STORM WATER SOLUTIONS

REVIEWING WATER REUSE

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By: Mari Garabedian

Evaluating storm water capture & reuse and the effectiveness of BMPs

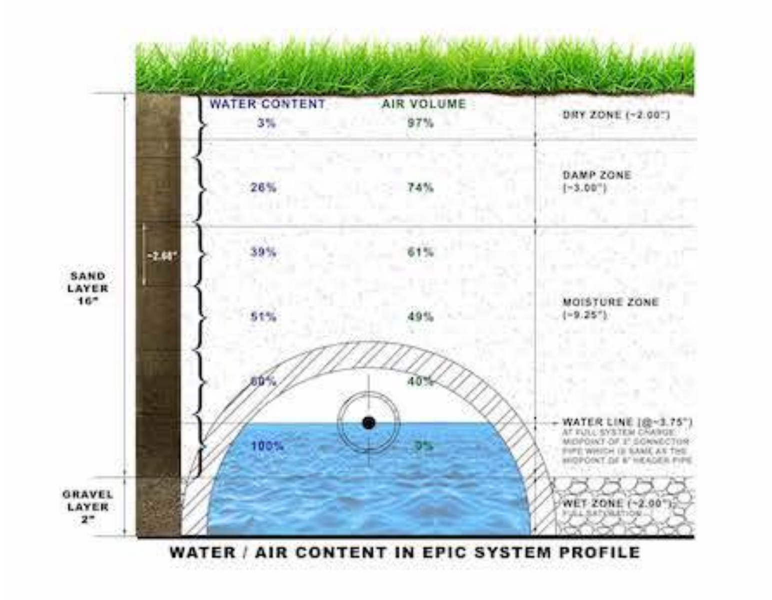
Most in the industry know the evolution of storm water mitigation, which initially was implemented as a measure to reduce pollution from runoff into receiving bodies of water. As urban development continued to grow, another problem arose – more impervious surface meant more runoff, and it became evident that the aging storm water and sewer infrastructure was not capable of handling the increased flows. Enter the idea of retaining the runoff on site. Infiltration is a great, relatively inexpensive way to solve the problem except it requires suitable soils, clearances from structures and has other site-related restrictions.

The Next Idea

The next evolution in storm water retention was not something “new” – it was derived from the ages-old idea of harvesting rainwater for other uses. Initially, storage tanks were a simple and quick way to do so as there are many manufacturers and the products are readily available. Then, another problem arose. In large urban developments where space is at a premium and every square inch is precious, the tanks became cumbersome and inefficient solutions. They took up too much space and often required expensive and elaborate pump systems to convey the collected runoff to a landscaped area for it to be dispersed. Necessity is the mother of innovation, and it did not take long for new products and systems to become available, which offer a much more elegant solution.

At an installation site in California, storm water from adjacent areas is captured, stored and reused for irrigation.

Before we dive deeper into new technologies and systems, let us take a look at the benefits of rainwater reuse. There is the most obvious benefit – free water. Although in some states harvesting rainwater is regulated and sometimes allowed under special circumstances (e.g. Nevada and Colorado), most others do not impose restrictions or rainwater collection is not regulated. Some even encourage it or have incentives for harvesting rainwater. Clean water is a resource vital to sustaining life and being able to maintain landscaping while minimizing potable water use is, truly, a no-brainer.



Gravel is placed at the bottom and is the saturated zone, which prevents roots from growing and clogging the system.

In addition, it is important to note that infiltration is encouraged, but evapotranspiration (evaporation from surface soil and transpiration through plants) accounts for 15% of the water vapor in the atmosphere and is vital for cloud formation. Infiltration takes a long time for the runoff to reach aquifers and, though extremely important, it does not deliver the almost immediate results of evapotranspiration. Increased evapotranspiration eliminates the heat island effect often caused by increased impermeable surfaces due to development. Reduction of heat generated by more impermeable surfaces affects the amount of energy needed to cool down buildings, which is directly translated in operational cost savings. Let us not forget another added benefit – plants consume carbon dioxide and produce oxygen, so the more planting we can add, the more clean air can be produced. The preceding makes a good case for rainwater reuse to be a wise solution even in areas with large amount of rainfall since the benefits are not specific just for arid regions. As beneficial as evapotranspiration may be, it does come at a cost.

With systems that utilize traditional rainwater harvesting tanks, there is a higher cost for equipment and maintaining it. Newer technologies may have a relatively high upfront cost but offer lower maintenance expenses and longer product lifespan. Then there is the space issue. As previously noted, tanks need space, and they also need landscaping areas to implement the "reuse" component of the system. That is a lot of real estate. The newer, innovative systems often offer an all-in-one solution where the storage and use components reside in the same footprint. Another important aspect of collecting and reusing rainwater is the lower cost of irrigation. Often, that in itself is an important item on the checklist for many developers. Those seeking to build more sustainable environments and/or seeking LEED certification benefit greatly from capture and reuse of rainwater as part of their site-wide effort to minimize environmental impact.

Getting the Right Look

Then comes aesthetics. Most storm water BMPs look like exactly what they are engineered, sometimes odd-looking areas that make the layman wonder why someone would build something like that. As professionals, we can easily identify the different storm water BMPs just by looking at them – rain gardens, detention ponds, flow-through planters, etc. Many of them look awkward, whether when in operation during rain events or during dry days. As important as the actual function of the BMPs may be, it is important to factor in the need for aesthetically pleasing systems that are seamlessly integrated in the overall development design.

As far as drawbacks when it comes to capture and reuse, the one main item to take into consideration is cost. Most of the systems that offer all the benefits reviewed above are proprietary and have limitations as far as implementation; however, the slightly higher initial cost does come with the added benefit of providing solutions for issues that are sometimes hard to overcome with the traditional methods of storm water mitigation.

A recessed planter contains the integrated storage system in front of a building.

Exploring Solutions

One such system is the EPIC (Environmental Passive Integrated Conveyance) Total Water Solutions. Initially, EPIC was developed as a passive subsurface irrigation system for large turf applications. It offers a solution to capture, reuse and biofiltration. The EPIC chamber is a highly-modified perforated pipe. It operates without clogging utilizing patented offset holes at the interface between the collected runoff and the sand and gravel profile. The gravel is placed at the bottom and is the saturated zone, which prevents roots from growing into and clogging the system. The sand is the growing and irrigation medium. Water wicks up by capillary rise and waters the plants directly within their root zone. This subsurface method combined with the impervious EDPM liner on the bottom and sides ensures zero loss and 100% efficiency in water use. The use of sand is a key feature of the system as it maintains aerobic conditions due to the low compaction rate of sand.

Plant roots grow at a depth determined by them, seeking out the perfect moisture to air ratio, which suits their needs. Eliminating top watering is another important aspect of increasing water efficiency since traditional irrigation systems (drip lines, sprinklers, etc.) either clog often or lose water due to runoff, over watering, wind and immediate evaporation.

One example of how a passive subsurface irrigation system added value to a development project is Palm Terrace in Lindsey, California (Tulare County), by Self-Help Enterprises. The affordable housing project called for 50 multi-family units and a community center.

The typical fenced storm water detention pond and a pedestrian bridge were replaced with a turf area using EPIC to collect and reuse the runoff. Storm water from adjacent parking areas is captured, stored within the EPIC profile and reused for irrigation. An added 2,500-gallon tank increased the capacity of the system to offer even more available water for irrigation after rain events. The city of Lindsey has been experiencing water shortage due to some of its wells having diminished capacity, and the utilization of a passive subsurface irrigation system allowed the project to also collect greywater from showers in the housing units, which provided additional irrigation supply for the turf.

In the case of EPIC, the public health concerns of exposure to contaminants present in greywater is eliminated since all of the water in the system is present at a depth greater than 12 inches, covered with the sand profile, and maintenance vaults have gasketed covers, which are further secured by using security screws. In this project, the product used was able to provide additional turf play area, significant water usage savings and equal or greater capacity of a detention basin at a lower cost. This was a perfect match for the project, which also aimed to build a sustainable community. The project met its goal by implementing solar panels for energy use reduction and EPIC for water use efficiency, while offering the community a beautiful, green lawn for family gatherings and children's activities.

Another project where EPIC helped solve an issue was the second phase of the GH Palmer's DaVinci Luxury apartments in downtown Los Angeles. Originally, the storm water planters were designed as flow-through planter boxes at a minimum height of 42 inches (which was the requirement at the time of plan approval). During construction, it came to light that the height of the planters will interfere with the apartment window openings and those will have to be shortened to accommodate the planter height. For a luxury development, that was an unacceptable fix, as it would darken the units. EPIC was able to provide a capture and use solution with a much lower profile (24-inch walls, 18-inch-deep system) allowing for the windows to remain as designed.

In Conclusion

As this article reviewed the importance of capture and reuse for sustainable developments and explored two cases where use of flexible proprietary systems that offered storm water mitigation and added value to the project overall, it is important to note that the cost of capture and reuse BMPs may be higher than biofiltration solutions. A good way to judge if proprietary systems are a good fit for a development is to take into consideration space usage, aesthetics and the overall savings in irrigation water use and maintenance efforts over the life of the project. Generally, their maintenance is not much more involved than maintaining any landscaped area. These types of technologies offer a chance to implement mandated storm water mitigation solutions without sacrificing usable square footage and looks or needing additional landscape area as demonstrated in the two case-studies, even added benefits and value.

In conclusion, one can hope that more innovative products will be introduced to offer an increasing variety of solutions to implement capture and reuse of rainwater. As design professionals strive for environmentally friendly designs and sustainable features, reusing rainwater for irrigation while satisfying storm water mitigation requirements is a smart approach. We all like "smart" anything nowadays.