Features

This is the third in a series of articles relating to Low Impact Development and new stormwater regulations in Washington.

THIRD IN A SERIES

Building successful low impact developments

Low Impact Development (LID) is a fundamental shift in approach to managing stormwater. Rather than sending all the rain that falls on a site into pipes and detention ponds, LID uses a variety of strategies to distribute water into management features around the site and/or infiltrate it directly into the ground.

This approach has many benefits for builders and developers. Smaller LID features often cost less to install than stormwater pipe infrastructure and detention ponds. They also take up less space on the site and can be integrated into existing roads and rooftops, providing more flexibility in site design and preserving more buildable lots. Some LID features, such as bioretention and bioswales, can be attractive landscape features and can increase property values.

The community and environmental benefits are also significant. With more water infiltrating into the site, aquifers are replenished and water is cleaned by the soil and plants, significantly reducing the amount of pollution that reaches waterways. Water that seeps through soils is also cooled, which is important for healthy fish populations.

LID does not work, however, on every site. Careful planning and soil testing should be done to ensure that these features work together as intended to manage stormwater.

What's the difference?

Comparison of Conventional and Low Impact Development

Conventional	Low Impact Development
■ Sends stormwater to the storm sewer, taking pollutants with it	■ Manages stormwater onsite, cleaning and reducing the amount of water that overflows into the storm sewer and streams
■ Expensive pipe and pond infrastructure	■ Less expensive bioretention systems can reduce cost, naturally treat storm water, and replenish aquifers
■ Techniques haven't been updated in over 50 years	■ Techniques and BMPs are based on a significant amount of current research

New Tools and Principles

To get the water quality benefits and meet regulatory requirements, LID has to be done correctly. The Department of Ecology has worked with engineers, public works staff, and representatives from the building community to create guidance documents on LID. Ecology's Stormwater Management Manual for Western Washington (SWMMWW) and the Low Impact Development Technical Guidance Manual for Puget Sound describe Best Management Practices (BMPs) for LID. Ecology is also currently working with Eastern Washington stakeholders to create a LID guidance manual for Eastern Washington. Although these are not directly regulatory documents, the SWMMWW is referenced by stormwater regulations and does explain the BMPs in detail.

Example BMPs

No individual BMP is mandated for all sites, but rather sites use a combination of strategies that are appropriate.

Here are some examples:

Permeable Pavement

Pervious concrete, asphalt and pervious pavers allow water to infiltrate through and usually into a storage layer of larger rock below. They are very effective at infiltrating stormwater in parking lots, low volume roads,

See LID on page 15

Example Best Management Practices (BMPs)

LID from page 14

driveways and sidewalks. Gravel roads and driveways are not considered pervious because they are compacted, contain fines, and have no storage layer underneath.

Bioretention

Bioretention cells are designed to capture and infiltrate and naturally-treat stormwater using soil and plants. They differ from stormwater retention or detention ponds because they absorb the water (rather than leaving it all standing), take up less space, and because they are usually designed to be an attractive feature. It's particularly important to put the right plants in the right place in bioretention facilities. Drought-resistant, native plants work well in the high edges of a rain garden, and plants that tolerate saturated soils do best near the bottom.

Bioretention ponds feature drought-resistant native plants at the edge and saturated-soil loving plants near the bottom.

Urban and Suburban Trees

Large evergreen trees are the most effective type of trees for absorbing stormwater, but all trees have an impact. Trees draw water out of the soil and capture rainwater on their leaves which evaporates back into the atmosphere. Projects that retain or plant trees can earn a tree credit that reduces the amount of impervious surface to be mitigated.

Reduce Impervious Surfaces

When impervious surfaces are large, like on roofs or parking lots, they can build up runoff volume and velocity, which can carry more sediment and requires larger facilities to manage and detain it. Developers can reduce the amount of overall impervious surfaces on the site by designing narrower, more efficient roadways. Smaller impervious surfaces can also mean reduced material costs.

Vegetated Roofs

Vegetated roofs are not likely to be a common LID strategy, but they do provide a stormwater benefit in that they can act like a sponge to hold rainwater during storm events, filtering it and releasing it slowly. Extensive (shallow) or intensive (deep) vegetated roofs can also offer other benefits to a project. They can provide an extra insulating layer to reduce heat gain (and cooling costs), and they can be designed as attractive roof gardens to provide an amenity for building occupants to use, or to improve their view.

Permeable pavers allow water to infiltrate through to a storage layer below.

Rainwater Harvesting

Rainwater harvesting can be a viable LID strategy where site infiltration potential is poor, or density is high enough to limit available infiltration area. In addition to reduction in stormwater runoff, rainwater harvesting for reuse or irrigation can reduce the consumption of municipal water supply, resulting in a savings to the building owner over the long term.

Amending Soils

In addition to using specially-amended soils in rain gardens and bioswales, the soil throughout a site can perform better at capturing stormwater with amendments. Construction activity compacts that soil and degrades its structure, often rendering it nearly impermeable. A thin layer of topsoil adds little benefit, but by amending soils throughout the site with organic material a significant amount of infiltration and treatment capacity can be restored. This also provides a benefit in improving the health and drought-tolerance of landscaping.

Minimum Excavation Foundations

Conventional foundations remove the organically-rich, permeable surface soils and make the building footprint into impermeable surface. Minimum excavation foundations use concrete piers, grade beams, pins and soil screws to support the structure, transferring the load to the subsoil. This preserves the layer of permeable surface and can be an efficient use of space on small sites with otherwise poorly infiltrating soils.

Minimum excavation foundations work well with poorly infiltrating soil.

Dispersion and Infiltration

Impervious surfaces such as roofs can be managed by dispersing runoff over a yard or through natural vegetation. Stormwater can also be managed by infiltration trenches, dry wells and other infiltration techniques that disconnect roof runoff from other stormwater.