

### Report Summary

Municipal managers need a life-cycle cost (LCC) analysis method for evaluating low-impact development (LID) projects as an alternative to, or as part of, conventional stormwater controls. They need a framework for assessing which design alternative (LID or conventional) fulfills the performance requirements of the typical municipal land development project (such as runoff retention or pollutant removal) while having the lowest LCC and, in some cases, additional benefits.

LID techniques attempt to mimic a site's predevelopment hydrologic regime, using distributed landscape features and engineered devices such as bioretention, grass swales, vegetated rooftops, rain barrels, and permeable pavements to reduce runoff, minimize pollutant discharges, decrease erosion, and maintain base flows of receiving streams. LID focuses on capturing and infiltrating the stormwater into the soil as close as possible to the point at which it hits the ground, thus reducing runoff. It differs from conventional stormwater management approaches, which typically aim to move water away from a site as quickly as possible via impervious surfaces (gutters, pipes, and paved ditches) to a central retention and treatment device.

LID is a relatively new and innovative stormwater engineering and design approach that has economic and environmental benefits that conventional techniques lack. Proponents assert that some LID techniques can achieve sediment retention and pollutant removal goals at a lower initial cost than conventional systems, in part because they require less pipe and underground infrastructure. In cases where LID designs have had higher initial costs than traditional approaches, proponents point to lower maintenance and operating costs and other savings that result in lower LCCs than traditional approaches. Proponents also assert that LID techniques have additional benefits such as enhanced pollutant removal rates, increased open space, reduced downstream flooding, increased property values and redevelopment potential, public health protection, reduced automobile traffic and fuel consumption, habitat preservation, erosion prevention, and improved quality

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of life for a community.<sup>1</sup> However, the collection of empirical data supporting claims of cost savings and other benefits is in its early stages.

We recommend an approach to applying LCC to LID and a means to estimate some of its benefits. Our approach identifies further technical research needs, including compiling actual cost figures for LID design, construction, and operation and maintenance. It also suggests further research topics concerning benefits. For example, research into the monetary benefits of LID, such as a study on increases in property value directly caused by LID, would be useful.

Regardless of the available cost and benefit information, decision makers are regularly making stormwater management decisions. The decision to use LID often comes down to the bottom line—is it the most affordable option? In many cases, LID is indeed the least costly choice on a life-cycle basis, even if the up-front capital costs are higher than for traditional stormwater alternatives. Affordability should be defined as a measure of the overall LCCs of a project, with benefits properly recognized.

A common challenge to gaining support for LID is the perception that it is new, not well understood, and more difficult and expensive to design and construct. These criticisms can be overcome with a better understanding of LID, coupled with a grasp of its longer-term advantages. Managers should approach the option of LID as a business matter and work to show that, in many cases, it is the most cost-effective option.

Some cost and many benefit components of LID projects are not easily quantified, but a manager can still build an economic case to support LID by using our recommended approach. Specifically, the manager should complete the comprehensive cost estimation worksheet, consider whether LID provides the listed benefits, and use the examples of LID benefits as data sources for the project in which they are interested.

Funds or resources for estimating full LID benefits are unlikely to be available at the municipal level. We recognize this and suggest that our recommendation to create factors to represent the relative level of effectiveness will help simplify the process, yet provide useful information.

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<sup>1</sup> CH2M HILL, Inc., *Pierce County Low Impact Development Study*, April 2001.