

Storm-Water Regs Grow Up

Q: We have been hearing more and more about LID (low-impact development) rules here in the state of Maryland. Can you help us understand these new regulations, and explain how they're different from the storm-water plan we already have to fulfill?

A: *Ted Cushman responds:* Low-impact development (LID), also called "environmental site design," is a new take on the old problem of storm-water runoff that is catching on throughout the nation. LID measures would be incorporated into your SWPPP (storm-water pollution prevention plan) in place of the traditional "best management practices," or BMPs. All of these measures are designed to control runoff from your site in order to protect streams, wetlands, and the ocean from flood scouring, silt buildup, and harmful pollutants (like motor oil, pesticides, fertilizers, and even raw sewage that overflows treatment plants during heavy rainstorms). Any construction project that disturbs even a half-acre of land surface falls under the requirements of the U.S. Environmental Protection Agency's National Pollutant Discharge Elimination System (NPDES), which requires you to file a federal or state permit application and implement an approved SWPPP.

THE PROBLEM

Traditional BMPs used in most SWPPPs depend on what's called the "end of pipe" approach. Because

hardscapes like roofs, driveways, and roads prevent rainwater from percolating into the earth, the standard approach is to collect all that water with storm drains, and then send it through pipes to big detention basins.

That method costs a lot but isn't always effective. The drains and basins don't catch all the rain, even from light or moderate storms. And by diverting water directly into the watershed, end-of-pipe engineering prevents the natural recharge of groundwater that normally feeds streams in nature. So extensive development causes creeks



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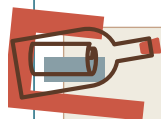
Vegetated swales, such as this one built for the redevelopment of the High Point neighborhood as part of the City of Seattle Natural Drainage System project, are used to collect and filter road runoff.

and rivers to flood every time it rains, then dry up between storms — both of which stress the watershed's natural ecosystems. And although conventional BMPs may slow storm water down, they don't filter it — so a lot of pollution still ends up in the rivers and bays.

THE NEW SOLUTION

LID takes a different tack: catch the rain right where it falls and let it soak into the ground — if possible, just the way it did before the site was developed. To achieve that, LID uses "integrated management practices" (IMPs): working small-scale, decentralized elements such as vegetated swales and "rain gardens" (or as the engineers refer to them, "bioretention basins") into the landscaping, and using permeable paving materials for parking areas, driveways, sidewalks, and roads.

LID is garnering a lot of attention in a number of East Coast states, including New York, New Jersey, Maryland, Massachusetts, and Florida, but Maryland has a jump on most of them. Prince George's



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Permeable pavements, such as interlocking "open" pavers (top) or a porous concrete driveway (above), are designed to allow rainwater to soak through and leach into groundwater, rather than creating large-flow storm water. Care must be taken to not overcompact the subsoil and impede drainage. The trick is a deep, well-sorted gravel base.



USDA NATURAL RESOURCES CONSERVATION SERVICE

County, Md., pioneered the practice starting in the late 1980s and wrote a manual on the method for the U.S. EPA in 1999 (you can download it at www.epa.gov/owow/nps/lid). Last summer, Maryland passed a law requiring LID as the first-choice storm-water management method for all new development, wherever feasible. But even though the concept is simple, the details are not — so creating regulations to implement the new law has bogged the state down for months, with no end in sight. For now, the most up-to-date reference for developers and builders is probably the 2007 *Environmental Site Design Manual* from Queen Anne's County, Md., which is posted online at www.qac.org/depts/dpw/dwphome.htm.

What does all this mean for the builder? Well, if you're also the developer, you'll need qualified engineers from the get-go — people with the skills to analyze natural drainage patterns and measure existing soil permeability. (That's not unique to LID, by the way — if your job triggers the EPA's NPDES requirements, you're probably going to need engineers no matter what.) With site characteristics well understood, you can then design measures to fit the case. Here's a quick look at the menu you'll probably be choosing from:

Bioretention ("Rain gardens"). A rain garden is just a low area where runoff from as much as an acre or two of land is allowed to collect and filter into the subsoil. To make one, you excavate some of the existing soil out and replace it with a special planting mix (sand, peat moss, and compost are typical ingredients). Then you put in a mix of plants that don't mind getting their feet wet but which can also do without watering in a pinch. Usually, though not always, there's an ordinary drain provided to deal with excess water in heavy storms. Rain gardens are designed to puddle for 12 to as long as 48 hours, but in most rainstorms, puddling will be shallow and brief. Rain gardens are great at filtering and purifying water as well as holding it temporarily to prevent flash flooding. Well-designed rain gardens fit into the landscape as an attractive amenity.

Vegetated swales ("bio swales"). You might call this a ditch with plants in it, and you wouldn't be far off. Swales stop sheet flow over grassy areas, or catch road runoff, and hold it briefly while allowing it to percolate into the ground.

Permeable pavements. New types of concrete and asphalt, which use small, single-sized gravel and no sand, can have up to 40% porous drainage space.

Then there are interlocking pavers set into a gravel base, with drain space between the paving blocks. Or you can get really simple and just use gravel. These materials are not a no-brainer, however — you have to avoid compacting the subsoil during installation, and if the soil is slow-draining, you need to create a reservoir of crushed rock under the paving to hold water temporarily until it can trickle into the earth.

Those are the top three tools in the bag, and the most common site modifications. House by house, you can also apply techniques such as rain barrels and cisterns, or green roofs. Each method has its own tips and tricks — there's a lot to learn when you start down the LID path. However, some developers and builders who've tried it say the benefits are well worth the learning curve, and not just because you're protecting the planet. If you choose your low-impact methods wisely, after you back out the cost of conventional drains, sewer pipes, and detention ponds — and after you recover the land area that those engineering-intensive methods eat up — low-impact development is likely to end up as a plus on your bottom line.

Ted Cushman is a frequent contributor to Coastal Contractor.