

## STORMWATER ORDINANCE



### HAZARDS ADDRESSED



### HOW IT WORKS

**Low-impact development (LID)** and **stormwater best management practices (BMPs)** are common environmentally sensitive approaches to site development that minimize the adverse effects of stormwater runoff. They emphasize the use of site-specific design and other planning techniques to preserve natural systems. These may include both structural and non-structural measures to accommodate the infiltrating, filtering, storing, evaporating, and detaining of rainfall in proximity to where it falls. Structural measures are engineered solutions to reduce runoff through absorption and filtration such as vegetated buffers or swales, retention or detention basins, and permeable pavements. Non-structural measures include land use planning techniques that promote the use of natural features such as floodplains, riparian areas, and porous soils to reduce runoff while simultaneously limiting new impervious landscapes through site design. While a primary goal of LID and BMPs is to protect water quality and reduce flooding, they differ from conventional stormwater management strategies in that they also strive to minimize impervious areas and preserve or enhance the local landscape, habitat and ecological functions, aesthetics, public health, and other community assets or values.

LID and stormwater management BMPs include a broad range of practices for various sites and development types, and can be applied to redevelopment or renovation projects as well as



*Example of LID (bioswale) in large commercial parking area in Aurora, CO.*

*Source: Colorado Association of Stormwater and Floodplain Managers*

new construction.

LID practices are often development-specific, and include the conservation of open space, vegetation, wetlands, and other natural features, as well as the use of green infrastructure for lands intended to be developed or otherwise disturbed. **Green infrastructure** includes natural landscapes or facilities that seek to mimic natural functions. Examples include rain gardens, permeable pavements, cisterns, bioswales, vegetated infiltration beds, and green roofs – all of which are designed to capture and absorb, store, or use stormwater runoff, versus conveying it from the site.

Stormwater management BMPs are often managed by communities using a more holistic, systems-based approach with an emphasis on pollutant control and regulatory compliance. BMPs encompass a wide range of practices that are primarily intended to reduce or eliminate water quality impacts from stormwater runoff leaving a site. Examples include requirements for erosion and sediment control during construction and regulations for limiting post-construction runoff from the site, including LID and other design techniques for the on-site detention, retention, or treatment and conveyance of stormwater flows from impervious coverage.

Applied on a broad scale, LID and BMPs can maintain or restore a watershed's hydrologic and ecological functions and reduce the risk of downstream flooding triggered by excessive stormwater runoff that often accompanies community growth and urbanization. Additional hazard-related benefits include reducing an area's susceptibility to drought conditions through regenerative design measures such as water reuse and maintaining groundwater recharge.

## IMPLEMENTATION

Requirements or incentives for applying LID and BMP approaches to site design can be incorporated into existing land development codes, stormwater management regulations, or erosion and sediment control ordinances. They can also be implemented in local public works projects. Communities typically implement LID or BMPs by regulating development on a case-by-case basis through site development standards that require the peak flow and volume of runoff from a site to be no greater than before it was developed. This may include a range of options or requirements for developers such as the use of structural BMPs for temporary stormwater detention or nonstructural techniques such as LID to maximize a site's ability to absorb site runoff. Communities must also specify certain criteria in the regulations such as the scale of development that is subject to the regulations and the performance standards (i.e., the design storm, which refers to a rainfall event of a specified frequency and magnitude) to be applied for facilities used to manage runoff from the site. The completion of hydrologic and hydraulic studies showing compliance with these standards is typically required of developers during site plan reviews.

## WHERE IT'S BEEN DONE

Since 2007 the **Southeast Metro Stormwater Authority (SEMSWA)** has worked in close partnership with the City of Centennial, Arapahoe County, and Douglas County to provide stormwater management services for drainage and flood control facilities. Created by a local intergovernmental agreement for a "drainage authority" in Colorado, SEMSWA operates as a political subdivision and a public corporation of the State. Per its mission statement, SEMSWA provides services "essential to the protection, preservation, and enhancement of our neighborhoods, community and natural resources through flood control, water quality, construction, maintenance, and education."

In addition to managing compliance with federal environmental regulations, SEMSWA reviews and approves various plans and reports for stormwater compliance through the planning and development process, including but not limited to land use cases, construction documents, drainage plans and reports, erosion and sediment control plans and reports, and floodplain development. It also plans and implements a variety of stormwater projects to ensure proper drainage, reduce flooding risks and property damage, and protect water quality. SEMSWA actively promotes the use of LID and stormwater BMPs for development projects throughout its service area, especially through minimizing impervious surface areas that are directly connected to the storm sewer system and maximizing pervious areas that receive stormwater runoff. Through its efforts SEMSWA has helped the City of Centennial, Arapahoe County, and Douglas County achieve among the highest credit scores in Colorado for stormwater management as assessed by FEMA’s Community Rating System (CRS).

**Wheat Ridge** promotes the use of LID and stormwater BMPs through specific requirements that must be followed by all proposed developments or re-developments. The City’s Site Drainage Requirements (2014) provide explicit information and guidance to development applicants that are based on the latest editions of the Drainage Criteria Manuals promulgated by the Urban Drainage and Flood Control District (UDFCD) and encouraged by the Colorado Association of Stormwater and Floodplain Managers (CASFM). This includes utilizing the UDFCD Four-Step Process that focuses on (1) reducing stormwater runoff volumes; (2) employing BMPs; (3) stabilizing drainageways; and (4) the implementation of long-term source controls. The requirements document includes clear descriptive language on the mandatory criteria and recommended practices for various development categories and activities, along with a series of flow charts to help applicants navigate the process with the City’s Public Works Department.

## ADVANTAGES AND KEY TALKING POINTS

LID and BMP approaches to stormwater management provide communities and developers with flexible, cost-effective options for site design that maintain predevelopment volumes and rates of stormwater runoff. Other notable benefits include:

- Prevents future community development from increasing flood hazards to existing development.
- Helps maintain or improve surface water quality.
- Encourages small-scale designs for stormwater and water quality control that are tailored to specific site characteristics.
- Saves money:
  - The cost of LID is often less than the cost of conventional land development and stormwater management. Savings come from reduced costs for site preparation (clearing, grading, paving, stormwater infrastructure, etc.).
  - Reduces need for community infrastructure and utility maintenance costs (streets, curbs, gutters, sidewalks, storm sewers, etc.). In fact, many property owners and homeowner associations perceive LID/BMP systems as value-added amenities and actively provide for their maintenance.
- Decreases the need for large stormwater detention areas or treatment plants, possibly enabling more land to be developed or used for other community purposes.

- Improves regulatory expediencies. LID and BMP practices are currently promoted by the Environmental Protection Agency (EPA) as a method to help communities meet goals of the Clean Water Act.
- Increases the ecological health of riparian stream corridors due to lower amounts of sediment and pollutants and/or decreased erosion due to stormwater velocity entering the waterway.

## CHALLENGES

Similar to other regulatory or capital project reviews for stormwater management, LID and BMPs often requires technical expertise to administer. For example, the review and enforcement of local regulations requires an engineer to review site plans, hydrologic and hydraulic studies, and other information demonstrating local compliance. Other challenges include:

- Requires that a community have stormwater management plans, regulations, and ordinances in place.
- Can be challenging to administer and enforce without trained staff.
- Adds an additional layer of requirements to the site plan or development review process.
- Requirements need to address the ongoing maintenance of LID or structures, which will become less effective over time without appropriate maintenance. Maintenance can be challenging for staff to monitor.
- Existing codes or regulations may prohibit or restrict the implementation of LID or BMP practices, requiring revisions or updates.

## MODEL CODE LANGUAGE AND COMMENTARY

There are numerous options for how low-impact development and stormwater BMP standards may be integrated into a local government’s various regulations. For example, they can be organized as a stand-alone chapter of a zoning and development code, or integrated into other site development standards (such as access and connectivity, erosion and sediment control, open space, and sensitive area protection). They also can be located outside the zoning regulations altogether, such as within technical engineering manuals, stormwater master plans, or other similar documents.

Wherever located in the regulatory framework, key issues to consider when adopting LID and stormwater requirements include the following:

- Purpose and intent
- Applicability
- Stormwater management site design standards

The following sections describe each of these elements and provide standard language that can be considered by Colorado local governments. Model language is in blue shading. Commentary is located in *italics* in the column at the

### **Commentary**

***Cross-Reference Technical Standards:*** Many zoning and land development codes simply cross-reference adopted stormwater management guidelines or criteria manuals.

right. The model language used in this document is based on several existing ordinances and programs from varying communities around the state and the nation, including municipalities and counties. The language is illustrative only; consult local counsel to tailor language for your jurisdiction.

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### Purpose and Intent

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Stormwater-related provisions may be found throughout a development code, whenever water quality issues are triggered. For example, consider the following purpose statement authorizing cluster development:

“This [*ordinance/section/etc.*] is intended to allow for the construction of [*residential/commercial/all development*] that promotes clustering arrangements. Flexibility is allowed in lot design in order to achieve alternative layouts than help preserve natural resources and allow for creative stormwater management solutions.”

Or this more general purpose statement related to stormwater management:

This [*ordinance/section/etc.*] is intended to reduce the quantity of stormwater runoff generated, improve the quality of stormwater as it leaves a site, and increase the amount of onsite stormwater infiltration.

Purpose and intent statements should draw on applicable language from the comprehensive plan, if available. Comprehensive plans increasingly address issues like sustainability, resilience, and water quality that often include policies that support the development of LID code requirements and encourage the use of stormwater BMPs.

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### Applicability

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A threshold decision for all communities is whether to encourage or require the use of LID principles and stormwater BMPs for new development. The more significant the stormwater issue in the community (hopefully documented in adopted plans), the more likely the community will mandate the use of LID and stormwater BMPs.

Exceptions to general development standards should be considered for projects anticipated to have relatively low impacts on stormwater quality or quantity. For example, consider the following conditions for exemptions from LID or stormwater and water quality standards:

Exceptions to this [*ordinance/section/etc.*] include:

**Applicability:** *If required, the jurisdiction also must consider what types of development will be subject to the standards. For example, does all new development have to include LID elements? The general trend is increasingly to require the implementation of LID principles in most new development, particularly auto-intensive uses that have significant amounts of parking and/or other impervious cover.*

- A. New single-family or two-family residential developments (or redevelopments) that are not part of a new subdivision and that disturb an area of less than one acre.
- B. Parking lot maintenance of existing pavement, or replacement or removal of pavement of less than one-half acre with drainage patterns unchanged.

When establishing the applicability of stormwater requirements, many communities set thresholds and hold projects of different types to different standards. For example, new development can be categorized as minor development, moderate development, major development, and/or redevelopment. Major development would include the most significant potential impacts to stormwater quantity or quality and would be subject to the most stringent regulations.

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### Stormwater Management Standards

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Because of the importance of reducing the quantity of stormwater runoff, most communities that mandate any type of low-impact development establish a broad requirement that post-development stormwater runoff rates be the same as or less than pre-development rates. Beyond that basic requirement, there are a variety of opportunities for integrating LID and stormwater BMPs into development codes. The sections below discuss some of these options.

### Require Onsite Stormwater Management

The treatment and retention of stormwater onsite is an important goal of most regulations. Communities can reduce the amount of runoff that leaves a site by adopting minimum onsite stormwater management controls, such as:

- A. Development shall infiltrate [90 percent] of runoff through on-site management.
- B. Development shall control either [85 percent of a 24-hour storm runoff event], or [10 percent of the 50-year peak flow rate] through landscape-based treatment to the maximum extent possible.
- C. Development shall reduce urban runoff from all impermeable surfaces by [0.75 inches] using infiltration or treatment and release.

Impervious areas can be further reduced or “disconnected” by allowing methods for infiltration such as disconnecting downspouts, pavement disconnection (curb cuts), tree canopy increase, reducing impervious cover, and using green roofs or porous paving materials.

***Categories of Development:** If categories of development are established, those thresholds can apply more broadly to the site plan review procedure and other development standards, not just for drainage or water quality. A community would not want to classify a “major” development differently within the context of drainage and water quality than it does for general site plan review procedures.*

### Dimensional Standards

Directly limiting impervious surface or building coverage can improve infiltration and vastly reduce total stormwater runoff. Consider the following:

In the [\_\_\_\_\_ zoning district], building coverage shall not exceed [30 percent] of the total lot.

Communities could also consider a system by which impervious coverage maximums are scaled to the size of the development, with more dense districts allowing for greater impervious coverages as shown in an example below.

Maximum impervious lot coverage shall not exceed the following percentages:

Size of Development Project	R-1 district Low Density	R-2 district Medium Density	R-3 district High Density
<b>Less than 15,000 sf</b>	50 percent	50 percent	60 percent
<b>Between 15,000 sf and 49,999 sf</b>	40 percent	50 percent	60 percent
<b>Between 50,000 and 200,000 sf</b>	25 percent	50 percent	60 percent
<b>More than 200,000 sf</b>	10 percent	50 percent	60 percent

The jurisdiction can adjust minimum lot sizes if necessary to accommodate LID and achieve permitted densities:

If compliance with [LID standards/stormwater BMPs] can only be achieved by increasing the amount of open space or landscaping beyond that otherwise required, the maximum residential density shall be calculated as though the additional required open space or landscaped area is developable land for dwellings, and the minimum lot sizes shall be adjusted as necessary to accommodate additional residential dwelling units permitted by that calculation.

### Landscaping and Screening

Encouraging or requiring low-water and native landscaping can help create a more natural landscape and ultimately improve water quality and conservation efforts. Allowing for natural berms or screening materials other than walls can help improve drainage and reduce runoff. Some examples of integrating LID and stormwater BMPs into landscaping requirements are included below.

Incorporating LID into landscaping purpose statement:

The purpose of these urban landscape standards is to help support the creation of attractive places that reduce the negative impacts of an urban environment by:

- A. Requiring canopies of tree-lined streets;
- B. Requiring integration of xeriscape plant materials; and
- C. Developing standards for public spaces.

Address future impervious areas added following a certificate of occupancy:

Following the issuance of the initial certificate of occupancy, if additional impervious area in excess of [500 square feet] is added to the site, open spaces and landscaped areas shall be revised to provide the required capture volume for the additional impervious area.

### **Parking and Loading**

Reducing the minimum amount of required parking and loading areas can be one of the most impactful and effective techniques a local government can take to reduce stormwater quantity and improve water quality. Some communities establish parking maximums, and further establish that those maximums can only be exceeded if using LID principles such as porous pavers, or grass-lined swales within the parking design. Other communities are eliminating loading berth requirements to reduce runoff. For example:

- A. Maximum parking requirements can be exceeded up to [ten percent] if pervious pavement or pavers are used for the amount of parking in excess of the maximum parking requirements.
- B. Retail sales and services with an aggregate gross floor area of less than [15,000 square feet] shall not be required to provide loading spaces.

Parking lot design should also be considered for incorporation of LID principles, such as:

- A. Structured parking is required for some zoning districts or uses (thus reducing the per-space impermeable surface);
- B. Landscaped swales are required between parking rows;
- C. Breaks in curbs are required so that parking lot runoff flows into landscaped areas; and
- D. Landscaped islands are required to break up large parking areas (such as blocks of 20 spaces or more).

***Parking and Loading:** Parking standards require striking a balance between several competing interests. For example, reducing parking or setting parking maximums can result in improved water quality and reduced runoff; however, neighborhoods are often concerned with adjacent commercial parking inadequacies resulting in spillover onto residential streets.*



## Subdivision and Site Design Standards

The layout and design of new subdivisions presents an opportunity to consider overall stormwater drainage and LID techniques (e.g., clustering lots to preserve greater opportunities for natural drainage and detention within the project). Consider alternative approaches to subdivision and circulation design, by implementing LID principles such as:

- A. Requiring alternative residential street layouts with narrower, open-section streets;
- B. Limiting on-street parking to one side of the street where possible;
- C. Incorporating bioswales and tree-lined streets;
- D. Encouraging shared driveways for certain residential uses; and
- E. Reducing minimum driveway widths.

Place the burden on the applicant to demonstrate why LID techniques could not be pursued under certain conditions:

For subdivisions where LID techniques are technically infeasible to meet stormwater quantity standards, the applicant shall provide a full justification and demonstrate why the use of LID techniques is not possible. In such case, LID stormwater management techniques shall still be used to meet water quality standards. Documentation of technical infeasibility shall include engineering calculations, geologic reports, hydrologic analyses, and site maps.

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## Incentives

Some communities encourage LID and stormwater BMPs through incentive programs and alternative or optional development standards, such as those described below.

### Green Factor

Seattle, Washington, and subsequently Indianapolis, Indiana, adopted the “green factor,” a performance-based landscaping system that encourages LID principles (and other benefits) by offering bonuses. Under the green factor, property owners are required to meet a minimum percentage parcel vegetation and can use various techniques to reach that threshold, including rainwater harvesting, drought tolerant plants, tree preservation, green roofs, and more. In Seattle, the green factor was originally limited to downtown business districts as a pilot program before applying it to other zoning districts.

### Subdivision and Site Design

**Standards:** Communities often include a separate section for subdivision design and site layout standards within a development standards chapter of the zoning code. Procedures related to subdivision approvals should be located with other development application approval procedures.

**Green Factor:** Although rainwater harvesting is one of the encouraged LID techniques under the Green Factor program, it is not currently permitted under Colorado Law. Exceptions were made through House Bill 09-1129 to allow for pilot projects in select new developments to evaluate the feasibility of rainwater harvesting as a water conservation technique in Colorado.

To read more about the green factor in Indianapolis, see page 531 of the adopted Indianapolis Consolidated Zoning and Subdivision Ordinance, here:

[indy.gov/egov/City/DMD/Current/Pages/ordinance.aspx](http://indy.gov/egov/City/DMD/Current/Pages/ordinance.aspx)

### **Green Alley Program**

Chicago, Illinois, has implemented several green infrastructure incentive programs to encourage LID, including the “green alley” that began in 2006 to showcase pilot projects testing various permeable paving materials for use in alleys to both reduce flooding and increase infiltration of runoff. The city shares its best practices related to this program in the *Green Alley Handbook*, available here:

[cityofchicago.org/city/en/depts/cdot/provdrs/street/svcs/green\\_alleys.html](http://cityofchicago.org/city/en/depts/cdot/provdrs/street/svcs/green_alleys.html)

### **Xeriscape Rebate Program**

Aurora, Colorado, offers rebates to its customers willing to replace high-water grass lawns to low-water use landscaping. Eligible areas include residential front and side yards, and commercial or large property areas that are highly visible to the public. Low-water use landscapes are eligible for up to \$3,000 in rebates, and areas that require no supplemental watering following plant establishment are eligible for up to \$4,500 in rebates. Learn more about the program, here:

[auroragov.org/LivingHere/Water/Rebates/Xeriscape/index.htm](http://auroragov.org/LivingHere/Water/Rebates/Xeriscape/index.htm)

## KEY FACTS

<b>Administrative capacity</b>	Water resource engineer or civil engineer
<b>Mapping</b>	Not required
<b>Regulatory requirements</b>	Stormwater management regulations; erosion and sediment control ordinance
<b>Maintenance</b>	Minimal
<b>Adoption required</b>	Yes
<b>Statutory reference</b>	C.R.S. §25-8 and Colorado Discharge Permit System Regulation 61.8(11)(ii)D)
<b>Associated costs</b>	Staff time for administration and enforcement

## EXAMPLES

<b>City of Aurora</b> Zoning Ordinance and Xeriscape Rebate Program	Landscaping, Article 14. <a href="http://municode.com/library/CO/aurora">municode.com/library/CO/aurora</a> . Also see draft development standards in Module 2, currently under review by the city, (see Section 4.7.4): <a href="http://auroragov.org/DoingBusiness/CityPlanning/ZoningCodeUpdate/index.htm">auroragov.org/DoingBusiness/CityPlanning/ZoningCodeUpdate/index.htm</a> Xeriscape rebate program: <a href="http://auroragov.org/LivingHere/Water/Rebates/Xeriscape/index.htm">auroragov.org/LivingHere/Water/Rebates/Xeriscape/index.htm</a>
<b>City of Wheat Ridge</b> Site Drainage Requirements	Site drainage requirements, at the bottom of the page under “resources” <a href="http://ci.wheatridge.co.us/64/Development-Review">ci.wheatridge.co.us/64/Development-Review</a> .
<b>Southeast Metropolitan Storm Water Authority (SEMSWA), Colorado</b> Stormwater Management Manual	<a href="http://semswa.org/semswa-stormwater-management-manual.aspx">semswa.org/semswa-stormwater-management-manual.aspx</a>
<b>Urban Drainage and Flood Control District (UDFCD), Colorado</b> Stormwater Criteria Manual, Volume 3	<a href="http://udfcd.org/volume-three">udfcd.org/volume-three</a>
<b>City of Chicago</b> Green Alley Program	<a href="http://cityofchicago.org/city/en/depts/cdot/provdrs/street/svcs/green_alleys.html">cityofchicago.org/city/en/depts/cdot/provdrs/street/svcs/green_alleys.html</a>
<b>City of Indianapolis, IN</b> Green Factor in Zoning	<a href="http://indy.gov/egov/City/DMD/Current/Pages/ordinance.aspx">indy.gov/egov/City/DMD/Current/Pages/ordinance.aspx</a> See page 531 of the adopted consolidated zoning and subdivision ordinance
<b>Tri-County Regional Planning Commission, Central Illinois</b> LID Residential Overlay Zoning Ordinance	<a href="http://tricountyrpc.org/files/Low_Impact_Development_Residential_Zoning_Ordinance_TCRPC_model.pdf">tricountyrpc.org/files/Low_Impact_Development_Residential_Zoning_Ordinance_TCRPC_model.pdf</a>

## FOR MORE INFORMATION

### Low Impact Development Center

[lowimpactdevelopment.org](http://lowimpactdevelopment.org)

### Colorado Department of Public Health and Environment, Water Quality Control Division

[colorado.gov/pacific/cdphe/wqcd](http://colorado.gov/pacific/cdphe/wqcd)

### Colorado Water Quality Control Commission

[colorado.gov/pacific/cdphe/wqcc](http://colorado.gov/pacific/cdphe/wqcc)

**Colorado Association of Stormwater and Floodplain Managers – Stormwater Quality Committee**

[casfm.org/stormwater\\_committee/default.htm](http://casfm.org/stormwater_committee/default.htm)

**Colorado State University Stormwater Center**

[stormwatercenter.colostate.edu](http://stormwatercenter.colostate.edu)