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The LID Technology Selection Pyramid: Selecting the Right Green Infrastructure Approach

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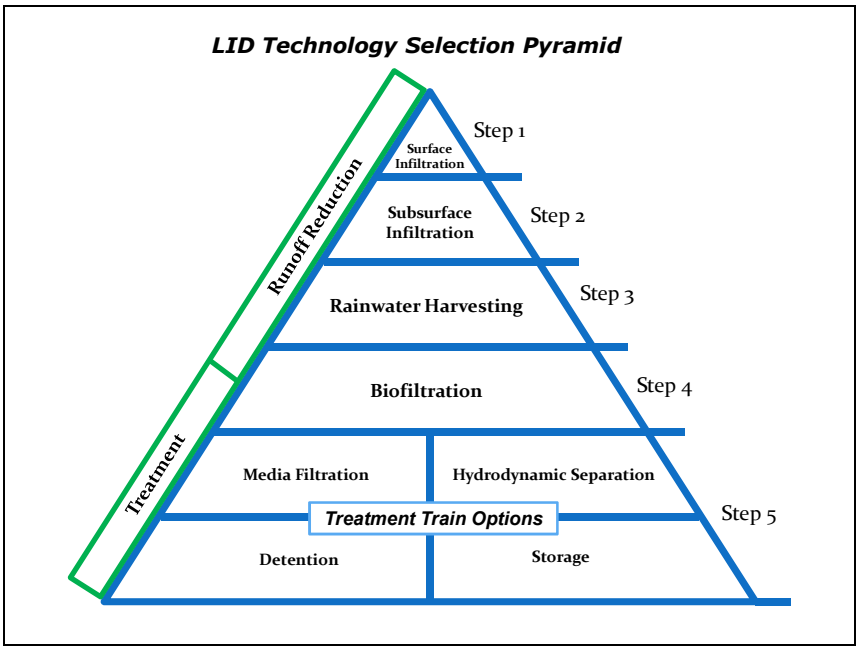
With the expanding demand to implement green infrastructure and low impact development (LID) practices, a variety of innovative site development designs are emerging. Incorporating technically feasible and cost-effective stormwater management practices into these design strategies requires an understanding of the regulatory framework within which LID technologies are selected. That is, agencies commonly follow a preferred technology selection process instead of simply identifying a given technology and implementing it. If the most preferred technology cannot be installed due to limiting site conditions, then the next technology option should be considered, and so on, until the appropriate technology(s) can be utilized.

A five step LID technology selection pyramid has been developed to illustrate how to select the right green infrastructure approach for site development plans. The five LID technologies are listed below in descending order of preference:

1. Surface Infiltration,
2. Subsurface Infiltration,
3. Rainwater Harvesting,
4. Biofiltration, and
5. Treatment Train Options including Media Filtration, Hydrodynamic Separation, Detention and Storage.

The fundamental goal of LID is to mimic pre-development hydrology by not creating runoff and allowing on-site stormwater to infiltrate to the ground. Hence, surface infiltration is often the most preferred option. However, there are limitations to this approach, as well as the other subsequent technologies within the selection series as explained below.

The pyramid depicts the LID selection preferences and compares those technologies to whether they focus on runoff reduction or stormwater treatment. It should also be kept in mind that these practices, whether used singularly or in combinations, can be used to directly contribute or help contribute to LEED credits and points for new site construction and major renovation. Explanations of the merits and limitations of these technologies are provided below.



Step 1: Surface Infiltration

Many LID regulations promote surface infiltration as the most preferred LID practice since it can achieve the most reduction in stormwater runoff compared to the other practices. While infiltration may be a simple approach, its implementation is not always as simple. The potential to utilize surface infiltration can be limited within highly urban settings given that it can require a large amount of space relative to development area. It may also not be feasible where the majority of the site must be paved to accommodate the intended land use. Thus, development area and property use constraints can prohibit the use of surface infiltration as the first choice for an LID technology.

Step 2: Subsurface Infiltration

An alternative approach to surface infiltration is to move infiltration underground. This strategy can allow for green space opportunities in urban settings where land space limits surface infiltration. However, subsurface infiltration is not immune to limitations either. For example, soils may be unsuitable for infiltration, a large footprint may be needed, the groundwater table is shallow, and/or bedrock may prevent the installation of underground structures.

Step 3: Rainwater Harvesting

In keeping with a fundamental LID goal of reducing runoff, stormwater harvesting captures rainwater and can eliminate runoff from the site. This strategy utilizes stormwater as a valuable resource and asset instead of managing runoff as a liability. Rainwater harvesting can allow the property to utilize runoff as a source for nonpotable water uses by capturing water that would otherwise have been lost. However, some regulations do not allow for harvesting since it can

deprive the groundwater table from local recharge, may require a large footprint or storage vessel that does not conform to the intended use of the site; or, there are other development or building codes that can prevents its use.

Step 4: Biofiltration

When the technologies of Steps 1, 2 or 3 cannot be implemented, the use of biofiltration is typically considered next. It spans the gap between the fundamental LID goal of runoff reduction and the need for water quality treatment. While this green solution can manage a considerable volume of water on a per storm basis, the infiltration rates often will not allow for handling the majority of annual stormwater runoff. Biofiltration technologies, whether via land based designs or engineered solutions such as "tree boxes," can also offer an effective level of water treatment. While biofiltration designs often provide a high level of treatment, it may be necessary to supplement this practice with other technologies to better address the goals of LID due to the low treatment flows associated with their operation.

Step 5: Treatment Train Options

This step in the technology selection process differs from the four prior technologies since it offers the opportunity to incorporate a unique and effective treatment train approach to water quality using manufactured treatment devices (MTDs) and land based designs. Media filtration provides a high level of treatment typically such that a sediment removal goal of 80% can be achieved on a standalone basis. Hydrodynamic separation (HDS) devices are often used for pretreatment in association with detention or storage features, whether above- or below ground. Detention and storage strategies can also be used in association with biofiltration, media filtration and hydrodynamic separation technologies. The technologies included in Step 5 may be considered a more conventional than those in the other steps, but given any set of circumstances including those of retrofit designs, can be an excellent strategy for site design and development.

Contact your local AquaShield™ sales agent for information on how our line of products can help you meet LID design challenges and goals.

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