is over 11,000 linear feet of bioretention swales constructed to manage and treat stormwater runoff.

What's new in design and installation

A variety of curb cut inlet configurations have been used for bioretention facilities, addressing concerns over car tires rolling through the openings, trash buildup at the inlet, and inefficient flow capture from the curb line to the cell. Solutions include curb covers at the inlet to deter car tires, expanded curb cut widths and a 4- to 6-inch drop into the facility to reduce buildup of debris, and a depression in the gutter line to help direct flows into the facility.

A mortar bed can be used in pre-settling zones to hold cobbles in place that filter sediment before it spreads across the facility, thereby reducing maintenance demands. Dry filter boxes can also be installed at curb cut inlets to collect sediment and other debris and to facilitate easy long-term maintenance.

Elevated underdrains can be integrated into a bioretention facility design to reduce nitrogen in stormwater (nitrogen is a contaminant of concern for marine and groundwater) and provide more moisture for plants during our dry summers.

The current bioretention soil mix specification (40% compost and 60% sand) should not be used within ¼ mile of phosphorus-sensitive waterbodies per the 2019 Stormwater Management Manual for Western Washington (Volume V, Chapter 5). A new bioretention soil mix specification is being developed that can be used near phosphorus-sensitive waterbodies and should be available for use in 2020.

Select native perennial plants that are already adapted to the region, have lower irrigation demands, and require less maintenance once established.

What's new in maintenance

Traditional landscaping crews may need additional training for bioretention maintenance versus traditional landscaping maintenance. Often, bioretention facilities are designed for a lower level of pruning and vegetation removal than a typical landscaped feature.

Bring boards to stand on or use maintenance pathways (see design tips) during maintenance to reduce soil compaction.

Use a vactor truck to quickly and easily clean out a mortar bed or dry filter box (see What's new in Design and Installation).

More Information and Resources

Stormwater Management Manual for Western Washington
Low Impact Development Technical Guidance Manual for Puget Sound
Rain Garden Handbook for Western Washington
Western Washington LID OandM Guidance Document
Statewide LID Training Program Module 3.2 (Intermediate LID Design: Bioretention), Module 5.0 (Advanced Longterm LID Operations: Bioretention), and Module 6.2 (Advanced LID Design: Bioretention Media and Compost Amended Soils)
Washington State University Extension and Washington Stormwater Center LID Training
Washington State University Assessing and Monitoring Rain Gardens
12,000 Rain Gardens Resources for Rain Gardens

Pervious Concrete

Pervious concrete is a rigid pavement similar to conventional concrete that uses a cementitious material to bind aggregate together. The fine aggregate (sand) component is reduced or eliminated in the gradation compared to conventional concrete; as a result, voids form between the aggregate in the pavement surface and allow water to infiltrate.

Pervious concrete is typically used for low-volume residential streets, parking lots, public walkways and sidewalks, bike lanes, plazas, and patios. Pervious concrete is a durable pavement with a similar life span to conventional concrete.

Benefits

- Allows for direct infiltration into the subgrade soils, maximizing site functionality while reducing surface runoff
- Can reduce or eliminate the need for traditional curbs, gutters, drainage structures, piping, water quality treatment, and detention, which saves on overall project cost and space
- Can be mixed in smaller batches for repair and replacement
- Reduces noise caused by tire-pavement interaction
- Long-lasting, high-strength choice for permeable pavement

Design Tips

- Different colors can be added to pervious concrete to integrate artistic elements and designate different use areas in plazas, patios, walkways, or parking lots (e.g., parking stalls, walkways, play areas, etc.).
- Can be used on slopes up to 6% with check dams in the reservoir course.
- Plan project staging and erosion control measures to avoid contaminating or compacting the subgrade.
- Can be striped like conventional solid pavement.

CASE STUDY

The City of Lacey Regional Athletic Complex includes 36,000 square feet of pervious concrete that directly infiltrates rainfall through the ballfield plaza. A majority of the site's two miles of trails were constructed with porous asphalt. Stormwater runoff from the remainder of the 70-acre site is routed to infiltration trenches beneath the ballfields.

What's new in design and installation

Pervious concrete specifications developed by the APWA-WA Construction Materials Committee are now part of WSDOT's General Special Provisions (GSPs) and have addressed design issues and inconsistent specifications encountered in past installations: www.wsdot.wa.gov/partners/apwa

Researchers are currently testing pervious concrete mixes with additives such as carbon fiber composites to increase durability and strength. The composites—a waste product of the aviation industry—are dispersed throughout the pavement mix to provide uniform strength.

Setting time and shrinkage are accelerated in pervious concrete construction. Joint installation should quickly follow compaction. Rolling joint tools are recommended for their efficiency and are recommended over sawcutting to reduce raveling and clogging from cutting operations.

The National Ready Mixed Concrete Association (NRMCA) offers a pervious concrete contractor certification program. Three levels of certification are available: pervious concrete technician, pervious concrete installer, and pervious concrete craftsman. The Washington Aggregates and Concrete Association (WACA) offers courses on an as-needed basis. A database of the certifications can be found on NRMCA's website: www.nrmca.org/certifications/pervious/SearchNew

Pervious concrete is designed using traditional rigid pavement methods using a factored flexural strength; however, traditional ASTM test methods for concrete do not apply, and alternate construction verification methods are used.

Observation wells (6-inch PVC pipe) that extend to the bottom of the aggregate layer should be integrated into the design to help facilitate routine inspections and maintenance.

What's New in Maintenance

Routine vacuuming with a regenerative air vacuum sweeper is recommended to remove accumulated sediments. The frequency of the vacuuming directly depends on the amount of sediment buildup over time, but it should be done at least once annually.

Small ride-on cleaning equipment is now available for routine and restorative maintenance of pervious concrete surfaces.

Restorative maintenance is more expensive and time-consuming than routine maintenance, but can be used to restore sections of pavement that have not been adequately maintained.

More Information and Resources

Stormwater Management Manual for Western Washington
Western Washington LID OandM Guidance Document
Pervious Concrete Contractor Certification Program
Statewide LID Training Program Module 3.3 (Intermediate LID Design: Permeable Pavement) and Module 5.1 (Advanced Long-term LID Operations: Permeable Pavement)

Porous Asphalt

Porous asphalt is a flexible pavement similar to conventional asphalt that uses a bituminous binder to bind aggregate together. The fine aggregate (sand) component is reduced or eliminated in the gradation compared to conventional asphalt; as a result, voids form between the aggregate in the pavement surface and allow water to infiltrate.

Porous asphalt is typically used for low-volume residential streets, parking lots, public walkways and sidewalks, bike lanes, plazas, and trails.

Benefits

- Allows for direct infiltration into the subgrade soils, maximizing site functionality while reducing surface runoff.
- Can reduce or eliminate the need for traditional curbs, gutters, drainage structures, piping, water quality treatment, and detention, which saves on overall project cost and space.
- Reduces noise caused by tire-pavement interaction.
- Does not have to cure and can be opened to traffic sooner.
- Lower cost choice for permeable pavement.

Design tips

- Seasonal availability of the required asphalt binder should be considered in project planning.
- Can be used on slopes up to 6% with check dams in the reservoir course.
- Plan project staging and erosion control measures to avoid contaminating or compacting the subgrade.
- Can be striped like conventional solid pavement.
- Use for projects that will have light loads and minimal turning movements, such as driveways and minor roads. Porous asphalt is easily damaged with larger vehicles and under turning movements.

CASE STUDY

In 2007, the City of Olympia, Wash. conducted a study of varying stormwater mitigation strategies on two blocks of Decatur Street between 9th and 11th. A total of 200 feet of porous asphalt roadway was compared to conventional asphalt and traditional stormwater management facilities and was found to have similar cost/benefit ratios for treatment efficiency.

What's new in design and installation

Porous asphalt specifications developed by the APWA-WA Construction Materials Committee are now part of WSDOT's General Special Provisions (GSPs) and have addressed design issues and inconsistent specifications encountered in past installations: www.wsdot.wa.gov/partners/apwa

Porous asphalt does not require proprietary ingredients or special paving equipment. With proper mix design, general contractors can install porous asphalt with minimal additional training or certification.

Insulated covers over loads during hauling can reduce heat loss during transport and increase working time. Temperatures at delivery that are too low can result in shorter working times, increased labor for hand work, and increased cleanup from asphalt adhering to machinery.

Air temperatures should be no lower than 45 degrees Fahrenheit during installation of porous asphalt.

Observation wells (6-inch PVC pipe) that extend to the bottom of the aggregate layer should be integrated into the design to help facilitate routine inspections and maintenance.

What's New in Maintenance

Routine vacuuming with a regenerative air vacuum sweeper, or pressure washing, is recommended to remove accumulated sediments. The frequency of the vacuuming directly depends on the amount of sediment buildup over time, but it should be done at least once annually.

If pavement patching is necessary, conventional asphalt can be used for small areas (typically less than 10% of the pavement area).

Small ride-on cleaning equipment is now available for routine and restorative maintenance of porous asphalt pavement.

Restorative maintenance is more expensive and time-consuming than routine maintenance, but can be used to restore sections of pavement that have not been adequately maintained in the past.

More information and resources

Stormwater Management Manual for Western Washington
Western Washington LID O and M Guidance Document
National Asphalt Pavement Association
Statewide LID Training Program Module 3.3 (Intermediate LID Design: Permeable Pavement) and Module 5.1 (Advanced Long-term LID Operations: Permeable Pavement)
Washington Stormwater Center Permeable Pavement Training Videos

Permeable pavers / open-cell grids

Permeable interlocking concrete pavers (PICPs) are solid, precast, manufactured modular units. The pavers are solid (impermeable), and the joints are filled with aggregate (permeable). Permeable pavers are typically installed in plazas, patios, sidewalks, driveways, and parking lots.

Open-celled grid systems are made of concrete or plastic. The grid openings can be filled with topsoil and grass, or aggregate (permeable). Grid systems are typically installed in overflow parking areas, emergency vehicle access roads that are not frequently used, and driveways.

Benefits

- Permeable pavers and open-celled grid systems allow for direct infiltration into the subgrade soils, maximizing site functionality while reducing surface runoff.
- Can reduce or eliminate the need for traditional curbs, gutters, drainage structures, piping, water quality treatment, and detention, which saves on overall project costs and space requirements.
- Ability to remove a few pavers or grid segments at a time to access underlying aggregate, then replace by hand rather than sawcut and repave.

Design tips

- Permeable pavers can be used to integrate artistic elements into plazas, patios, or walkways.
- Different colors or patterns of permeable pavers can be used to designate different areas (e.g., parking stalls, walkways, play areas, etc.)
- Permeable pavers and open-celled grid systems can be installed just in parking stalls or in entire parking lots.
- Open-celled grid systems can be a helpful solution for overflow parking areas as they typically have low maintenance needs and costs.

CASE STUDY

Chuck's Produce in Vancouver, Wash. integrated permeable pavers into its parking lot design when it opened a second location. A total of 29,000 square feet of permeable pavers were installed in the parking stalls and sidewalks. Colored pavers designate sidewalks and areas where shopping carts should be returned.

What's new in design and installation

Permeable pavers and open-celled grid systems can be used for low-speed, heavier vehicle traveling surfaces. With an appropriate aggregate course depth below, permeable pavers can support up to 8,000 pounds per square inch, and open-celled grid systems can support up to 15,000 pounds per square inch.

Some of the original permeable pavers on the market did not meet ADA standards due to the width of the aggregate-filled joints; however, there are now numerous options available from several different vendors with narrower joints that meet ADA standards. Several open-celled grid systems can also be designed to meet ADA standards.

Mechanical paver installations can save time and money on larger paver installations compared to manual paver installations, but only work with full pavers (no partial bricks) and specific patterns.

- Mechanical paver installation: ~3,000 to 10,000 square feet per machine per day
- Manual paver installation: ~1,000 square feet per person per day

In addition to PICP and open-celled grid systems, there is also a pervious paver available made of natural stone. Water can flow through the pervious paver itself (approximately one gallon per second per square foot), so the aggregate-filled joints included in a traditional PICP system are not necessary to include in the design, and a smaller area of pervious pavers may be needed to manage stormwater runoff from the site.

The Interlocking Concrete Pavement Institute (ICPI) offers a one-day PICIP course for contractors on installing permeable pavers. A PICP specialist designation can also be earned by meeting additional requirements: www.icpi.org/node/2727.

What's new in maintenance

Moss grows on permeable and impermeable pavement in the Pacific Northwest, but there are options for removing moss and weeds in paver joints. If moss is inhibiting infiltration or posing a slip safety hazard, it can be removed from sidewalks using a stiff broom in the summer when it is dry. Vacuum sweeping or a combination of a stiff broom/power brush can remove moss from parking lots and roadways. Weed burners can be useful tools for removing weeds growing in paver joints.

The ICPI and multiple vendors have developed materials to support design and maintenance to ensure permeable pavers are properly installed and meet long-term performance goals.

More information and resources

Stormwater Management Manual for Western Washington
Western Washington LID OandM Guidance Document
Interlocking Concrete Pavement Institute (ICPI)
Statewide LID Training Program Module 3.3 (Intermediate LID Design: Permeable Pavement), and Module 5.1 (Advanced Long-term LID Operations: Permeable Pavement).

Vegetated roofs

Vegetated roofs (also known as green roofs and ecoroofs) are thin layers of engineered soil and vegetation constructed on top of conventional flat or sloped roofs. All vegetated roofs consist of four basic components:

- Waterproof membrane
- Drainage layer
- Lightweight growth medium (typically 2 to 6 inches)
- Vegetation (ranging from low groundcover to trees)

Additional (optional) components may include:

- Protection layer
- Root barrier
- Insulation
- Moisture-retention mat
- Leak-detection system
- Filter fabric

Benefits

- Increases property values through social, economic, and environmental benefits that help to offset design costs. These roofs often double as social space in buildings where people gather.
- Reduces energy usage (average of 10%) and doubles the lifespan of a typical roof (to 50 years).
- Reduces cooling load and tenant energy costs.
- Provides an aesthetically pleasing amenity that has been shown to relieve mental fatigue and lower stress.
- Reduces peak flows (by approximately 50%) and total runoff volume (up to 70%).
- Reduces heat island effects and improves air quality within dense urban settings.

Design tips

- A variety of planting palettes can accommodate varying light availability, roof slope, irrigation, and desired maintenance frequency. Plants can range from low groundcover to tall trees.
- Roof slopes between 5 to 20 degrees are most suitable, but vegetated roofs can be installed on roofs with slopes up to 40 degrees with specific design.
- Vegetated roofs should be combined with a rainwater harvesting system with caution. The water filtered through the vegetated roof contains tannins and fine sediment.

CASE STUDY

Mukilteo City Hall (completed in 2008) was the first facility in Snohomish County to be certified as LEED Gold. It includes a 2,900-square-foot vegetated roof in addition to permeable pavement (pervious concrete and open-celled grass grids) and a biofiltration swale.

What's new in design and installation

Modular vegetated roof systems are available in trays or mats that can speed up the installation process and reduce costs. Trays or mats can be delivered to the site either partially or fully planted.

There is a green roof professional (GRP) training and accreditation program available that addresses design and installation, waterproofing and drainage, and plants and growing media: https://greenroofs.org/green-roof-professional-training

Vegetated roof retrofits can occur on existing conventional roofs with the assistance of a licensed structural engineer. Considerations should be made for the additional dry and wet soil weight, as well as wind loading.

The City of Portland's Ecoroof Program has developed numerous helpful vegetated roof resources, including an Ecoroof Handbook, an Ecoroof Guide, information on a 2008-2012 incentive program, and videos addressing a range of topics including permitting, vegetation, installation, operations and maintenance, irrigation, and case studies: www.portlandoregon.gov/bes/44422

What's new in maintenance

Weeding and irrigation are the primary maintenance requirements for vegetated roofs. Roof drains must be kept clear of blockage and debris to prevent clogging.

Vegetated roofs require a specialized growth medium engineered for the specific system installed. Adding compost per manufacturer's recommendations will help to maximize functionality and plant growth.

Sedums can be mulch mowed to create cuttings and encourage establishment during the first two years or as needed to increase establishment in future years.

More information and resources

Stormwater Management Manual for Western Washington
Low Impact Development Technical Guidance Manual for Puget Sound
Western Washington LID OandM Guidance Document
Statewide LID Training Program Module 3.5 (Rainwater Collection Systems and Vegetated Roofs) and Module 2.1 (Introduction to LID for Inspection and Maintenance Staff)

Rainwater harvesting

Rainwater harvesting is the capture and storage of rainwater for beneficial use. In 2009, the Washington Department of Ecology issued a rainwater interpretive policy, which clarifies that a water rights permit is not required to use water collected from a rooftop in Washington. Roof runoff may be routed to cisterns for storage and nonpotable uses such as:

- Irrigation
- Toilet flushing
- Cold water laundry

Rainwater harvesting occurs on larger-scale commercial and institutional projects and on smaller-scale residential projects with pumped systems and simple gravity-fed rain barrel systems.

Benefits

- Reduces energy consumption within a community by decreasing demand for treated water distributed by local municipalities.
- Conserves water and mitigates stormwater flows.
- Marketed as a green feature alongside other low-impact development features such as bioretention or rain gardens.

Design tips

- Can be designed for potable or non-potable uses. Potable uses are limited to single-family residential applications.
- Cisterns are available in a variety of sizes, shapes, materials, and colors to fit site constraints, cost, and aesthetics, either blending in or contrasting with the building and site design.
- Cisterns may be placed above, below, or partially buried below the ground surface.
- For potable systems, prefinished metal roofing is preferred.
- Install pre-filters and screen all inflows to the cistern with 1/16” stainless steel mesh to prevent leaves and other debris from entering the cistern.

CASE STUDY

The Center for Urban Waters in Tacoma, Wash. (completed in 2010) follows the concept of a living laboratory, incorporating sustainable features to minimize the building’s environmental footprint. Rainwater is collected into a 10,000-gallon cistern and reused for irrigation and low-flow flush fixtures within the building.

What's new in design and installation

Material lifespan is an important design consideration when installing a rainwater harvesting system. Typical warranties for cisterns range from 15 to 30 years, while pumps have warranty periods ranging from 2 to 10 years.

The American Rainwater Catchment Systems Association (ARCSA) and the American Society of Plumbing Engineers (ASPE) have developed design and installation standards for rainwater catchment systems for engineers, designers, plumbers, builders/developers, local government officials, and end users: www.aspe.org/content/arcsaaspeansi-63-2013-rainwater-catchment-systems-electronic-download

The ASPE offers an on-demand rainwater harvesting webinar and a green plumbing design certificate program:

- Rainwater harvesting webinar: https://education.aspe.org/products/rainwater-harvesting
- Green plumbing design program: https://aspe.org/GPD

The RainWise program in King County and Seattle offers training and certification courses for contractors and rebates for eligible property owners: www.700milliongallons.org/rainwise

The Washington Stormwater Center developed a video that documents a simple potable rainwater system: https://vimeo.com/133942623

What's new in maintenance

Cisterns generally have low maintenance demands but can accumulate sediment over time. An annual cistern inspection is recommended to identify and remove any debris.

Keeping roof gutters clear is an important step to reducing sediment accumulation and maintenance issues. One of the most common maintenance requirements is annual filter replacement. Pump replacement can be minimized with proper care of system components.

Water quality testing is required for rainwater harvesting for potable use.

More information and resources

Stormwater Management Manual for Western Washington
Rainwater Interpretive Policy and Rainwater Harvesting Calculator
Statewide LID Training Program Module 3.5 (Rainwater Collection Systems and Vegetated Roofs) and Module 2.1 (Introduction to LID for Inspection and Maintenance Staff)

Amended soil

Amended soil refers to the practice of restoring soils that are disturbed during construction activities. Soil is biologically active and is composed of weathered rock fragments and organic matter, which is full of living microorganisms. All soils can benefit from additions of organic matter, which serves to build and stabilize the structure of soil, improving both aeration and permeability. Options to restore disturbed soils include:

- Till compost into existing soil
- Stockpile and reuse existing topsoil (amend if needed to meet organic matter content requirements)
- Import compost-amended topsoil and till into existing soil

Benefits

- Reduces need for fertilizers and pesticides.
- Reduces irrigation demand by up to 50 percent (three- to seven-year payback on irrigation savings alone).
- Creates marketable buildings and landscapes.
- Decreases erosion.
- Improves plant health and survival.

Design tips

- Leaving undisturbed vegetation and soil is always the preferred method for retaining soil health, but not always feasible in construction projects.
- Redistribute existing topsoil whenever feasible to maintain soil health.
- Where existing soils cannot be reused, establish new topsoil to a minimum of eight inches to promote healthy plantings.
- Development of a soil management plan is often required with this BMP to determine the amounts of compost, amended soil, and mulch to be used on site.

CASE STUDY

Redmond Ridge, a large, master planned development, had soft soils with excessive water retention and low nitrogen content. Developers graded the site 12 inches below finished grade and applied 14 inches of amended soil mix. Native duff and compost were blended offsite. Organic matter, pH, and C:N ratios were controlled to meet amended soil requirements and to achieve optimal plant growth.

What's new in design and installation

In some jurisdictions, compost used for erosion control during the construction phase (compost blankets, berms, and compost filter socks) can be incorporated into the soil after the construction phase to meet amendment requirements, which eliminates disposal costs and promotes faster plant establishment and growth for significant cost savings.

"Topsoil" is not a defined, regulated product. Topsoil products can often include subsoil, uncomposted organic material, and/or land clearing and construction debris. Use mixes containing only clean compost and mined sand or "sandy loam," as defined by the USDA.

Make sure to fence soil protection zones and inform all contractors and subs that stockpiles and vehicle and equipment traffic are not allowed in fenced areas. If temporary vehicle access is required, place steel plates over six inches of coarse wood chips.

What's new in maintenance?

The most important maintenance activity is replenishing the soil organic matter content by leaving leaf litter and grass clippings on site and maintaining two to three inches of mulch over bare areas in the spring or fall. Arborist wood chips are preferred.

In order to maintain infiltration, compacted turf areas should be aerated and top-dressed with ¼ to ½ inch of compost.

Weeds should be removed manually using pincer-type weeding tools, flame weeders, or hot water weeders. Unhealthy vegetation should be removed and replaced.

More information and resources

Stormwater Management Manual for Western Washington
Western Washington LID OandM Guidance Document
Statewide LID Training Program Module 2.1 (Introduction to LID for Inspection and Maintenance Staff) and Module 6.2 (Bioretention Media and Compost Amended Soils)
Building Soil Manual
Erosion Control with Compost

Minimal excavation foundations

A minimal excavation foundation minimizes a building's required mass grading and site disturbance by distributing its structural load onto piles or shorter perimeter walls, as opposed to using solid foundation slabs dug into the earth.

Piles are slender elements (pins, screws, or clusters) embedded on end into the ground to support a structural load.

Perimeter walls (also called post and beam, grade beam, or fin wall structures) are short and thick walls at building exteriors, that spread the building weight over a larger area of soil.

Benefits

- Minimizes or eliminates excavation and soil compaction, which helps store and filter stormwater flows.
- Can be installed in areas with poor soils/drainage by accessing structurally superior sub-soils.
- Conserves materials by using 5 to 10 percent of the concrete that would be required for a typical foundation.
- While minimal excavation foundations are often used for boardwalks, decks, porches, and carports, they can also be used for entire houses or small commercial buildings (up to three stories high).

Design tips

- Pile designs can be installed "pile first," where piles are installed prior to the supporting structure, or "post pile", where the structural walls are constructed and then the piles are driven through precast openings in the walls.
- A variety of materials can be used for piles – concrete, steel, or wood – depending on the design and cost constraints of the project.
- Perimeter walls should be terraced on sloped sites to minimize excavation requirements.
- When on slopes, buildings should be sited along contour lines to reduce excavation (cut and fill) and retain the site's infiltration capability.

CASE STUDY

Clearwater Commons is a 16-unit cohousing development near North Creek in Bothell, Wash. All homes are built on pin piles in efforts to minimize impacts to the native soils and hydrology of the site. Stormwater runoff and shallow interflow are not interrupted by the building foundations and can maintain pre-development flow patterns.

What's new in design and installation

Minimal excavation foundations can be installed as a combination of piles and pre-cast walls. This configuration allows for installation of sloped wall bases, with minimal grading requirements.

Pin foundation systems can be installed with large, handheld electric or pneumatic impact hammers, or hammers mounted on small construction equipment (e.g., skid steers). They require a heavy-duty air compressor and minor labor without any assistance from large machinery for installation.

Piles and perimeter walls reduce soil compaction from heavy machinery and equipment that is typically used for excavation.

Some foundation systems can be designed to allow for the removal and replacement of pilings, which can extend the life of the support indefinitely.

What's New in Maintenance

Good drainage is critical to maintaining foundations. Maintaining a free-draining buffer material that separates the soil from the grade beam or other structural element mitigates risks of rot or corrosion.

Corrosion rates for galvanized or coated steel piling, or degradation rates for concrete piling, are typically very low to non-existent, and piling for these types of foundations can last for the life of the structure.

Maintenance or replacement may be needed for wood piling or systems that are exposed to salt air or highly caustic soils (typically in industrial areas).

More information and resources

Stormwater Management Manual for Western Washington
Low Impact Development Technical Guidance Manual for Puget Sound

Dispersion

Dispersion is the release of surface and stormwater runoff through a vegetated area, resulting in attenuation of peak flows, some infiltration, and water quality benefits. The four primary types of dispersion are:

- Downspout dispersion
- Concentrated flow dispersion
- Sheet flow dispersion
- Full dispersion

Downspout dispersion systems are focused on roof runoff and can include splash blocks or gravel-filled trenches (also called dispersion trenches).

Benefits

- Dispersion is a simple design that can be easily installed or retrofitted into a property to handle runoff from driveways, sidewalks, and roofs. Dispersion also works well on linear roadway projects.
- It reduces peak flows by slowing entry of the rainwater into the conveyance system.
- It is generally cost effective, where space is available, as minimal infrastructure and maintenance is required.

Design tips

- Use a level spreader to evenly distribute collected flows across vegetated areas.
- Avoid slopes greater than 15 percent where possible, unless using a level spreader (which can manage slopes of up to 33 percent).
- Construct flowpaths as groundcover in vegetated flowpaths are traditionally undisturbed native landscape or grass, but constructed flowpaths may be feasible (see What's new in design and installation).
- Dispersion flowpaths may be restricted or infeasible in environmentally critical areas, including steep slopes, contaminated sites, and septic drain fields.
- Minimize the area that needs to be cleared or grubbed. Maintaining plant root systems is important for dispersion areas.

CASE STUDY

Cordata Park is a 25-acre park in north Bellingham. Stormwater runoff from the park is collected and conveyed to onsite wetlands to maintain hydrologic inputs to the environmentally critical areas. Dispersion trenches are used to diffuse the stormwater into the wetlands across a wide area rather than a point discharge, which may cause erosion.

What's new in design and installation

Previously developed areas can be converted to native vegetation suitable for dispersion, provided underlying soils are compost amended, soils are de-compacted, and native species are planted to a specified density. Additional information can be found in the Stormwater Management Manual for Western Washington (BMP T5.30 – Full Dispersion).

Using low-ground pressure vehicles and equipment during construction minimizes compaction.

What's new in maintenance

Dispersal areas must be watered once every one to two weeks during the establishment period (initial one to two years) and during prolonged dry periods.

If vegetation coverage is poor, assess for nutrient deficiencies, amend soils to promote plant health, and/or replant as needed with appropriate species for the soil and moisture conditions.

Aggregate in rock pads can become eroded or dislodged over time and may need to be replaced occasionally.

Vegetative flowpaths must be maintained to remove obstructions such as weeds and rodent holes or mounds.

More information and resources

Stormwater Management Manual for Western Washington
Western Washington LID OandM Guidance Document
Statewide LID Training Program Module 2.1 (Introduction to LID for Inspection and Maintenance Staff)
WSDOT Highway Runoff Manual

New and retained trees

Tree retention refers to retaining trees during new development and redevelopment activities. If retained trees meet specific size, location, and viability requirements, then a jurisdiction may allow a flow control credit to be applied.

Tree planting refers to planting new trees during new development and redevelopment activities. Similar to retained trees, new trees must meet specific size, location, and viability requirements to receive flow control credit (if allowed by the local jurisdiction). Evergreen trees receive a larger flow control credit than deciduous trees. Flow control credits are not typically applicable to trees in native vegetation areas or in planter boxes.

Benefits

- Trees can increase property values.
- Retaining trees or planting new trees can reduce the size of other onsite stormwater facilities if flow control credit is applied. Tree retention has more stormwater benefits over planting seedlings.
- Networks of tree roots can improve soil stability, as roots can bridge weaker soils and anchor to more stable areas.
- Trees can provide additional benefits such as reduced heat island effect and improved air quality.

Design tips

- Maintain setbacks between structures and new or retained trees in order to provide adequate space and light for optimal growth without interference.
- New and retained trees must meet minimum size requirements and be viable for long-term retention.
- Supplemental irrigation should be incorporated into site designs where new trees are planted to provide irrigation for three to five years following installation.

CASE STUDY

In 2003, the Seattle Housing Authority redeveloped the High Point neighborhood in West Seattle to increase housing density. Retaining existing mature trees was an important part of the redevelopment, and many trees were marked with a dollar value to convey the importance of maintaining their vitality throughout the phased construction process.

What's new in design and installation

Approved trees vary by jurisdiction due to local climates and soils. Check with local jurisdictions for currently accepted species if you are planning on planting a new tree in the right-of-way or applying a flow control credit. Consult an arborist if soil disturbance is proposed within the critical root zone (CRZ) of a retained tree. The CRZ is defined as the line encircling the base of the tree with half the diameter of the drip line. Specialized techniques such as augering or compressed air excavation instead of trenching can be used to protect and preserve tree roots during construction activities.

If roots on a retained tree must be cut, minimize impacts by avoiding excavation activities during hot and dry weather. Keep the retained trees well-watered before and after excavation activities and cover the exposed roots with mulch as soon as possible.

What's new in maintenance

Apply mulch by hand in a ring around the tree to avoid covering the root flare. Avoid mulch volcanos!

Prune trees at the right time of year. Avoid pruning during spring growth flush. Deciduous trees should be pruned from November through February. Hazardous trees should be pruned at any time of the year to avoid risk or injury.

To reduce scald injury, do not prune trees with thin bark in the summer. Do not prune pine or elm species from May through October to reduce possible exposure to bark beetle (pine) or Dutch Elm Disease (elm).

Ensure that newly planted trees receive adequate water during a three- to five-year establishment period. Most trees require 10 to 15 gallons once every one to two weeks during the first summer and every two to four weeks during the second and third summers. Additional watering may be needed during prolonged dry periods.

Retaining or using native tree species will help reduce maintenance requirements, as they require less care within the environment.

More information and resources

Stormwater Management Manual for Western Washington
Low Impact Development Technical Guidance Manual for Puget Sound
Western Washington LID OandM Guidance Document
Statewide LID Training Program Module 2.1 (Introduction to LID for Inspection and Maintenance Staff)
King Conservation District Urban Forest Health Program
A guide to Washington State's Urban Tree Canopy
Puget Sound Urban Tree Canopy and Stormwater Management

Section 2: Providing incentives

Incentivizing LID for developers

This section is intended for use by **municipal staff**. As noted in the **Social Marketing Report, incentives are the primary motivator for developers to implement "above and beyond" LID solutions.** This section includes tools to address the gap in available incentive programs by providing jurisdictions with guiding questions to consider when developing or modifying an incentive program. This section also provides incentive program factsheets that offer a more in-depth look at each incentive program type.

Guiding Questions for Developing or Modifying an Incentive Program asks jurisdictions to consider key questions when developing an incentive program. It also points to a set of incentives that align with specific goals, audiences, and resources for the jurisdiction to consider. It may be helpful to review the incentive factsheets before answering these questions.

Incentive program factsheets build upon the guiding questions for developing or modifying an incentive program and provide information about:

- Advantages and disadvantages of incentive program types.
- Suitability for various jurisdiction circumstances.
- Recommendations for program design and implementation.
- Case studies for programs currently offered in local jurisdictions.
- The incentive factsheets address the following program types:

The incentive factsheets address the following program types:

Award and recognition
Fee discounts
Grants
Land use and permitting
Expedited process
Rebate and cost-share programs

Incentive programs as a key motivator

Given that incentives are the primary motivator for developers to implement "above and beyond" LID solutions, this section of the guidebook aims to address the gap in current incentive programs offered by jurisdictions. Incentive programs that address developers' key considerations of affordability, feasibility, and return on investment, will be the most effective in motivating developers to go "above and beyond."

LID incentives survey results

An LID incentives survey was circulated to public works, community development and planning, and stormwater permit staff throughout Washington state to obtain information on the existing incentives jurisdictions are using to encourage the use of LID BMPs; 93 participants took the survey across 65 jurisdictions. **When asked what incentives, assistance, or other strategies their jurisdiction offers to increase use of LID, 43% reported "none."**

Incentive programs that address developers' key considerations of affordability, feasibility, and return on investment, will be the most effective in motivating developers to go "above and beyond."

Affordability

During the social marketing research interviews, **all developers** indicated financial benefits would be a motivator to implement LID solutions in their projects or to go above and beyond a jurisdiction's stormwater code requirements. Financial incentives like grants, tax credits, and/or rebates can minimize installation costs and help make LID a financially attractive, and possibly cost-saving, feature. During the social marketing research interviews, municipal staff noted financial incentive programs were very popular, and that these programs would benefit from increasing the dollar amount of the financial incentive and/or rebate.

Feasibility

Developers noted strict regulations or lack of flexibility from jurisdictions as a barrier in considering creative LID solutions above and beyond the stormwater code requirements, and expressed an interest in code variances, such as allowing developers to increase density in exchange for incorporating LID above and beyond solutions. Flexibility was key in motivating developers to explore innovative stormwater solutions.

One developer shared a story about being required to buy custom planters only a few inches taller than standard planters. This requirement increased the cost of the planters ten-fold and added several months to the project timeline for manufacturing. In the developer's mind, money and time were wasted for no perceived benefit. To incentivize developers, jurisdictions can increase the flexibility and feasibility of LID BMPs by offering expedited process and land use and permitting incentive programs. The City of Auburn's Flexible Development Alternatives program does this by offering points for each LID BMP implemented; points then count toward incentives, including expedited permitting, density bonuses, and relaxed height restrictions.

Return on Investment (ROI)

Developers favored financial incentives such as reduced utility and permit fees as they mitigate financial risks associated with LID implementation and create long-term cost savings for property owners. Respondents to the LID incentives survey also identified fee discount programs as popular programs in the jurisdictions that provided them.

During the research interviews, developers referred to the LEED certification or green-building programs as a reason to include additional environmentally friendly features. They see green awards and recognition

programs as a way to make their properties more attractive to public demand, improving their return on investment.

Figure 6. Barriers and motivators for developers to implementing LID solutions

	Barriers (-)	Motivators (+)
AFFORDABLE	Expense Burdensome permitting/approval process	Tax credits Grants or refunds Expedited permitting process LID points program
FEASIBLE	Building site limitations Site/jurisdiction requirements Jurisdictional staff/code inflexibility	Code variances Training and resources
SOLID ROI	Ongoing maintenance needs Evolving technologies	Reduced utility rates Reduced permit fees LEED or green certification Awards or recognition

Guiding questions for developing or modifying an incentive program

Jurisdictions are encouraged to use these questions when developing incentive programs to think through: goal, audience, and resources. After using this guide to identify the best incentive type(s), jurisdictions can review the factsheets for each of the below incentive types.

- Financial Incentives
  - Grants
  - Fee discounts
  - Rebate and cost-share programs
- Award and recognition
- Land use and permitting
- Expedited process

Instructions

1. Consider and answer the questions to the best of your ability for each of the three sections.
2. After each section, review your answers and read the accompanying text to determine which incentive type(s) best meet your needs for that section.
3. Use the results for each section to identify the best incentive type(s) to develop or modify.
4. Once you have identified your best incentive type(s), you can find additional information in the associated factsheets in this guidebook.

Defining your goal

Q: What is your primary goal for modifying or developing an incentive program?

- ☐ **Awareness**
  Increase awareness about Low-Impact Development and stormwater issues
- ☐ **Enhancement**
  Improve or adapt an existing incentive program or create a new incentive program
- ☐ **Implementation**
  Motivate or empower audiences to go above and beyond state and federal requirements

If your primary goal is **awareness**, an award and recognition incentive program may be the best option for you, as it is a lower-cost program that can increase awareness about LID and stormwater issues. The financial incentives (grants, fee discounts, and rebates and cost-share programs) are also good options for awareness incentive programs.

If your primary goal is **enhancement**, a land use and permitting incentive program may be the best option for you as it reduces some of the barriers to participating in an incentive program.

If your primary goal is **implementation**, any of the incentive programs will accommodate this goal, though during the social marketing research, financial incentives (grants, utility fee discounts, and rebates and cost-share) were rated most favorably by developers as a motivator.

Characterizing your audience

Q: What customer type makes up the largest impervious surface area?

- [ ] Commercial
- [ ] Residential

Q: Are smaller or larger property types most in need of LID incentivization?

- [ ] Smaller
- [ ] Larger

Q: What type of development do you want to focus on?

- [ ] New development
- [ ] Redevelopment
- [ ] Retrofit

Q: How much new development do you expect in your jurisdiction?

- [ ] Not a lot of new development
- [ ] A lot of new development

Q: Are there priority areas for localized flooding or erosion control or that have good infiltration potential?

- [ ] Yes
- [ ] No

Most incentive types will fit the needs for any audience type. If you are targeting smaller properties or areas without a lot of new development, an expedited process program may not be the best fit because implementing the program will have less of a ROI for these audiences.

Aligning your resources

Q: What resources can you allocate to a program? Consider small and large needs.

- [ ] Budget
- [ ] Staff capacity
- [ ] Public-private partnerships
- [ ] Infrastructure

Q: What barriers limit the creation of the program?

- [ ] Budget
- [ ] Staff capacity
- [ ] Support from management
- [ ] Inability to collaborate across programs and jurisdictions
- [ ] Technical knowledge

Q: Do you have a stormwater utility fee (needed for fee discounts) or another means of funding the program?

- [ ] Yes
- [ ] No

Q: Are grant opportunities available? Section 3 lists possible financial resources for jurisdictions, including grant opportunities.

- [ ] Yes
- [ ] No

Q: Are other departments within the jurisdiction supportive? Alternatively, is there upper level management or executive level support, or environmental goals that this program could support?

- [ ] Yes
- [ ] No

Q: How does equity play into potential incentive program design?

It is important to consider equity when investing in green infrastructure. Environmental pollutants, including stormwater runoff, disparately affect low-income neighborhoods, communities of color, and other marginalized communities. LID offers opportunities to address inequities through improving air and water quality, increasing tree canopy, and enhancing outdoor green spaces.

Examples of strategies local jurisdictions use include:

- The City of Seattle uses an equity checklist, which asks a set of guiding questions for staff to consider.
- The City of Tacoma uses an equity index, an interactive tool that highlights the disparities within the city, to evaluate projects and funding.

Each jurisdiction will face different considerations regarding environmental equity. We encourage staff to review any jurisdiction-specific materials regarding equity and to consider how they may apply to LID incentives.

- Does your jurisdiction offer funding for projects that align with citywide diversity and/or equity efforts? How may your program leverage this funding?
- Are there opportunities to partner with outside organizations, nonprofits, or other community leaders doing environmental equity work? How may your program incentivize these partnerships?
- How do historic planning and development inequities, like redlining and superfund sites, continue to impact communities in your jurisdiction? How may your program address these impacts?

If you have **limited budget, staff capacity, and additional funding opportunities**, the financial incentives (grants, fee discount, and rebates and cost-share programs) might not be the best fit for your jurisdiction. The remaining incentive options would be most feasible to explore: award and recognition, land use and permitting, expedited process.

Because developers see the highest value in financial incentives, **you may want to pursue a financial incentive program regardless of local context**. Consider beginning with a pilot program that you can scale up if/when additional resources become available. The pilot program could also increase management and executive level support before launching a full incentive program. Some of the resources listed in Section 3 may help with funding for starting an incentive program.

Incentive program factsheets

Award and recognition

Award and recognition incentive programs recognize projects, developers, and property managers that implement Low-Impact Development (LID) practices on private and public property. The formality and structure of such programs can range from simple recognition (like signage and/or plaques) to more formal recognition events that honor exemplary work in advancing LID practices.

Benefits

- Increases awareness about the important role that LID plays in managing stormwater by recognizing innovative projects and thought leaders within the field.
- Encourages innovation as successful projects inspire others to go above and beyond current stormwater requirements and helps contractors stand out from their competitors.
- Easy to implement. Programs can be as simple as recognition, including signs or recognition for standalone achievements, and can be scaled up to formal awards or certifications.

Applicable development types and audiences

- Can be applied across residential, commercial, and new/redevelopment sites.
- Audience includes individual businesses, homeowners, property managers, nonprofit agencies, municipal departments, and developers.

CASE STUDY
Puget Sound Region - Salmon Safe Certification

Salmon-Safe's urban development certification program is intended to promote ecologically sustainable land management that protects water quality and aquatic biodiversity. Stormwater management is one of the five core certification standards for urban developments. To be certified by Salmon-Safe, a proposed urban development must demonstrate thoughtful design stewardship and a commitment to long-term progress in addressing the impacts of the proposed development on sensitive aquatic and natural resources. Development project certification is valid for five years, subject to annual verification.

Development and implementation considerations

Award and recognition incentive programs vary in formality and structure. Lower level efforts, such as website recognition, yard signs, or plaques, are versatile and can highlight projects and individuals while simultaneously highlighting LID BMPs and the important role they play in stormwater

management. These incentive programs tend to require less budget and staff time than other incentive program types. For example, Skagit County provides yard signs for rain gardens on private property to inform the general public of the value of rain gardens and encourage others to implement LID practices.

Larger effort award and recognition incentive programs can include special events, award ceremonies, public engagement activities, or ongoing public and industry campaigns to identify above and beyond projects. For example, Seattle's annual Sustainable Green Home Building Awards recognizes local housing that has implemented LID practices.

Deciding whether to expand an award and recognition incentive program can be challenging because it is hard to measure direct correlations between award and recognition recipients and increases in LID practices. Some cities have found that award and recognition incentive programs are most effective when recognizing projects, developers, or property owners who have implemented LID practices using other incentive programs. This helps address other barriers that may be preventing the installation of LID practices and promotes additional resources.

Administrative considerations when developing an award and recognition incentive program include:

- Setting up the application process
- Creating recognition criteria
- Pilot testing the program with potential recipients
- Researching the opinion leaders, journals, and professional networks of value to the developer
- Promoting the program to encourage participants to apply
- Continuing promotion of award and recognition recipients
- Managing applications and selecting recipients

The criteria for being recognized and review process can range and be scaled according to initiative. It is important to consider current and projected budget and staffing when making administrative decisions that best suit your jurisdiction.

Tips for success

- Consider the LID technique you would like to see more of in your jurisdiction. Award and recognition incentives are great for encouraging specific LID practices in the community.
- Connect awards and recognition to local sustainability goals. This will increase awareness of using LID practices.
- Promoting award and recognition recipients is an important element of advancing LID.

Fee discounts

Fee discounts offer either a discount or credit to reduce stormwater utility fees for property owners that implement specific Low-Impact Development (LID) practices like reducing onsite impervious area, implementing stormwater control measures that reduce or treat stormwater onsite, and/or education or participation in public projects.

Benefits

- Fee discounts can be scaled based on the available budget and resources of the jurisdiction.
- Discounts can be offered as a set dollar amount or as a percent reduction in stormwater fees.
- Fee discounts help property owners reduce their stormwater bills and maintenance costs by reducing and treating stormwater onsite.

Applicable development types and audiences

- Applicable development types include commercial, industrial, and/or institutional properties that have a lot of impervious surfaces. These development types tend to have higher stormwater fees and benefit the most from stormwater fee discounts.
- The audience for this incentive is property owners and those who regularly maintain the property. Developers may not benefit much from fee discounts if they do not maintain ownership because it is generally associated with the long-term benefit of reducing ongoing maintenance costs.

CASE STUDY
City of Fife – Stormwater Utility Fee Discount

The City of Fife offers a 40% discount on stormwater utility fees for using LID on properties served by privately owned and maintained stormwater management systems. To qualify for this discount, the owner must provide a certified statement verifying that maintenance has been performed in accordance with the facility's operation and maintenance manual. They noted that property owners appreciate the ability to reduce stormwater utility fees by maintaining their stormwater infrastructure, offsetting the cost of maintenance.

Development and implementation considerations

Fee discounts are the most common LID incentive program. Utilities offer discounts on stormwater fees to property owners that reduce their onsite impervious area or implement stormwater controls that reduce or treat stormwater onsite, such as a rain garden. They can be offered as a percent reduction, or as a dollar amount and generally vary between 10% per practice installed to 100% of the entire stormwater bill. Discounts generally are given to practices that reduce stormwater volume, but can also be for water quality control, peak flow reduction, and/or education/participation in public projects. Stormwater fee discounts are proportional to the amount of impervious area on a property. This means the discount is smaller for small property owners.

Large commercial, industrial, and/or institutional properties that have a lot of impervious surface are generally the main audience in the fee discount incentive program—an important consideration in determining if this incentive is right for your jurisdiction.

Fee discounts are typically offered for a set time period. After that period, the property owner needs to re-apply to continue receiving the discount, which generally involves an inspection from the utility. Re-applying without an inspection is also a potential option.

Fee discounts are most effective when used with other incentives (such as grants or rebates) because those incentives help cover upfront costs while fee discounts offset annual maintenance costs. For example, Montgomery County, Maryland allows participation in a fee discount and rebates program for the same stormwater control measure, which helps landowners install LID practices through a grant and maintain them through a fee discount.

Tips for success

- Consider program goals and tailor the types of discounts offered accordingly (i.e., incentivize property owners to participate to meet these program goals).

Grants

Grant incentive programs are financial incentives that provide funding to property owners, community groups, and/or nonprofit organizations to implement LID practices on private properties. Grant incentives typically fund 100% of the project and are most frequently used for larger projects that relate to setting and meeting environmental goals that go above and beyond state requirements.

Benefits

- When grant-funded projects are large, high-visibility LID installations, the project's recognition can be used to educate the public about the benefits of LID practices and/or serve as a pilot project in the community.
- Grant programs can be designed by jurisdictions and utilities to focus on specific initiatives and/or high priority areas. This creates opportunity to leverage funding with other local initiatives.

Applicable development types and audiences

- Applicable development types include nonprofits and commercial, industrial, and institutional properties. Grants can also be used for multifamily residential properties, but this practice is less frequent because of the typical scale of the project.
- The audience is property owners, residents and developers.

CASE STUDY
City of Lake Forest Park - Environmental Legacy Grants

The Environmental Legacy Grants program aims to foster awareness, stewardship, and improvement of the natural environment by increasing awareness and use of LID techniques. Applications are simple and accepted and reviewed on a first come, first served basis. Grants provide a 50% project reimbursement:

Up to $500 for single family and $1,500 for community organizations or multiple property owner non-rain garden projects.

Up to $1,000 for single family and $2,000 for community organization rain garden installations.

Development and implementation considerations

Grant incentive programs differ from rebate incentive programs as they generally fund large projects that install several LID practices. The budget for the program depends on the scale of the project and number of participants.

Grant incentive programs can be resource intensive as they require staff to review the grant applications submitted by developers and/or property owners. These applications can be reviewed annually, or at a more

frequent interval, depending on the grant program. Review timelines impact developers that have a strict schedule; however, reviewing applications more frequently can help reduce this burden.

Projects are typically reimbursed after they are complete and have been inspected. Grant programs require staff to assist in inspection, contracting, and maintenance throughout project development. Because of the additional administrative burdens, some utilities/jurisdictions have hired a third party, such as a consultant, to reduce the administrative burden of the program.

The most successful grant incentive programs have found it helpful to provide clear resources and technical assistance, such as site visits and design verification. This reduces confusion about implementing LID practices. The LID BMP factsheets in this guidebook are a useful tool to direct property owners and developers to when choosing which LID solutions to implement.

Community and economic development corporations, such as SEED Seattle, can help administer grant programs, implement grant programs, and oversee the implementation of LID practices through successful partnerships with jurisdictions. These groups can help identify and encourage high priority projects to submit applications to grant programs. They can also contribute financially, help leverage additional funding, or offer letters of support in grant applications.

Grant resources

- WaterWorks Grant Program
- GSI Mini grants
- King County Conservation District Member Jurisdiction Grant Program

Tips for success

- Developers are frequently working on set timelines. Grant programs may not provide the necessary flexibility if they only offer grants once a year. To increase participation in the program, consider offering a rolling application process in which (1) applicants can apply any time of the year; and (2) granting awards several times a year.

Land use and permitting

Land use and permitting incentives encourage developers to use Low-Impact Development (LID) practices by reducing permitting fees and providing flexibility in land use and development codes. In addition to reducing fees (e.g., impact, use, review, and permit fees) and providing waivers, payments can be delayed. Expedited permitting is a related incentive discussed in more detail on the expedited process factsheet.

Benefits

- Land use and permitting incentives generally do not require initial start-up costs because they offer flexibility in the development code or permit fee reductions in exchange for a public benefit and additional LID. This stands out from other incentive programs that generally require additional funding, although reducing impact fees has budget implications.
- Developers tend to benefit the most when (1) flexibility is provided for complicated sites, (2) alternative compliance standards are offered, and/or (3) other regulations are relaxed. In some markets, providing additional development capacity can be of great value to developers.
- Land use and permitting incentives can encourage developers to use additional LID practices by providing a menu of options to meet development code requirements and weighting LID practices higher. Examples include Seattle's Green Factor Program (featured below) and Auburn's Flexible Development Alternatives program (on the expedited process factsheet).

Applicable development types and audiences

- Applicable development types include new and redevelopment sites. Land use and permitting incentives are the most effective in urban areas with a lot of development.
- Developers are the key audience for this incentive.

CASE STUDY
City of Seattle – Green Factor Program

The Seattle Green Factor is a score-based code requirement that increases the amount of and improves the quality of landscaping in new development. The program requires construction to vegetate 30% of a site, but the Seattle Green Factor assigns higher weights for many LID practices, allowing a developer to install more effective LID practices in a smaller area.

Development and implementation considerations

- Jurisdictions with successful land use and permitting incentive programs target the parts of the development process most relevant to the developer.
- Land use and permitting incentives can be tailored to smaller projects, but they are most applicable to large projects.

Tips for success

- Clearly demonstrate cost savings and benefits from these land use and permitting incentives to developers (e.g., value of additional development capacity). In addition, help developers understand how LID in itself adds value and increases their return on investment.

Expedited process

Expedited process incentive programs are effective in reducing costs and risks associated with Low-Impact Development (LID) practices by streamlining and expediting parts of the development process (e.g., design review process, permit process).

Benefits

- Expedited process incentives generally do not have a cost to implement as they do not require a separate budget like other incentive programs.
- Expedited development review processes ensure timely review and approvals, which are critical to the success and profitability of a project. In turn, developers are encouraged to participate in the incentive program.
- Examples of process incentives include automatic approvals and administrative reviews, which help eliminate risk of public hearings and approvals.
- Developers frequently favor expedited process incentives over other incentives because they help make projects more financially beneficial.

Applicable development types and audiences

- Applicable programs apply across residential, commercial, and new/redevelopment sites.
- The applicable audience for this incentive type is developers.

CASE STUDY
City of Auburn - Flexible Development Alternatives

The City of Auburn's point-based incentive program encourages developers to go above and beyond requirements. LID BMPs are each worth five points. Water quality, habitat, and natural vegetation also garner points. Development projects that reach 100 points can have:

- Alternate lot dimensions
- Alternate parking lot landscaping
- Alternate engineering design
- Expedited permitting process
- Increased density
- Other bonuses including increased impervious and increased maximum height

Development and implementation considerations

Expedited process incentive programs can be used together with land use and permitting incentive programs (see land use and permitting factsheet). When these two incentives are combined, they can provide value, remove barriers, and make the process more efficient for developers.

Expedited process incentive programs are generally the most effective in areas with high redevelopment pressure and in jurisdictions with high levels of permit requests. In these instances, speeding up the process is particularly motivating for developers to move forward with their projects These incentives can be tailored to smaller projects, but they are most applicable to large projects.

Tips for success

- Predict potential procedural difficulties developers may run into while processing their project and look for ways to avoid adding additional steps and to expedite the process.
- Cross-train staff to help with permitting during peak periods to ensure expediting commitments can be met.

Rebate and cost-share programs

Rebate and cost-share programs are financial incentives that offer reimbursement or co-payment to property owners for installing Low-Impact Development (LID) for specific practices. Examples of these practices include cisterns, bioretention planters, bioretention in the right of way, green roofs, and new trees.

Benefits

- Rebate and cost share programs offer educational benefits. They provide an incentive to install an easier LID practice, such as a cistern, which increases overall understanding about LID practices and their benefits and encourages further participation in implementing LID practices.
- Programs are scalable and can be tailored to meet the community's goals, budget, resources, and expertise. They also help encourage specific LID practices that are of high priority in the community.

Applicable development types and audiences

- Applicable development types include residential and commercial. This incentive typically applies to a retrofit program but could also be used for new development/redevelopment. This incentive typically supports smaller installations.
- Property owners and renters are the primary audience.

CASE STUDY
City of Shoreline – Soak it Up Rebate Program

The Surface Water Utility offers rebates up to $2,000 for Shoreline home or business owners to install a rain garden or native vegetation landscaping on their property. Rebates are based on $2.50 per square foot of contributing area. Applications require drainage test results, a site plan, plant list, and W-9 tax form.

Development and implementation considerations

The structure of rebate/cost share incentive programs vary. They can cover many LID practices or just focus on one type. They can be offered either as a set dollar amount, a percentage of the project cost, or based on the area or amount of LID installed. They can be offered throughout the year, or until the program funding has been fully allocated.

Rebate incentive programs typically do not cover the full cost of LID practices or maintenance costs. The resident or property owner fronts the cost of the LID practice and is reimbursed after it is installed, creating a financial barrier for many potential participants. Consider reducing upfront costs by having the jurisdiction pay the contractor who is doing the work directly, which also helps control costs for the jurisdiction. Rebate and cost share programs can become costly for the jurisdiction if there is a high number of installations.

The most successful rebate and cost share incentive programs offer maintenance budgets that vary by the type of installation covered, program goals, target participants, or other community factors. Rebate and cost-share programs have also been found to be particularly effective when (1) partnering with local contractors, (2) finding a way to connect applicants to local contractors to finish the project, and (3) promoting training or certification for local landscape contractors. Hiring a third party to administer rebate programs can be helpful, as connecting multiple contractors and property owners can become resource intensive.

Tips for success

- Increase the amount of the rebate to increase participation (if resources and budget allow).
- Consider different approaches for residential and commercial customers (e.g., scaling the program up for larger commercial customers).
- Target areas with defined stormwater needs for LID practices and market the incentive program in those areas.

Section 3: General LID information and training resources

This section is intended for use by municipal staff, developers, and technical consultants. It provides relevant training opportunities, certifications, and other LID resources for local governments and developers and includes the following elements:

- Stormwater requirements matrix:
  - Resource for city and county stormwater requirements in western Washington
  - Links to relevant city and county stormwater and surface water codes
  - Links to relevant jurisdiction-specific addendums, manuals, and engineering standards
- Western Washington incentives matrix:
  - Showcases the variety of incentives jurisdictions across western Washington offer to encourage developers, property owners, and engineers to implement LID BMPs
- General information and LID code:
  - General information on LID and stormwater management
  - Technical assistance for jurisdictions on LID code integration
  - Technical manuals for developers and planners on LID implementation
- LID vendors, costs, and financing:
  - Directory of LID vendors and contractors
  - BMP cost estimates
  - Tools for financing
- Certifications:
  - Training, certification, and technical assistance resources for developers, civil engineers, geotechnical engineers, landscape designers, planners, and architects

More information and resources

General information and resources
Certifications
LID Code
LID vendors, costs and financing
Stormwater requirements matrix
Western Washington incentive matrix

Relying on technical consultants

As noted in the Social Marketing Report, developers rely heavily on their civil engineers, geotechnical engineers, landscape designers, and architects to be knowledgeable regarding local stormwater code requirements and best practices. Developers specifically stated that the civil engineer is the person they turn to when making stormwater management decisions. This reliance does not eliminate the other specialists' roles or their need for education; rather it points out which partner the developers appear to rely on most. To be effective in encouraging developers to go "above and beyond" the current stormwater code requirements, jurisdictions should encourage contracting with technical consultants to offer "above and beyond" options and highlight the benefits they will bring to the developer. Jurisdictions can offer training resources or refer to some of the resources listed below.

This section responds to the identified need for technical assistance resources and additional training opportunities for technical consultants.

General information

Stormwater Management Manual for Western Washington (SWMMWW)
A technical manual that provides guidance on the measures necessary to control stormwater quantity and quality in western Washington. The SWMMWW is referenced in the Municipal Stormwater General Permits, so western Washington municipalities covered by the permit are required to adopt the SWMMWW or an equivalent manual to set requirements for new development and redevelopment projects. The SWMMWW is also referenced in the Industrial Stormwater General Permit, the Construction Stormwater General Permit, the Boatyard General Permit, and the Sand and Gravel General Permit. The SWMMWW is used by developers, engineers, and commercial/industrial business owners.

Low-Impact Development Technical Guidance Manual for Puget Sound
A technical manual targeted to engineers, planners, landscape architects, policy makers, and developers that contains information on site assessment, site planning and layout, and individual BMP design guidelines (e.g., bioretention, permeable pavement, vegetated roofs).

Rain Garden Handbook for Western Washington
A handbook geared towards homeowners and the general public that describes how to design, install, and maintain a rain garden in western Washington.

Western Washington LID Operation and Maintenance Guidance Document
A guidance document, targeted to a western Washington municipal audience, that addresses operation and maintenance guidelines to ensure properly functioning LID facilities.

LID design examples
Below are examples of typical LID design details. Designs are not directly applicable across jurisdictions and it is always important to consider site specific conditions.

- City of Edmonds: SD-600 LID Storm
- City of Renton: Surface Water Std. Details
- City of Seattle: Bioretention Standard Details
- City of Tacoma: Green Stormwater Plans and Typical Details

- LID Technical Guidance Manual: Bioretention Standard Design Features
- SWMMWW – Volume V: Example details for LID BMPs

Interlocking Concrete Pavement Institute (ICPI)
Resources for contractors/installers, designers, owners, and policy makers related to concrete paver design and construction.

Rainwater Interpretive Policy and Rainwater Harvesting Calculator
These tools are provided on the Washington State Department of Ecology website:

- The rainwater interpretive policy details rainwater collection rules in Washington state.
- The rainwater harvesting calculator helps users size their rainwater harvesting system based on the typical climate where they live.

Environmental Protection Agency Green Infrastructure
National resources on building, learning about, and partnering to implement green infrastructure projects.

Washington Stormwater Center's Resources on LID Planning, Modeling, and Site Design
List of resources that can be used for planning and designing a LID project. Resources include an example LID retrofit plan, LID design manuals from other parts of the country, and case studies.

Sound Impacts
An online portal for all of the region's practitioners and implementers of green infrastructure.

Greenroads
Provides resources to advance sustainability education and initiatives for transportation infrastructure.

Certifications

LID certifications

The Online State LID Certificate Program
An online training and certificate program specific to Washington state that covers design and maintenance of LID. Courses span a number of LID topics, including bioretention, permeable pavement, rainwater collection systems, and vegetated roof design and maintenance. The program offers two certificate tracks: LID design and LID operations and maintenance.

Salmon-Safe
A certification and accreditation for farmers, vineyards, developers, builders, and land managers aimed at encouraging development and management practices that protect and improve watershed health. The program includes a Salmon-Safe developer accreditation in Washington, Oregon, California, and British Columbia.

Green building certifications

LEED certification
A national green building certification that includes some LID elements, such as rainwater management.

Evergreen sustainable development standard
A Washington state building performance standard required of all affordable housing projects or programs receiving capital funds from the Housing Trust Fund. The standard encompasses several LID topics, such as surface water management and water reuse.

Living building challenge certification
A national green building certification that encourages net positive water use for all projects.

Built Green certification
A regional residential green building certification program of the Master Builders Association of King and Snohomish counties that includes best practices related to site and water management.

Green Globes certification
A national green building certification that includes LID topics, such as stormwater management and ecological impacts.

Greenroads certification
The Greenroads Rating System is an easy way to measure and manage sustainability on transportation projects. The rating system is the core publication used in the Greenroads Project Rating Program, which challenges project teams to go above and beyond minimum environmental, social, and economic performance measures and evaluated by an independent, expert, third-party review. Individuals can also become a sustainable transportation professional (STP) and demonstrate their comprehensive understanding of the best practices for green transportation.

Industry certifications

Interlocking Concrete Pavement Institute (ICPI) certification
Guidance on how to become a certified ICPI Concrete Paver Installer. Installers can specialize in residential, commercial, permeable interlocking paver concrete, or sales.

National Ready Mix Concrete Association
Information on the Pervious Concrete Contractor Certification Program. Three levels of certification are available: technician, installer, and craftsman.

ecoPRO Sustainable Landscape Professional certification
Certification program for landscape professionals with LID-related topics, including protecting and conserving soils, conserving water, and protecting water and air quality.

Green Roof Professional Training and Accreditation
Three courses and an accreditation exam that builds competency in green roof design and construction.

National Green Infrastructure Certification Program
A green infrastructure certification for construction, inspection, and maintenance workers.

LID code

LID code update and integration training and toolkit
Trainings and resources designed to help western Washington jurisdictions update and revise their codes to require and allow for the use of LID. This resource builds on the information presented in the Integrating LID into Local Codes guidebook.

Integrating LID into Local Codes
A guidebook for implementing LID effectively and incorporating LID topics into codes, standards, and regulations.

Nature's Scorecard
Evaluates how well Puget Sound cities and counties are complying with the LID requirements in the National Pollutant Discharge Elimination System (NPDES) municipal stormwater permits by reviewing changes made to municipal codes.

Association of Washington Cities
Guidance for cities and counties responsible for implementing and explaining LID in their communities.

LID vendors, costs and financing

Puget Sound stormwater BMP cost database
A summary of cost information and a vendor list for LID projects constructed in the Puget Sound area.

Washington State Department of Ecology Stormwater Financial Assistance Program
The Department of Ecology's Stormwater Financial Assistance Program (SFAP) funds eligible public stormwater projects—including activities to plan, design and/or construct LID practices in areas of existing development. Jurisdictions can maximize the stormwater benefits associated with public or private development and redevelopment using SFAP for public stormwater facilities that go above and beyond state requirements. Jurisdictions are not eligible for SFAP funding for stormwater facilities that are necessary to comply with state permit requirements for new development and redevelopment, nor can SFAP directly fund private infrastructure.

International stormwater BMP database
Cost information for a variety of national and international LID projects.

Washington Stormwater Center's Provider Directory
A list of Washington stormwater-related businesses with contact information.

RainWise contractors
Provides information on RainWise program eligibility, the rebate process, an approved contractor list, and maintenance.

Washington Stormwater Center's Funding, Financing, and Foundations list
A guide to funding various green infrastructure projects with links to external resources.

Stormwater requirements matrix

The following matrix is a starting point for locating jurisdiction-specific requirements and materials.

It summarizes which stormwater manual each jurisdiction has adopted and provides a link to the stormwater/surface water code. The matrix also identifies jurisdictions that have established specific thresholds or onsite BMP requirements that are different from Ecology's requirements and lists additional jurisdiction-specific addendums, manuals, or engineering standards where applicable.

Note: The stormwater manual adoption is sometimes listed in the definitions section within the stormwater/surface water code or as a stand-alone section separate from the definitions section. The references in this matrix may change as municipal code and local documents are updated. If you are designing a project for a specific jurisdiction, you will still need to review the code, manual, addendum (if applicable), and engineering standards (if applicable) in detail.

Jurisdictions Going Above and Beyond

In addition to incentivizing additional LID, jurisdictions can adopt stormwater requirements that go above and beyond Ecology's requirements. **Jurisdictions with above and beyond requirements are noted with a "Yes" in the city/county specific thresholds column of the matrix.**

City of Bainbridge Island	City of Edmonds
The City of Bainbridge Island's thresholds for Minimum Requirement #5 are: • **1,300 square feet (sf)** new plus replaced hard surface area (new development) • **800 sf** new plus replaced hard surface area (redevelopment) **Both thresholds are lower than Ecology's threshold** of 2,000 sf new plus replaced hard surface area (new development and redevelopment), which results in on-site stormwater management requirements for smaller projects.	The City of Edmonds has established a **25% retrofit requirement** for existing hard surfaces on a parcel that is being developed. **Ecology does not currently have a retrofit requirement** for Phase II jurisdictions (only for new development and redevelopment), so this City-specific on-site stormwater management requirement is above and beyond Ecology's requirements.

Regional Stormwater Manual Key

Ecology SWMMWW: The Washington State Department of Ecology Stormwater Management Manual for Western Washington
King County SWDM: King County Surface Water Design Manual
Pierce County SSDM: Pierce County Stormwater and Site Development Manual

Name	Adopted Manual	Stormwater/ Surface Water Code Reference	City/County-specific thresholds or on-site BMPs?	Weblink to Code	Name of City/ County-specific Addendum or Manual
Aberdeen	Ecology SWMMWW	Chapter 13.70 Storm and Surface Water Management	No	www.codepublishing.com/WA/Aberdeen	Not applicable
Algona	Ecology SWMMWW	Chapter 13.46 Storm Water Management Regulations and Requirements	No	www.codepublishing.com/WA/Algona	Not applicable
Anacortes	Ecology SWMMWW	Chapter 19.76 Stormwater	No	https://anacortes.municipal.codes	Engineering Standards for Storm Drainage, Chapter 2
Arlington	Ecology SWMMWW	Chapter 13.28 Stormwater Utility	No	https://library.municode.com/wa/arlington/codes/code_of_ordinances	Not applicable
Auburn	Ecology SWMMWW	Chapter 12.04Public Works Construction	No	https://auburn.municipal.codes	City of Auburn Supplemental Manual to the Ecology SWMMWW and Engineering Design Standards
Bainbridge Island	Ecology SWMMWW	Chapter 15.20 Surface and Stormwater Management	Yes	www.codepublishing.com/WA/BainbridgeIsland	City of Bainbridge Island Design and Construction Standards and Specifications

Name	Adopted Manual	Stormwater/ Surface Water Code Reference	City/County-specific thresholds or on-site BMPs?	Weblink to Code	Name of City/ County-specific Addendum or Manual
Battleground	Ecology SWMMWW	Chapter 18.250 Stormwater Control and Drainage	No	www.codepublishing.com/WA/BattleGround	City of Battleground Stormwater Design and Construction Requirements (Section 4)
Bellevue	Ecology SWMMWW	Chapter 24.06 Storm and Surface Water Utility Code	Yes	www.codepublishing.com/WA/Bellevue	Storm and Surface Water Engineering Standards and Surface Water Engineering Details
Bellingham	Ecology SWMMWW	Chapter 15.42 Stormwater Management	Yes	www.codepublishing.com/WA/Bellingham	Packet on Stormwater Permit Submittal Requirements
Black Diamond	Ecology SWMMWW	Chapter 14.04– Stormwater Management and Drainage Design	Yes	www.ci.blackdiamond.wa.us/citycode	Not applicable
Bonney Lake	Pierce County Stormwater Management and Site Development Manual	Chapter 15.13 Stormwater Management	No	www.codepublishing.com/WA/BonneyLake	Not applicable
Bothell	Developed own manual	Title 18 Utilities Infrastructure, Chapter 18.04 Storm Water and Drainage Control Code (Note: Adopted manual can be found in Chapter 18.01)	No	www.codepublishing.com/WA/Bothell	City of Bothell Surface Water Design Manual

Name	Adopted Manual	Stormwater/ Surface Water Code Reference	City/County-specific thresholds or on-site BMPs?	Weblink to Code	Name of City/ County-specific Addendum or Manual
Bremerton	Ecology SWMMWW	Chapter 15.04 Stormwater	No	www.codepublishing.com/WA/Bremerton	City of Bremerton Engineering Design and Construction Standards (Division 4)
Brier	Ecology SWMMWW	Chapter 14.04 Stormwater Management and Regulations	No	www.codepublishing.com/WA/Brier	Not applicable
Buckley	Ecology SWMMWW	Chapter 14.30 Stormwater Management	No	www.codepublishing.com/WA/Buckley	City of Buckley Development Guidelines and Public Works Standards
Burien	King County Surface Water Design Manual	Chapter 13.10.020 Surface Water Management	Yes	www.codepublishing.com/WA/Burien	City of Burien Surface Water Design Manual
Burlington	Ecology SWMMWW	Chapter 14.05 Surface Water Management	No	www.codepublishing.com/WA/Burlington	Not applicable
Camas	Ecology SWMMWW	Chapter 14.02 Stormwater Control	No	https://library.municode.com/wa/camas/codes/code_of_ordinances	City of Camas Stormwater Design Standards Manual
Centralia	Ecology SWMMWW	Chapter 18.15 Adoption of Stormwater Management Documents	No	www.codepublishing.com/WA/Centralia	Not applicable

Name	Adopted Manual	Stormwater/ Surface Water Code Reference	City/County-specific thresholds or on-site BMPs?	Weblink to Code	Name of City/ County-specific Addendum or Manual
Clyde Hill	Ecology SWMMWW	Chapter 15.10 Drainage	No	www.codepublishing.com/WA/ClydeHill	Not applicable
Covington	Ecology SWMMWW	Chapter 13.25 Surface and Stormwater	Yes	www.codepublishing.com/WA/Covington	City of Covington Design and Construction Standards
Des Moines	King County Surface Water Design Manual	Chapter 11.08 Surface Water Management Program	Yes	www.codepublishing.com/WA/DesMoines	Supplemental storm water standards
DuPont	Ecology SWMMWW	Chapter 22.01 Stormwater Management Regulations and Requirements	No	www.codepublishing.com/WA/DuPont	Not applicable
Duvall	King County Surface Water Design Manual	Chapter 9.06 Storm Drainage Utility	No	https://library.municode.com/wa/duvall/codes/code_of_ordinances	Not applicable

Name	Adopted Manual	Stormwater/ Surface Water Code Reference	City/County-specific thresholds or on-site BMPs?	Weblink to Code	Name of City/ County-specific Addendum or Manual
Edgewood	Pierce County Stormwater Management and Site Development Manual	Chapter 13.05 Stormwater Manual – Site Development Regulations	Yes	www.codepublishing.com/WA/Edgewood	Modifications to the Pierce County Manual (PCM)
Edmonds	Ecology SWMMWW	Chapter 18.30 Stormwater Management	Yes	www.codepublishing.com/WA/Edmonds	Edmonds Stormwater Addendum and Edmonds Standard Details
Enumclaw	Ecology SWMMWW	Chapter 14.10 Stormwater Management	No	www.codepublishing.com/WA/Enumclaw	Not applicable
Everett	Ecology SWMMWW	Chapter 14.28 Surface and Storm Drainage	No	www.codepublishing.com/WA/Everett	City of Everett Design and Construction Standards
Federal Way	King County Surface Water Design Manual	Title 16 Surface Water Management	No	www.codepublishing.com/WA/Federal Way	City of Federal Way Addendum to the King County Surface Water Design Manual
Ferndale	Ecology SWMMWW	Chapter 13.34 Stormwater Control	No	www.codepublishing.com/WA/Ferndale	Not applicable
Fife	Ecology SWMMWW	Chapter 15.32 Drainage of Surface Water	No	www.codepublishing.com/WA/Fife	Not applicable
Fircrest	Ecology SWMMWW	Chapter 20.24 Storm Water Management	No	www.codepublishing.com/WA/Fircrest	Not applicable

Name	Adopted Manual	Stormwater/ Surface Water Code Reference	City/County-specific thresholds or on-site BMPs?	Weblink to Code	Name of City/ County-specific Addendum or Manual
Gig Harbor	Developed own manual	Chapter 14.20 Stormwater Management	No	www.codepublishing.com/WA/GigHarbor	City of Gig Harbor Stormwater Management and Site Development Manual
Granite Falls	Ecology SWMMWW	Chapter 13.20 Storm Drainage System	No	www.codepublishing.com/WA/GraniteFalls	Not applicable
Issaquah	Ecology SWMMWW	Chapter 16.26 Clearing, Grading, and Stormwater Management	Yes	www.codepublishing.com/WA/Issaquah	City of Issaquah Stormwater Design Manual Addendum
Kelso	Developed own manual	Chapter 13.09 Stormwater Management	No	www.codepublishing.com/WA/Kelso	City of Kelso Engineering Design Manual
Kenmore	King County Surface Water Design Manual	Title 13 Utilities and Public Works, Division II. Surface and Stormwater Utility	No	www.codepublishing.com/WA/Kenmore	City of Kenmore Surface Water Design Manual Addendum
Kent	King County Surface Water Design Manual	Chapter 7.07 Surface Water and Drainage Code	No	www.codepublishing.com/WA/Kent	City of Kent Surface Water Design Manual
Kirkland	King County Surface Water Design Manual	Chapter 15.52 Storm Water Drainage	Yes	www.codepublishing.com/WA/Kirkland	City of Kirkland Addendum to the 2016 Surface Water Design Manual and Storm Drainage Pre-Approved Plans

Name	Adopted Manual	Stormwater/ Surface Water Code Reference	City/County-specific thresholds or on-site BMPs?	Weblink to Code	Name of City/ County-specific Addendum or Manual
Lacey	Developed own manual	Chapter 14.27 Stormwater Management	No	www.codepublishing.com/WA/Lacey	City of Lacey Stormwater Design Manual
Lake Forest Park	King County Surface Water Design Manual	Chapter 16.24 Drainage Plans	No	www.codepublishing.com/WA/LakeForestPark	Not applicable
Lake Stevens	Ecology SWMMWW	Chapter 11.06 Stormwater Management	No	www.codepublishing.com/WA/LakeStevens	Not applicable
Lakewood	Ecology SWMMWW	Chapter 12.11 Storm Water Management (Note: Adopted manual can be found in Chapter 12.03)	No	www.codepublishing.com/WA/Lakewood	City of Lakewood Engineering Standards Manual
Longview	Ecology SWMMWW	Chapter 17.80 Stormwater Management	No	www.codepublishing.com/WA/Longview	City of Longview Stormwater Management Guidelines and Standard Plans and Details
Lynden	Ecology SWMMWW	Chapter 13.24 Stormwater Management System	No	https://library.municode.com/wa/lynden/codes/code_of_ordinances	City of Lynden Design and Development Standards
Lynnwood	Ecology SWMMWW	Chapter 13.40 Stormwater Management	Yes	www.codepublishing.com/WA/Lynnwood	City of Lynnwood Supplemental Stormwater Guidelines

Name	Adopted Manual	Stormwater/ Surface Water Code Reference	City/County-specific thresholds or on-site BMPs?	Weblink to Code	Name of City/ County-specific Addendum or Manual
Maple Valley	King County Surface Water Design Manual	Title 13 Surface Water Management	No	www.codepublishing.com/WA/MapleValley	Not applicable
Marysville	Ecology SWMMWW	Chapter 14.15 Controlling Stormwater Runoff from New Development, Redevelopment, and Construction Sites	No	www.codepublishing.com/WA/Marysville	Engineering Design and Development Standards
Medina	Ecology SWMMWW	Chapter 20.43 Land Development Grading and Drainage	No	www.codepublishing.com/WA/Medina	Not applicable
Mercer Island	Ecology SWMMWW	Chapter 15.09 Storm Water Management Program	Yes	www.codepublishing.com/WA/MercerIsland	Not applicable
Mill Creek	Ecology SWMMWW	Chapter 15.14 Surface Water Management Program	No	www.codepublishing.com/WA/MillCreek	City of Mill Creek Standard Specifications and Details
Milton	Ecology SWMMWW	Chapter 13.26 Storm Drainage of Surface Water – Utility, Management and Maintenance	No	www.codepublishing.com/WA/Milton	Not applicable
Monroe	Ecology SWMMWW	Chapter 15.01 Stormwater Management	No	www.codepublishing.com/WA/Monroe	City of Monroe Design and Construction Standards

Name	Adopted Manual	Stormwater/ Surface Water Code Reference	City/County-specific thresholds or on-site BMPs?	Weblink to Code	Name of City/ County-specific Addendum or Manual
Mountlake Terrace	Ecology SWMMWW	Chapter 16.20 Stormwater	No	www.codepublishing.com/WA/MountlakeTerrace	City of Mountlake Terrace Engineering Standards
Mount Vernon	Ecology SWMMWW	Chapter 13.33 Storm Water Drainage Utility	No	www.codepublishing.com/WA/MountVernon	City of Mount Vernon Engineering Standards
Mukilteo	Ecology SWMMWW	Chapter 13.12 Surface Water Management	No	www.codepublishing.com/WA/Mukilteo	City of Mukilteo Development Standards
Newcastle	King County Surface Water Design Manual	Chapter 13.10 Surface Water Management Code	No	www.codepublishing.com/WA/Newcastle	City of Newcastle Surface Water Design Manual Addendum
Normandy Park	Ecology SWMMWW	Chapter 13.08 Drainage and Water Quality	No	www.codepublishing.com/WA/NormandyPark	Not applicable
Oak Harbor	Ecology SWMMWW	Chapter 12.30 Storm Water Management	No	www.codepublishing.com/WA/OakHarbor	Not applicable
Olympia	Developed own manual	Chapter 13.16 Storm and Surface Water Management	No	www.codepublishing.com/WA/Olympia	City of Olympia Drainage Design and Erosion Control Manual

Name	Adopted Manual	Stormwater/ Surface Water Code Reference	City/County-specific thresholds or on-site BMPs?	Weblink to Code	Name of City/ County-specific Addendum or Manual
Orting	Ecology SWMMWW	Title 9 Water and Sewers, Chapter 5 Stormwater Regulations, Article A Stormwater Management	No	https://codelibrary.amlegal.com/codes/ortingwa/latest/overview	Not applicable
Pacific	King County Surface Water Design Manual	Chapter 24.08 Stormwater Management	No	www.codepublishing.com/WA/Pacific	Not applicable
Port Angeles	Ecology SWMMWW	Chapter 13.63.190 Stormwater – Utility and Regulations	No	https://library.municode.com/wa/port_angeles/codes/code_of_ordinances	City of Port Angeles Urban Services Standards and Guidelines
Port Orchard	Ecology SWMMWW	Chapter 20.150 Stormwater Drainage	Yes	www.codepublishing.com/WA/PortOrchard	City of Port Orchard Public Works Engineering Standards and Specifications
Poulsbo	Ecology SWMMWW	Chapter 12.02 Construction and Development Standards	No	www.codepublishing.com/WA/Poulsbo	City of Poulsbo Construction Standards and Specifications
Puyallup	Ecology SWMMWW	Chapter 21.10 Stormwater Management	No	www.codepublishing.com/WA/Puyallup	City of Puyallup Standards for Public Works Engineering and Construction Manual
Redmond	Ecology SWMMWW	Chapter 15.24 Clearing, Grading, and Stormwater Management	No	www.codepublishing.com/WA/Redmond	City of Redmond Stormwater Technical Notebook

Name	Adopted Manual	Stormwater/ Surface Water Code Reference	City/County-specific thresholds or on-site BMPs?	Weblink to Code	Name of City/ County-specific Addendum or Manual
Renton	Developed own manual	Chapter? 4-6-030 Drainage (Surface Water) Standards	No	www.codepublishing.com/WA/Renton	City of Renton Surface Water Design Manual
Sammamish	King County Surface Water Design Manual	Title 13, Surface Water Management	No	www.codepublishing.com/WA/Sammamish	City of Sammamish Addendum to the 2016 King County SWDM
SeaTac	King County Surface Water Design Manual	Chapter 12.10 Surface and Stormwater Management	No	www.codepublishing.com/WA/SeaTac	City of SeaTac Addendum to the King County SWDM
Seattle	Developed own manual	Title 22 Building and Construction Codes, Subtitle VIII Stormwater Code, Chapter 22.800	Yes	https://library.municode.com/wa/seattle/codes/municipal_code	Seattle Stormwater Manual
Sedro-Woolley	Ecology SWMMWW	Chapter 13.36 Stormwater Management	No	www.codepublishing.com/WA/SedroWoolley	City of Sedro-Woolley Public Works Development Standards
Shelton	Ecology SWMMWW	Chapter 13.02 Stormwater Management	No	www.codepublishing.com/WA/Shelton	City of Shelton Design and Construction Standards

Name	Adopted Manual	Stormwater/ Surface Water Code Reference	City/County-specific thresholds or on-site BMPs?	Weblink to Code	Name of City/ County-specific Addendum or Manual
Shoreline	Ecology SWMMWW	Chapter 13.10 Surface Water Utility	No	www.codepublishing.com/WA/Shoreline	City of Shoreline Engineering Development Manual
Snohomish	Ecology SWMMWW	Chapter 15.16 Stormwater Management	No	https://snohomish.municipal.codes	City of Snohomish Engineering Design and Construction Standards
Snoqualmie	King County Surface Water Design Manual	Chapter 15.18 Surface Water and Stormwater Management	No	www.codepublishing.com/WA/Snoqualmie	City of Snoqualmie Addendum to the 2016 King County Surface Water Design Manual
Steilacoom	Ecology SWMMWW	Chapter 13.50 Stormwater Management	No	https://townofsteilacoom.org/274/Municipal-Code	Not applicable
Sumner	Ecology SWMMWW	Chapter 13.48 Stormwater Management Regulations	No	www.codepublishing.com/WA/Sumner	City of Sumner Development Specifications and Standard Details
Tacoma	Developed own manual	Chapter 12.08 Wastewater and Surface Water Management – Regulation and Rates	Yes	www.cityoftacoma.org/government/city_departments/CityAttorney/CityClerk/TMC	City of Tacoma Stormwater Management Manual
Tukwila	King County Surface Water Design Manual	Chapter 14.30 Surface Water Management	No	http://records.tukwilawa.gov/WebLink/Browse.aspx	City of Tukwila Infrastructure Design and Construction Standards
Tumwater	Developed own manual	Chapter 13.12 Stormwater System	No	www.codepublishing.com/WA/Tumwater	City of Tumwater Drainage Design and Erosion Control Manual

Name	Adopted Manual	Stormwater/ Surface Water Code Reference	City/County-specific thresholds or on-site BMPs?	Weblink to Code	Name of City/ County-specific Addendum or Manual
University Place	King County Surface Water Design Manual	Chapter 12.15 Storm Drainage and Surface Water Management (Note: Adopted manual can be found in Chapter 12.10)	No	www.codepublishing.com/WA/UniversityPlace	Not applicable
Vancouver	Ecology SWMMWW	Chapter 14.26 Water Resources Protection	No	https://vancouver.municipal.codes	City of Vancouver, WA General Requirements and Details for the Design and Construction of Water, Sanitary Sewer, and Surface Water Systems
Washougal	Ecology SWMMWW	Chapter 14.32 Stormwater Utility Rates	No	www.codepublishing.com/WA/Washougal	City of Washougal Engineering Standard Details
Woodinville	King County Surface Water Design Manual	Chapter 13.05 Stormwater Runoff and Surface Water and Erosion Control	No	www.codepublishing.com/WA/Woodinville	Not applicable
Clark County	Developed own manual	Chapter 40.386 Stormwater and Erosion Control	No	www.codepublishing.com/WA/ClarkCounty	Clark County Stormwater Manual
Cowlitz County	Developed own manual	Chapter 16.20 Stormwater Management in Rural Areas and Chapter 16.22 Stormwater Management in the Unincorporated Urbanized Area	No	www.codepublishing.com/WA/CowlitzCounty	Cowlitz County Stormwater Drainage Manual

Name	Adopted Manual	Stormwater/ Surface Water Code Reference	City/County-specific thresholds or on-site BMPs?	Weblink to Code	Name of City/ County-specific Addendum or Manual
King County	King County Surface Water Design Manual	Chapter 9.04 Stormwater Runoff and Surface Water ad Erosion Control	No	www.kingcounty.gov/council/legislation/kc_code.aspx	King County Surface Water Design Manual
Kitsap County	Developed own manual	Chapter 12.08 Storm Water Drainage	No	www.codepublishing.com/WA/KitsapCounty	Kitsap County Stormwater Design Manual
Pierce County	Pierce County Stormwater Management and Site Development Manual	Title 17A Construction and Infrastructure Regulations – Site Development and Stormwater Drainage	Yes	www.codepublishing.com/WA/PierceCounty	Pierce County Stormwater Management and Site Development Manual
Skagit County	Ecology SWMMWW	Chapter 14.32 Stormwater Management	No	www.codepublishing.com/WA/SkagitCounty	Not applicable
Snohomish County	Developed own manual	Chapter 30.63A Drainage	No	https://snohomish.county.codes	Snohomish County Drainage Manual
Thurston County	Developed own manual	Chapter 15.05 Thurston County Stormwater Standards	Yes	https://library.municode.com/wa/thurston_county/codes/code_of_ordinances	Thurston County Drainage Design and Erosion Control Manual
Whatcom County	Ecology SWMMWW	Title 16 Environment	No	www.codepublishing.com/WA/WhatcomCounty	Whatcom County Development Standards - Chapter 2

Western Washington incentive matrix

The following matrix showcases the variety of incentives that jurisdictions across Western Washington offer to encourage developers, property owners, and engineers to implement LID BMPs. It identifies the type of incentive and eligible development types and provides a short description of the program. Developers and property owners can use the matrix to identify incentives for future projects. Jurisdictions can use the matrix to identify incentive programs that may be suitable for local adoption.

Incentive Type	Eligible Development Type	Jurisdiction/ Organization	Link to Program	Description
Financial	Multi-family residential Commercial	Auburn	Stormwater Rate Reduction	Non-single-family parcels with detention, retention, or water quality treatment facilities are charged a lower stormwater rate than non-single-family parcels without a stormwater facility.
Financial Technical Assistance	Residential	Bellingham	Homeowner Incentive Program	This program connects landowners living in the Lake Whatcom watershed with the technical and financial assistance they need to take action to improve water quality in the lake.
Financial	Commercial Residential	Burien	Neighborhood Matching Fund	The purpose of the neighborhood matching fund is to give residents access to city funds to improve the quality of life in Burien neighborhoods.
Financial	Residential	Everett	Let It Rain Rebate Program	The City of Everett offers up to a $2,500 rebate to homeowners who volunteer to install an approved rain garden.
Financial	Commercial Residential	King County	GSI Mini Grants	Green Stormwater Infrastructure Mini Grants provide up to $1,500 for landowners within the King County Wastewater Treatment Division (WTD) service area that are not eligible for other incentive programs. Up to $4,500 may be provided to income-limited landowners.
Financial	Residential	King County	RainWise	RainWise is a rebate program that helps eligible property owners manage stormwater by installing rain gardens and/or cisterns on private property.

Incentive Type	Eligible Development Type	Jurisdiction/ Organization	Link to Program	Description
Financial	Residential Commercial	King County	RainWise Access Grant	The RainWise Access Grant provides up to an additional $1,000 for RainWise eligible homeowners and non-profit community organizations (including religious groups) to bridge the gap between rebate amount and actual project costs for income limited and underserved communities.
Financial Technical Assistance	Residential	Kirkland	Yard Smart Rain Rewards	Qualified homes can take advantage of free technical assistance and rebates to install beautiful projects like rain gardens, native landscaping, and cisterns on their property to manage rainwater runoff. The program also includes rebates for disconnecting downspouts and for tree planting.
Financial Technical Assistance	Commercial Residential	Kitsap Conservation District	Kitsap Conservation District Cost Share Program	The Rain Garden and LID Program at KCD works cooperatively with county services, landowners, and local communities to expand knowledge and use of LID practices throughout Kitsap County.
Financial	Residential	Lynnwood	Tree Voucher Program	The Tree Voucher Program provides a coupon that can be used to purchase almost any species of tree and soil amendments from a participating Washington State Landscape and Nursery Association (WSLNA) nursery.
Financial	Commercial Residential	Olympia	Rain Garden Incentive Program	The Storm and Surface Water Utility is offering Olympia property owners the opportunity to apply for up to $400 reimbursement for plants and/or compost used for the construction of a rain garden
Financial Technical Assistance	Residential	Pierce Conservation District	Pierce Conservation District Cost Share Program	Pierce Conservation District staff work with several homeowners each year to design and install rain gardens on their property.

Incentive Type	Eligible Development Type	Jurisdiction/ Organization	Link to Program	Description
Financial	Commercial Residential	Port Angeles	Stormwater Green Infrastructure Rebates	The City of Port Angeles provides financial assistance to new development or redevelopment projects that result in less than 5000 square feet of new and replaced hard surfaces, and implement two or more of the following: Permeable pavement ($1 per square foot, up to a maximum of $1000) Compost amended soils in all disturbed areas not covered by new improvements (voucher for up to 10 yards of compost) Rain gardens (up to $1000 for materials)
Financial	Commercial Residential	Port Angeles	Rain Garden Retrofit Rebates	The City of Port Angeles provides financial assistance to residents and businesses building rain gardens at their existing home or place of business. Approved applicants can receive a rebate of up to $1000 for the purchase of materials such as plants, compost, sand, mulch, and rock.
Financial Technical Assistance	Residential	Puyallup	Cost Share Program	Puyallup's Rain Garden Program includes many green stormwater infrastructure elements that help manage stormwater where it falls including permeable pavements, rain barrels, and rain gardens.
Financial	Commercial Residential	Seattle	Stormwater Facility Credit	The Stormwater Facility Credit Program (SFCP) is a credit program for property owners with stormwater systems that help reduce the impact of stormwater on the City's system.
Financial	Commercial Residential	Seattle	RainWise Rebates	RainWise is a rebate program that helps eligible property owners manage stormwater by installing rain gardens and/or cisterns on private property.

Incentive Type	Eligible Development Type	Jurisdiction/ Organization	Link to Program	Description
Financial Technical Assistance	Residential	Seattle	Trees for Neighborhoods program	The Trees for Neighborhoods program provides: Help selecting the right tree and planting location Free trees (up to 4 per household, lifetime max of 6) A watering bag and mulch for each tree Training on proper planting and care Assistance applying for street tree planting permits
Financial	Commercial Residential	Shoreline	Soak It Up Rebate Program	The Surface Water Utility offers rebates up to $2,000 for Shoreline home or business owners to install a rain garden or native vegetation landscaping on their property.
Financial	Residential	Snohomish Conservation District	Cost Share Program	Qualified properties in Snohomish County and on Camano Island are eligible to receive funding (cost share) from the Snohomish Conservation District.
Financial	Commercial Residential	Tacoma	LID Surface Water Rate Reduction	Property owners may qualify for a surface water rate reduction if they choose to utilize permanent LID BMPs beyond what is required per the Stormwater Management Manual (SWMM) for development or redevelopment or as a retrofit for stormwater management.
Financial Technical Assistance	Residential	Tacoma	Make a Splash Stormwater Project Funding	The City of Tacoma's Environmental Services Department awards up to $50,000 a year in environmental grants to help educate residents and protect and restore our surface water resources.
Financial	Residential	Tacoma	Tree Coupon Program	Tree coupons are valid for $30 off each tree purchased, for up to three trees on a residential property, at select local tree retailers. Trees must be woody plants whose height is greater than 15 feet at maturity. Trees may be planted on private property or in right-off-way areas (such as planting strips) abutting private property.

Incentive Type	Eligible Development Type	Jurisdiction/ Organization	Link to Program	Description
Financial	Residential	Thurston County	Storm and Surface Water Utility Rate Credits	The stormwater fee credit program is designed to recognize schools, commercial businesses and other nonresidential property owners whose activities support the County's stormwater management goals by granting these parcel owners up to a 50 % credit on their stormwater rates and charges.
Financial	Residential	Vancouver	Treefund Program	The Treefund Program provides a 50% refund for planting a tree, up to $50, for up to 5 trees per lot. Existing or new Utility eBilling customers can receive up to $100 back on their first tree, up to the cost of the tree.

Conclusion

The natural beauty of Washington's Puget Sound region and its waterways is one of the main draws for people who live, work, and play in our communities. However, continued growth and the increased stormwater runoff that comes with it threaten these natural amenities and the health and beauty of the region. Stormwater runoff from impervious surfaces gathers pollutants before flowing into waterways, contributing to the 14+ million pounds of toxic chemicals that end up in Puget Sound each year (Ecology, Toxic Chemicals in the Puget Sound).

Jurisdictions and developers can play a key role in ensuring that our communities continue to be beautiful, livable spaces that balance human and ecosystem needs, even as we grow. Working together, we can create a future where:

- LID solutions are normalized and widespread in regional development, filtering and cleaning water, building natural habitat, improving air quality, increasing the beauty of our neighborhoods, and creating community gathering spaces.
- There is clear public demand for LID solutions, and all communities see benefits from LID implementation. LID solutions are promoted, planned, and implemented with an equity lens.
- LID is considered early in the development process, ensuring that developers can maximize their use of BMPs that are low-cost, easy-to-implement and maintain, and add significant social and economic value to meet market demand.

Innovative practices are already being explored in jurisdictions across Washington, as highlighted in the case studies featured throughout the guidebook. By continuing to simplify the design, maintenance, and installation process of LID BMPs—and enhancing developer incentive programs—jurisdictions can move the needle even further on LID "above and beyond" solutions, minimizing pollution from urban stormwater runoff, beautifying our communities, and protecting the quality of Puget Sound's iconic waterways.

Appendix A: Social Marketing Report

Incentivizing LID for Developers:

A Social Marketing Report

Washington State Department of Commerce | Puget Sound Regional Council | Cascadia Consulting Group | Hardwick Research | Herrera | BERK Strategy • Analysis • Communications

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Overview

BACKGROUND

Social Marketing Reports present research focusing on the behavior of a particular target market, identifying information relating to the opinions, needs, attitudes, and motivations of a group of people.

Low Impact Development (LID) is a green infrastructure approach to stormwater management that integrates on-site natural features with distributed stormwater best management practices (BMPs). These LID BMPs provide infiltration, filtration, and storage of stormwater by mimicking natural hydrologic conditions. **The Washington State Department of Ecology (Ecology) requires LID BMPs to be evaluated—and implemented if technically feasible—for new development and redevelopment in the majority of the cities and counties in Western Washington.** Developers implement LID solutions throughout Washington State to address a variety of water quality and quantity issues related to stormwater runoff.

Washington's Puget Sound region is one of America's fastest growing areas. New development is planned to focus primarily in urban growth areas due to geographic constraints and Growth Management Act policies. While this growth brings many benefits to the region, it can also strain the environment, for example, by increasing the risk of polluted stormwater runoff that threatens local waterways. To protect the health of our streams, rivers, lakes, and the Sound, Washington must focus on building green cities that can more effectively manage stormwater runoff, while increasing density and livability for our growing population. Addressing stormwater impacts from only new development and redevelopment sites will not adequately address stormwater discharges from existing developed sites, nor protect areas providing ecological services for stormwater management.

While there have been significant contributions to advancing LID throughout the region, there is still much work to be done. Responding to this need, the Washington State Department of Commerce (Commerce) and Puget Sound Regional Council (PSRC) convened a Building Green Cities (BGC) Advisory Committee representing cities, counties, local developers, the environmental community, and state and federal agencies to develop strategies to incentivize developers to utilize green stormwater infrastructure, thereby going beyond the National Pollutant Discharge Elimination System (NPDES) municipal stormwater permit requirements for LID in urban centers. Commerce held a kickoff meeting on October 24, 2017 and hired Cascadia Consulting Group (Cascadia) in spring 2018.

This project was supported by Grant No. EG170205 awarded by United States Environmental Protection Agency (EPA), through the Washington State Department of Ecology (Ecology). The contents of this document do not necessarily reflect the views or policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

SOCIAL MARKETING RESEARCH PROJECT

Cascadia Consulting Group (Cascadia) was hired to help Commerce, PSRC, and the BGC Advisory Committee lead a robust social marketing research effort and develop guidance for local governments to incentivize developers to go "**above and beyond**" municipal stormwater permit requirements in urban centers. Above and beyond in this context refers to any of the following situations:

1. Using LID when a project is otherwise **under the size thresholds**.
2. Exploring options around **BMPs considered to be infeasible**, based on the technical infeasibility criteria included in the Stormwater Management Manual for Western Washington.
3. Using **optional BMPs** (e.g., vegetated roofs, rainwater harvesting, minimal excavation foundations).
4. Using bioretention or permeable pavement in a drainage basin that is **flow control exempt** (e.g., Puget Sound).[1]

The Cascadia team used a social marketing approach to:

- Conduct and produce a **literature review** on the effectiveness of, and barriers to, low impact development (LID) in urban centers.
- Conduct **social marketing research** through **interviews with Puget Sound municipal staff** in three (3) jurisdictions to learn what they believe developers know about LID and use their feedback to inform creation of the developer interview guide.
- Conduct **social marketing research** through **interviews with Puget Sound developers** on barriers, motivators, and benefits to incorporating LID solutions in urban centers.
- Identify areas for **additional research** needed to fill gaps that emerged from the literature review and social marketing research.

Cascadia completed these research objectives with the help of three subconsultants. Hardwick Research conducted the developer interviews. Berk Consulting and Herrera Environmental Consultants (Herrera) provided technical oversight. The following social marketing report highlights the results of this research and will form the basis of a local government guidance document that provides incentives for developers and others to go above and beyond the municipal stormwater requirements for LID in new development and redevelopment projects in urban centers.

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[1] The municipal stormwater permit states that "*projects qualifying as flow control exempt … do not have to achieve the LID performance standard, nor consider bioretention, rain gardens, permeable pavement, and full dispersion if using List #1 or List #2. However, those projects must implement [post-construction soil quality and depth] BMP T5.13; [downspout full infiltration] BMPs T5.10A, [downspout dispersion] B, or [perforated stub-out connections] C; and [concentrated flow dispersion] BMP T5.11 or [sheet flow dispersion] T5.12, if feasible*."

LITERATURE REVIEW

In May and June 2018, Cascadia conducted a literature review regarding barriers, motivators, and opportunities to increase developer use of LID BMPs, following the process outlined below:

1. Reviewed an initial list of materials provided by Commerce.
2. Identified additional source materials during the literature review research and added these sources to the study.
3. Developed a document summary template (included in Appendix A) to capture key information in each source document.
4. Completed a document summary sheet for each of the 15 sources reviewed (included as links found in the bibliography).
5. Aggregated and coded document review data.
6. Summarized key findings on barriers, opportunities, and incentives related to LID adoption across four distinct themes, as well as example incentive programs used in other jurisdictions.

These findings informed the development of recruitment and interview guides for one-on-one interviews with municipal staff and developers to test these hypotheses and uncover additional insights (Appendices B and C). Key findings from the literature review will also be incorporated into the proposed guidance document for local governments for increasing developer adoption of LID.

KEY FINDINGS

We identified four key barriers to using LID solutions through the review of relevant literature:

- **Customer demand.** The lack of public awareness and lack of consumer appreciation for LID aesthetic.
- **Maintenance.** Uncertainty regarding ongoing maintenance causes hesitation.
- **Costs.** Lack of adequate funding sources for LID projects, cumbersome and time-consuming applications, and site-specific design requirements lead to uncertainty regarding costs.
- **Technical knowledge.** Developers need more long-term performance data and support to build expertise (e.g., demonstration projects, technical assistance with site-specific designs, toolkits, and information sharing across jurisdictions).
- **Policy.** Developers prefer LID stormwater codes separate from land use codes. Inconsistent codes and standards across jurisdictions can make it difficult to implement LID.

The literature also points to the strategies and incentives in Figure 1 for overcoming these barriers:

Figure 1. Strategies and incentives for overcoming barriers to using LID solutions.

- Reduced permitting fees
- Materials discounts
- Tax rebates
- Grants
- Public-private partnerships
- Incentivized LID adoption specifically in redevelopment projects

- Expedited or "fast-track" permitting
- Clearly defined guidelines
- Common rating system for LID (similar to LEED)
- Free or low-cost technical assistance
- LID education and outreach

- Increased consumer demand
- Awards and recognition
- Density bonuses
- Zoning variance

Refer to Appendix A for the detailed Literature Review.

SOCIAL MARKETING RESEARCH

The primary research question guiding this social marketing study was:

How can jurisdictions encourage developers to go above and beyond the current stormwater code requirements and install additional LID solutions?

To better understand the barriers and benefits developers face with implementing LID solutions, Hardwick Research conducted a **two-phase interview process** from September to November 2018 with **municipal staff from three local jurisdictions** and with **20 developers**, using the methodology outlined below.

Municipal Staff Interviews

Hardwick Research conducted the first phase of interviews with a representative from each of three municipalities (**secondary research target**), varying in size and geographic range throughout the Puget Sound region. Selected municipalities were **City of Lynnwood**, **City of Seattle**, and **Kitsap County**. Each participant was involved in day-to-day communication with developers, providing guidance on codes and plan review. Interview responses from municipal staff helped the consulting team **refine the developer interview guide**.

Municipal Interview Methodology

The consultant team's primary objectives for interviewing Puget Sound municipal staff were to (1) **learn what municipal staff believe developers know about LID** and (2) **use their feedback to support creation of the developer interview guide**. The consultant team developed the local government discussion guide presented in Appendix B. Interview topics within this guide included:

- Developers' current understanding and usage of LID.
- Current LID regulations and practices.
- Developers' primary barriers to using LID.
- Current incentives, programs, and funding offered to developers.
- Motivators and new incentives for using LID.
- Format for guidelines provided to municipalities.

Hardwick Research then conducted one-on-one telephone interviews with each municipality representative, summarized findings, and prepared recommendations for the developer interview guide.

Municipal Interview Findings

The following findings summarize the perceptions and perspectives of the three municipal staff we interviewed and do not represent feedback from developers.

Developers' current understanding and usage of LID

The municipal staff interviewed believed that in general, **developers are knowledgeable about LID and understand the stormwater code requirements** as they have had to adapt to the changing local stormwater code requirements. Developers rely on an educated design team (e.g., engineers and architects) to provide stormwater design recommendations. Interviewees from the City of Lynnwood and Kitsap County felt developers were considering LID early enough in the design process, but the City of Seattle interviewee did not.

Interviewed staff estimated that **10 to 20 percent of developers use optional or additional LID solutions** in their projects. In the City of Seattle, there are some market-driven incentives to go above and beyond the code requirements (e.g., people and tenants want green buildings), but the City is pushing hard for it as well via restrictive stormwater code requirements. In the City of Lynnwood, the geology results in the infeasibility of LID BMPs that rely on infiltration (e.g., bioretention, permeable pavement).

Current LID practices

Municipal staff interviewed from both Kitsap County and the City of Seattle noted their developers are required to **follow a prescribed list of LID BMPs**. Developers are required to start with the LID BMPs at the top of the list, and if they cannot incorporate a BMP, they must provide proof that it is not feasible before proceeding down the list. Although interviewed staff reported that they receive documentation of infeasibility, these claims are not tracked.

Developers' primary barriers to using LID

Municipal staff interviewed said that the primary barriers to using LID in their jurisdictions were:

- **City of Lynnwood:** geology.
- **City of Seattle:** cost and aesthetics.
- **Kitsap County:** cost, maintenance requirements, and return on investment.

Motivators and incentives for using LID

Municipal interviewees were **unaware of incentives offered to increase use of LID solutions** beyond what is required in the code. When asked for examples of incentives used in other regions of the United States, none came to mind. Interviewees offered new ideas for incentives, including:

- Reduce annual stormwater drainage fees.
- Provide education or create a design guide with products and examples of how to make LID design features more attractive.
- Showcase buildings that have incorporated LID BMPs well.
- Provide case studies showing the cost breakdown with and without LID.

Guidelines provided to municipalities

Interviewed staff did not indicate a strong preference regarding the dissemination method of the guidelines, but respondents did report they would prefer a **brochure or video to highlight key points**, especially if documentation is extensive.

The consulting team used the results of interviews with municipal staff above to develop the interview guide for the second phase of interviews with developers.

Developer Interviews

After completing preliminary interviews with municipal staff, Hardwick Research then conducted the second phase of interviews with 20 developers, representing a wide range of firms in the Puget Sound region (**primary research target**).

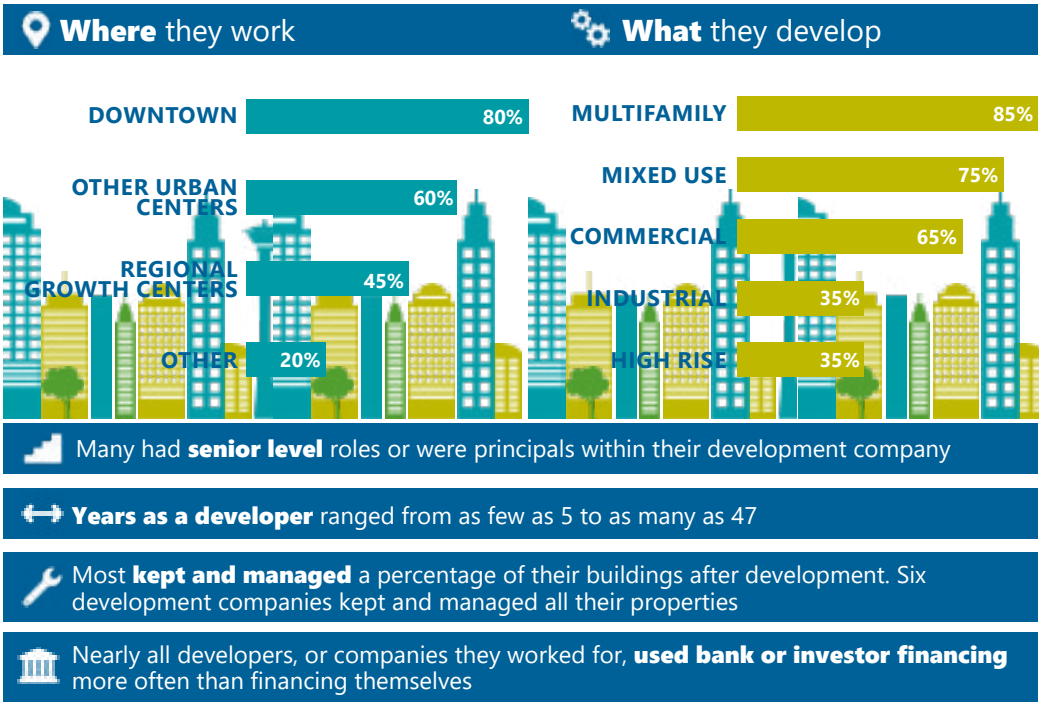
Developer Interview Methodology

The consultant team's primary objectives for interviewing Puget Sound developers were to (1) **understand how they implement LID solutions in new development projects** and (2) **learn what inspires them to go "above and beyond" stormwater code requirements**. The consultant team developed the Recruitment Guide provided in Appendix C. As outlined in this guide, the team identified developers ranging in terms of:

- Geographic diversity.
- Property types (commercial, mixed-use, multifamily, industrial).
- Properties built to "keep and manage" versus "develop and sell."
- Financing mechanism (self-financed versus bank or investor financing).
- Housing type, including some developers from housing authorities and non-profits.

The Recruitment Guide was also used to ensure that interviewed developers (1) made the final decisions on which LID BMPs are installed, (2) had worked as a developer for at least five years, and (3) developed buildings in urban or suburban areas. Using these parameters, the consultant team recruited **20 developers** representing a wide range of firms in the Puget Sound region, as shown in Figures 2 and 3. The project team offered developers who agreed to be interviewed a $200 incentive for participation. Some developers declined the incentive or chose to donate it to a charity of their choice.

Figure 2. Profile of interviewed developers



The consultant team then developed the interview guide provided in Appendix B, which included the following topics:

- Decision-making process for managing stormwater.
- Current LID regulations and practices.
- Barriers to using LID.
- LID incentives, programs, and funding.
- Motivators for using LID.

The team also developed the **LID handout** provided in Appendix D to aid the discussion and educate some of the developers on available BMPs. Hardwick Research **pre-tested the interview guide with three developers** and determined no significant changes to the interview guide were needed. Hardwick Research then conducted one-on-one telephone interviews with 20 developers and summarized interview findings

Figure 3. Locations of properties developed by interviewees.

Developer Interview Findings

The following findings summarize Hardwick Research's interviews with 20 Puget Sound region developers. Findings are presented in two main categories: (1) likes and dislikes by LID BMP category and (2) critical barriers and effective motivators.

Likes and Dislikes

Developers reviewed the LID handout and shared their experiences with each category of BMP, summarized below. In general, developers **prefer** LID solutions that (1) **increase site value**, (2) **create minimal disruption**, and (3) are **easy to install**. For these reasons, the most commonly used LID solutions are amended soils, rain gardens or bioretention, trees, and vegetated roofs in urban areas (Table 1).

Developers generally prefer to **avoid** installing features that (1) are **expensive**, (2) add **complexity** to a project, or (3) require **costly or complex maintenance**. Consequently, the least popular LID solutions are dispersion, permeable pavement, rainwater harvesting or using grey water, and minimal excavation foundations (Table 1).

Figure 4. Factors developers weigh when selecting LID BMPs.

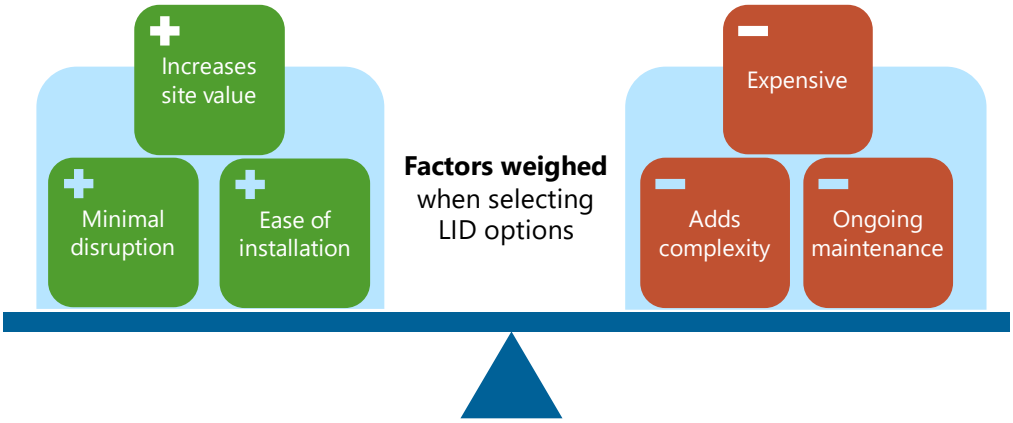


Table 1: Developer likes and dislikes by BMP.

Amended soil	+ Low-cost + Effective + Easy to implement	+ Standard practice for new landscape designs + Can be worked into most site landscapes	− Soil can get compacted and no longer function
Rain gardens / bioretention	+ Attractive architectural or landscape feature + Vaults or planters useful when not enough room for other practices		− Requires more land than detention vaults, which increases costs
New and retained trees	+ Adds value to property + Provides green space + Attractive feature	+ Already required by most jurisdictions (unrelated to stormwater management).	− Expensive to plant new trees
Vegetated roofs	+ Adds value to property + LEED points + Provides green space	+ Commonly used for urban offices and residential buildings + Attractive feature	− Extra engineering costs to accommodate the weight of the vegetation and water − Requires ongoing maintenance
Dispersion	+ Can incorporate into visible decorative feature		− Does not always work well − Often not applicable in larger developments
Permeable pavement	+ A good solution to meet requirements + Works better for sidewalks than roads, driveways, or parking lots		− Ongoing maintenance; does not wear well and difficult to keep clean − Not familiar with good quality products or experienced contractors for installation − Uncertain or poor long-term performance − Unattractive appearance
Rainwater harvesting and grey water	+ Can be marketed as a "green feature."		− Rarely used due to three months without rain in summer − Expensive to implement (requires dual piped water system) − Current technology does not produce a return on investment − Tanks can be unattractive − Complex installation
Minimal excavation foundation	+ Good solution for smaller buildings		− Not appropriate for larger commercial or multifamily developments

Additional research

The consultant team conducted additional research around the concerns with the least popular BMPs among developers. While Table 1 summarizes the perceptions and experiences of the developers interviewed, the findings below reflect information from literature, trade journals, case studies, guidance manuals, and other available resources. This research provides additional strategies and guidance for consideration as developers evaluate the feasibility of these BMPs.

- **Dispersion**: Although urban development space constraints typically prevent effective concentrated flow dispersion of driveway runoff, methods like sheet flow dispersion are still feasible. Sheet flow dispersion can be used for any runoff-generating surface that is graded to avoid concentrating flows [1].
- **Permeable pavement**: Performance issues often stem from improper design, construction, and maintenance. Permeable pavement should be used on sites with adequate infiltration and installed by certified and experienced contractors. It may not be feasible in areas with heavy traffic or where routine, heavy applications of sand occur in frequent snow zones. Pressure washing followed by vacuum sweeping or use of a regenerative air sweeper once or twice per year can be extremely effective for maintaining infiltration capacity by removing debris and clogs. Restoration of infiltration capacity may require specialized equipment and more intensive corrective maintenance [2, 3, 4].
- **Rainwater harvesting and grey water**: Designing rainwater harvest tanks to serve multiple functions (for example, using tanks as a privacy screen, fence, retaining wall, property wall, or supporting pillar for a covered porch) increases cost-effectiveness and can improve aesthetics [5]. Using a rainwater calculator helps size the system based on rainfall data in your area, roof size, and intended use of the harvested water [6].
- **Minimal excavation foundation**: While minimal excavation foundations are typically only feasible for structures up to three stories high, they can still be integrated successfully into secondary development structures such as elevated paths, foot-bridges, walkways, decks, and porches [7].

Additional research on these topics will be included in the guidebook for local governments.

Critical Barriers and Effective Motivators

Developers are more likely to go above and beyond stormwater code requirements to implement LID solutions that are **affordable**, **feasible**, and **provide a solid return on investment**. Developers explained the specific barriers and motivators to using LID solutions, summarized below.

Affordability. Developers see their role as **protector of the bottom line**, as they are ultimately responsible for each project's budget. Specific considerations include:

- Answering to external investors.
- Self-financing projects.
- Meeting profit-driven investment goals (if developer plans to sell the property).
- Supporting a long-term investment strategy (if developer plans to own the building).
- Keeping projects under a set spending limit (if developing for the housing authority).

Cost was the most commonly cited barrier to using LID solutions. Developers consider the costs beyond the initial installation fees (e.g., additional costs of maintenance) when deciding what solution to use and whether to go above and beyond a jurisdiction's stormwater code requirements. Some developers committed to environmentally friendly solutions mentioned they would like to incorporate more LID solutions, but they cannot justify the cost.

> "I will always gravitate to the lowest cost solution right off the bat. That's because the margin of error in what we do is razor thin."

The interviewed **developers were not aware of any financial incentives**, **programs**, or **funding** regarding LID solutions locally or around the country. Only one developer mentioned receiving a financial incentive (reduction in annual bills) when increasing permeable surface on a project in the City of Bellingham. Although currently lacking, **financial incentives were the most popular** among developers.

Barriers	Motivators
• *Expense*	• *Tax credits (e.g., property tax abatement)* • *Grants or refunds for innovation or "above and beyond"* • *Reduced stormwater utility rates* • *Reduced permit fees*

Feasibility. With the expertise of their consultants, stormwater management is among the first things developers consider when evaluating a project. Like electricity and potable water, **stormwater management is an integral part of the development and permitting process**. Most developers explained that there is a formal process in place for identifying and implementing stormwater solutions.

Determining which stormwater solution to install at a site often depends on:

- Issues specific to **site location** which can limit the feasibility of LID solutions, including soil drainage, surrounding geology and topography, and potential to connect to jurisdiction's existing stormwater drainage system.
- **Building and lot size**, which can determine how much space is available on the property for detention ponds, landscaping, and other features. **Building use** (type of tenant and their needs combined with the amount and type of vehicle traffic) can further limit stormwater management options.

Further, many **developers feel that meeting the current stormwater requirements is sufficient and paths to go above and beyond are limited**. These developers currently meet the jurisdiction's stormwater code requirements with the installation of a detention vault or bioretention system, or by connecting to an existing stormwater drainage system (based on the site). Many developers already amend the soil as well as plant or retain trees as part of the landscaping plan for the site. For these developers, dispersion and minimal excavation foundations don't apply in most cases due to space constraints and foundational requirements, respectively. This leaves developers with vegetated roofs (which are very expensive to install due to the additional structural support needed and required maintenance), permeable pavement (which requires routine maintenance and developers perceive degrades easily), or rainwater harvesting or grey water (which requires space for a tank, requires two separate water pipe systems, and is not functional for three months of the year due to lack of rainwater). Many developers noted they are **unable to choose between options as these site-specific variables essentially make the decision for them**.

> "A lot of it is just feasibility, like what works on the site. A lot of our sites are really tight, so there may only be a certain area where we can potentially infiltrate the site. So if that doesn't work, then we can't. It's really mostly about feasibility."

Nearly all developers have experienced situations where a particular stormwater management solution was deemed infeasible. In such cases, developers are required to provide **evidence of infeasibility** which includes reports from a geotechnical engineer, civil engineer, or other expert. This proof prevents developers from falsely claiming infeasibility, though jurisdictions do not typically push back once the documentation has been provided. Some jurisdictions can be more challenging for developers to work with due to **strict regulations or lack of flexibility** in considering creative LID solutions outside the stormwater code requirements that the developer believes would meet or exceed stormwater management requirements.

> "Sometimes the jurisdiction will have very set ideas about it and you can do nothing but conform to what they tell you to do. Other jurisdictions have a fairly loose idea and rely on you, the developer, and your consultants."

The slow process of permitting and uncertainty regarding whether their preferred options will be approved is another jurisdictional barrier for developers. Developers are interested in **expediting the permitting process** to save money on overall budget; however, they were unsure whether jurisdictions would be able to achieve expedited permit processing for everyone. Developers are also interested in **code variances**, for example, allowing developers to increase density in exchange for incorporating LID solutions when going above and beyond.

> "What would help all of us is if the regulatory process was easier, or more straightforward, or just quicker."

Managing uncertainty is one of the most important aspects of running a development business. Installation of many LID solutions diverts money away from the bottom line, and often inserts an additional layer of complexity and risk to projects. For example, developers avoid LID when they perceive it will:

- Extend or complicate the permitting process.
- Require installing new and unproven technology.
- Require burdensome maintenance.
- Involve sub-optimal (in terms of cost or complexity) installation procedures.

Finally, **developers rely heavily on their civil engineers** and other partners to help determine which stormwater solutions to install. Some also consult with a geotechnical engineer, architect, landscape designer, or LEED consultant. Training these key players (civil engineers, geotechnical engineers, landscape designers, architects) on proven and new LID solutions ensures developers have all options available to them. Developers suggested that forums like the Urban Land Institute (ULI), United States Green Building Council (USGBC), or Northwest EcoBuilding Guild can act as conduits to inform the developer community on the best LID solutions.

Barriers	Motivators
• *Building site limitations*	• *Expedited permitting process*
• *Site or jurisdiction requirements*	• *Code variances*
• *Jurisdictional staff or code inflexibility*	• *Training and resources*
• *Onerous permitting and approval process*	

Solid Return on Investment. The lack of knowledge on how to install some LID solutions properly and the **lack of "proven" (quality and correctly functioning) products** directly affect return on investment and influence whether developers would include LID solutions that go above and beyond. **Long-term costs** increase when lack of experience with a solution leads to mistakes, while maintaining LID solutions like permeable pavement or vegetated roofs requires **advanced expertise**.

Developers would be much more likely to incorporate LID solutions that go above and beyond the current code requirements if some of these risks could be mitigated; however, for some LID solutions such as grey water in toilets and porous asphalt, mitigating these risks requires technology to catch up. **Best practices are still evolving**, and developers are not as aware of proven LID solutions. As such, providing information on LID solutions that are tried and true (with problem-free installation and no or very minimal maintenance issues) is an incentive to developers.

Additionally, developers prefer to spend money on LID solutions that are **visible to tenants and aesthetically pleasing**, such as trees or vegetated roofs. Options like rainwater catchment systems pose barriers on both these fronts as the underground vaults are invisible costs to tenants and the above-ground tanks are unattractive. Some developers were interested in a brochure or booklet on LID solutions and aesthetically pleasing designs.

Many developers are already building **LEED or green-certified buildings**. Especially in the Puget Sound region, these certifications **attract tenants and investors**. Developers are concerned about getting enough points to be certified, and currently the certification requirements offer limited LEED points for going above and beyond the stormwater code requirements. As such, developers are more likely to invest additional money in LEED certification, which **typically enables buildings to recoup their investment through increased tenant rents**, than in LID solutions.

> "LID needs to show its value—whether that is higher rent or long-term [returns]."

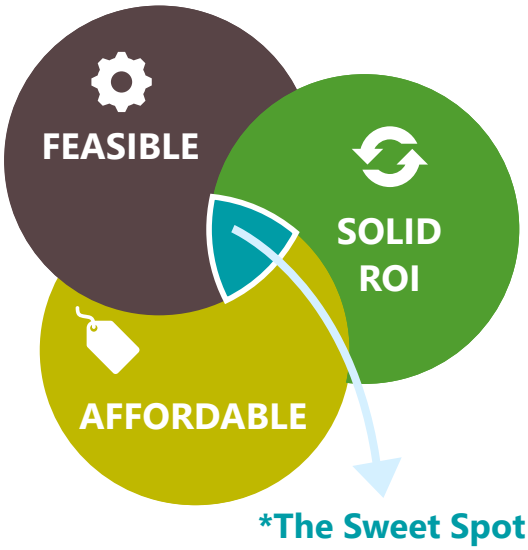
Developers would like to receive some type of benefit or recognition for going above and beyond a jurisdiction's stormwater code requirements. Some developers liked the idea of **making LID solutions count towards LEED certification**. While not a hugely popular motivator, a **program structured like LEED that allows for points for LID solutions implemented** appealed to a few developers who are willing to go above and beyond. For a handful of developers, an award would be an incentive to go above and beyond stormwater code requirements; however, **most of the developers interviewed did not see awards or recognition as an incentive**.

"We are going above, not necessarily for the jurisdiction requirements, but because it gets us LEED points. We are always looking for the most cost-effective LEED points also and stormwater can get us some of those LEED points, so that's another driver."

Barriers	Motivators
• *Ongoing maintenance needs*	• *LEED or green certification*
• *Evolving technologies*	• *LID points program*
	• *Awards or recognition*

Strategies for Encouraging Developers to Go Above and Beyond

Based on the interview findings presented above, the recommendations most likely to "move the needle" and increase the use of LID solutions above and beyond current stormwater code requirements are those that center on providing a benefit for the developer. **Affordability**, site **feasibility** and **return on investment** are the primary factors that influence developers' decisions to incorporate additional LID solutions. The following strategies address one or more of these factors.



Offer financial incentives

Note: the consultant team identified a research gap around strategies to address affordability. ***All developers indicated financial benefits would be a motivator*** *to implement LID solutions in their projects or go above and beyond a jurisdiction's stormwater code requirements. As such, the team will work on identifying strategies to address affordability as part of our additional research on incentive strategies.*

Improve and communicate the reliability and durability of LID solutions

Developers feel that **ongoing, routine maintenance** (e.g., routine cleaning or sweeping of permeable pavement, regular landscaping of vegetated roofs or rain gardens) affects the annual profitability of their developments and creates issues with defining responsibilities. Developers see **long-term maintenance** (e.g., changing or amending soil, replacing pavement) as an expected expense regardless of which LID solution was installed. Jurisdictions should **provide information on LID solutions that are tried and true** (with problem-free installation and no or very minimal maintenance issues) to reduce developer uncertainty.

Emphasize value to developers

Developers would like to receive credit for incorporating LID solutions into their projects as a way to market their buildings to investors and tenants. Jurisdictions should **inform developers of available certification options**, including the Sustainable SITES Initiative. None of the developers mentioned the Sustainable SITES Initiative, but a few mentioned complying with the "Evergreen Standard" (Evergreen Sustainable Development Standard). Describing how various LID solutions can provide value (e.g., attracting tenants, earning certification points, or improving aesthetics) will help encourage developers to go above and beyond. Most developers referred to the LEED certification or green-building programs as reasons to include additional environmentally friendly features. Jurisdictions should **consider ways to have implementation of LID solutions count toward increased levels of LEED certification**.

Jurisdictions should also **consider ways to emphasize aesthetically pleasing LID solutions**. LID solutions that add the most value to a property are low cost and visible to the tenants. Usually tenants never see stormwater management happening; it goes on underground or out of sight. Those LID solutions that are more visible can typically be designed to be aesthetically pleasing. For example, bioretention and vegetated roofs can be **touted as amenities, in addition to providing stormwater management functions**. **Educational signage** for these features can help to convey their value to a property as well as the environment.

> "I think more training for the jurisdictions about how to make these things more attractive to developers would probably be the biggest benefit we could drive out of this."

Increase training opportunities for civil engineers

Developers rely heavily on their civil engineers, geotechnical engineers, landscape designers, and architects to be knowledgeable regarding local stormwater code requirements and to recommend which stormwater management solutions to

install. Jurisdictions should **train technical consultants to offer "above and beyond" options and highlight the benefits they will bring to the developer**. To be effective in encouraging developers to go above and beyond the current stormwater code requirements, this training must focus on providing consultants the information necessary to present the benefits, especially financial, of the various LID solutions.

> "If we don't know something, we don't even know if it's an option. Educate the design specialist so they can present it to us as an option."

Nearly all developers specifically stated that the **civil engineer** is the person they turn to when making decisions regarding stormwater management. This does not eliminate the other specialists' roles or their need for education; rather it points out which partner the developers appear to rely on most. Developers expect their civil engineer to be knowledgeable regarding the local stormwater code requirements and **rely on them to make recommendations** on how best to meet those code requirements and manage stormwater onsite. Civil engineer recommendations to developers need to include:

- Review of the **available LID solutions**.
- Realistic **benefits and drawbacks** of each approach.
- Detailed "how to" and **best practices** for installation and maintenance.
- Specifics on **long-term maintenance and associated costs**.
- **Tried-and-true products** that are high quality and effective.
- Recommendations for **aesthetically pleasing** products and approaches.
- Information on available **LID incentives**.
- **Cost-effective** solutions.

Explain costs and benefits of LID solutions

Although most developers are personally concerned about the environment, success in their job requires them to prioritize the economic bottom line. They are interested in incorporating LID solutions above and beyond stormwater code requirements, but only if it makes sense financially or provides some type of benefit. They want something that has a **known** cost with no issues or installation surprises. They want that cost to be reasonable, and they want to see some type of **benefit to the project, even if it is intangible**. Intangible benefits that appeal to developers include things that are desirable to tenants, look nice, and provide LEED points.

Explore opportunities for innovation and stronger partnerships between jurisdictions and developers.

Developers shared examples of how they felt the jurisdictions made unreasonable demands in order to meet arbitrary requirements. For example, one was required to

buy custom planters only a few inches taller than standard planters. This increased the cost of the planters ten-fold and added several months to the project timeline for manufacturing. In the developer's mind, money and time were wasted for no perceived benefit. Jurisdictions need to **determine which code requirements could be flexible and revise those to provide either a range of acceptable options or accept minor variances** such as height of a planter. Alternatively, jurisdictions could **better explain the rationale for the requirement** so that the developer fully understands why they need to comply.

Some developers reported having their innovations blocked by jurisdictions. When they have offered a new approach that they believed would work best—or wanted to make a minor tweak to save significant time or money—the jurisdiction would not consider it, even when the developer was willing to wait for the jurisdiction to evaluate the proposal. **Jurisdictions should work together with developers when opportunities arise to advance the knowledge base on LID solutions or to optimize the existing stormwater code requirements**.

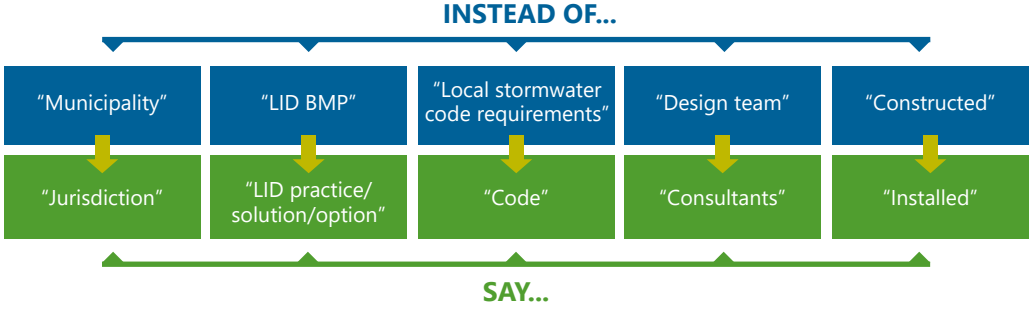
Jurisdictions should also **implement improved tracking methods to capture when developers are going above and beyond**. In cases where developers are incorporating a standard practice that is also a LID solution (e.g., planting trees or amending soil), they do not usually report these extras to the jurisdiction as part of meeting stormwater code requirements. In some cases, these LID solutions are required by a jurisdiction under non-stormwater code requirements. Jurisdictions should track these installations so that they count towards LID usage rates.

> "I never thought about trying to calculate the retained tree area and somehow reduce my overall stormwater obligation."

Use language that is familiar to developers

As shown in Figure 5, the developers we interviewed used language that differs from the prevailing technical language. Any educational or marketing materials produced will be perceived as more tailored and approachable if it uses this language.

Figure 5: Preferred LID language among developers



CONCLUSION

Interviews with developers and relevant literature suggest that in general, developers prefer LID BMPs that (1) **increase site value**, (2) create **minimal disruption**, and (3) are **easy to install**. Developers generally prefer to avoid installing LID solutions that (1) are **expensive**, (2) add **complexity or uncertainty** to a project, or (3) require **ongoing or long-term maintenance**. Consequently, the recommendations most likely to increase the usage of LID solutions above and beyond current stormwater code requirements center on **affordability**, site **feasibility** and **return on investment**.

NEXT STEPS

The findings from the literature review and social marketing report will serve as the foundation of Cascadia's next steps:

Additional Research

Cascadia will supplement the findings in this report with the following additional research:

1. Research the **validity of developer concerns with LID solutions** (e.g., long-term performance of permeable pavement).
2. Identify relevant case studies on **effort required to maintain functionality of LID solutions** over the long-term.
3. Survey jurisdictions throughout Washington to summarize the **performance of incentive programs**, supplemented with additional literature review of national or international LID incentive programs.

Guidebook for Local Governments

Drawing on the research results and potential strategies and incentives identified in this social marketing report, combined with the additional research outlined above, the consulting team will develop a draft guidebook for local governments and dissemination plan for the guidebook. The guidebook will outline clear action plans for local governments to help them **select and implement the recommended strategies and incentives** for increasing LID in urban development.

The guidebook will present information on each strategy regarding benefits, limitations, implementation considerations, and case studies on similar existing programs (where available) and **incorporate relevant key findings from the literature review and social marketing research**. The guidebook will also provide a reference listing of **example tools**, **policies or ordinances**, and **programs** that local governments can use to promote LID use among developers.

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Appendix B: LID success stories

CASE STUDY: Bioretention and rain gardens

In 2003, the Seattle Housing Authority worked with developers to redevelop the High Point neighborhood in West Seattle to increase housing density. A primary feature of the project is over 11,000 linear feet of bioretention swales constructed to manage and treat stormwater runoff.

CASE STUDY: Pervious concrete

The City of Lacey Regional Athletic Complex includes 36,000 square feet of pervious concrete that directly infiltrates rainfall through the ballfield plaza. A majority of the site's two miles of trails were constructed with porous asphalt. Stormwater runoff from the remainder of the 70-acre site is routed to infiltration trenches located beneath the ballfields.

CASE STUDY: Porous asphalt

In 2007, the City of Olympia, Wash. conducted a study of varying stormwater mitigation strategies on two blocks of Decatur Street between 9th and 11th. A total of 200 feet of porous asphalt roadway was compared to conventional asphalt and traditional stormwater management facilities and was found to have similar cost/benefit ratios for treatment efficiency.

CASE STUDY: Permeable pavers /open-cell grids

Chuck's Produce in Vancouver, Wash. integrated permeable pavers into their parking lot design when they opened a second location. A total of 29,000 square feet of permeable pavers were installed in the parking stalls and sidewalks. Colored pavers designate sidewalks and areas where shopping carts should be returned.

CASE STUDY: Vegetated roofs

Mukilteo City Hall (completed in 2008) was the first facility in Snohomish County to be certified as LEED Gold. It includes a 2,900-square-foot vegetated roof in addition to permeable pavement (pervious concrete and open-celled grass grids) and a biofiltration swale.

CASE STUDY: Rainwater harvesting

The Center for Urban Waters in Tacoma, Wash. (completed in 2010) follows the concept of a living laboratory, incorporating sustainable features to minimize the building's environmental footprint. Rainwater is collected into a 10,000-gallon cistern and reused for irrigation and low-flow flush fixtures within the building.

CASE STUDY: Amended soil

Redmond Ridge, a large, master-planned development, had soft soils with excessive water retention and low nitrogen content. Developers graded the site 12 inches below finished grade and applied 14 inches of amended soil mix. Native duff and compost were blended offsite. Organic matter, pH, and C:N ratios were controlled to meet amended soil requirements and to achieve optimal plant growth.

CASE STUDY: Minimal excavation foundations

Clearwater Commons is a 16-unit cohousing development near North Creek in Bothell, Wash.. All homes are built on pin piles in efforts to minimize impacts to the native soils and hydrology of the site. Stormwater runoff and shallow interflow are not interrupted by the building foundations, and can maintain pre-development flow patterns.

CASE STUDY: Dispersion

Cordata Park is a 25-acre park in north Bellingham. Stormwater runoff from the park is collected and conveyed to onsite wetlands to maintain hydrologic inputs to the environmentally critical areas. Dispersion trenches are used to diffuse the stormwater into the wetlands across a wide area, rather than a point discharge which may cause erosion.

CASE STUDY: New and retained trees

In 2003, the Seattle Housing Authority redeveloped the High Point neighborhood in West Seattle to increase housing density. Retaining existing mature trees was an important part of the redevelopment, and many trees were marked with a dollar value to convey the importance of maintaining their vitality throughout the phased construction process.

Incentive case studies

CASE STUDY: Award and recognition

Puget Sound Region - Salmon Safe Certification

Salmon-Safe's urban development certification program is intended to promote ecologically sustainable land management that protects water quality and aquatic biodiversity. Stormwater management is one of the five core certification standards for urban developments. To be certified by Salmon-Safe, a proposed urban development must demonstrate thoughtful design stewardship and a commitment to long-term progress in addressing the impacts of the proposed development on sensitive aquatic and natural resources. Development project certification is valid for five years, subject to annual verification.

CASE STUDY: Fee discounts

City of Fife – Stormwater Utility Fee Discount

The city of Fife offers a 40% discount on stormwater utility fees for using LID on properties served by privately owned and maintained stormwater management systems. To qualify for this discount, the owner must provide a certified statement verifying that maintenance has been performed in accordance with the facility's operation and maintenance manual. They noted that property owners appreciate the ability to reduce stormwater utility fees by maintaining their stormwater infrastructure, offsetting the cost of maintenance.

CASE STUDY: Grants

City of Lake Forest Park – Environmental Legacy Grants

The Environmental Legacy Grants program aims to foster awareness, stewardship, and improvement of the natural environment by increasing awareness and use of LID techniques. Applications are simple and accepted and reviewed on a first come, first served basis. Grants provide a 50% project reimbursement:

- Up to $500 for single family and $1,500 for community organizations or multiple property owner non-rain garden projects.
- Up to $1,000 for single family and $2,000 for community organization rain garden installations.

CASE STUDY: Land use and permitting

City of Seattle – Green Factor Program

The Seattle Green Factor is a score-based code requirement that increases the amount of and improves the quality of landscaping in new development. The program requires construction to vegetate 30% of a site, but the Seattle Green Factor assigns higher weights for many LID practices, allowing a developer to install more effective LID practices in a smaller area.

CASE STUDY: Expedited process

City of Auburn - Flexible Development Alternatives

The City of Auburn's point-based incentive program encourages developers to go above and beyond requirements. LID BMPs are each worth five points. Water quality, habitat, and natural vegetation also garner points. Development projects that reach 100 points can have:

- Alternate lot dimensions
- Alternate parking lot landscaping
- Alternate engineering design
- Expedited permitting process
- Increased density
- Other bonuses including increased impervious and increased maximum height

CASE STUDY: Rebate and cost-share programs

City of Shoreline – Soak it Up Rebate Program

The Surface Water Utility offers rebates up to $2,000 for Shoreline home or business owners to install a rain garden or native vegetation landscaping on their property. Rebates are based on $2.50 per square foot of contributing area. Applications require drainage test results, a site plan, plant list, and W-9 tax form.