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The typical sounds of summer fill the air at Wescott Park in Northbrook, Ill. Cheers erupt from the baseball diamonds, and laughter spills out from the playgrounds. But it is what is filling the structure beneath the park that has residents in the area resting a bit easier this year.

Underground and out of sight, a large labyrinth of precast concrete modules

forms a detention chamber capable of holding more than 7.7 million gallons of stormwater. More than 1,720 precast concrete pieces manufactured by StormTrap® were used to construct the storage facility, making it the largest of its kind by volume currently in existence. The project also included installation of almost one quarter mile of new 42-inch diameter storm sewer to convey stormwater to the storage



Visit <http://bit.ly/wescott-park> to watch a time lapse video showing construction of the 7.7-million-gallon underground stormwater detention facility.

facility. The ability to divert and store this volume of stormwater will help reduce local flooding, and as an additional benefit, a portion of the stored runoff can be used for irrigation and other purposes.

Balancing the community's needs

For many decades, the village's Sunset Fields subdivision experienced severe flooding of homes, yards, and roadways. Platted in the 1950s, the subdivision lacked detention facilities, adequately sized storm sewer, and overland flow routes that could safely convey stormwater. As the first step to address these problematic flooding issues, the Northbrook Master Storm-

water Management Plan introduced a conceptual stormwater detention project at Wescott Park.

"Stormwater requirements for subdivisions built 60 years ago were not what they are today," said Northbrook Director of Public Works Kelly Hamill. "This project was so important to our Master Stormwater Management Plan not only because of the benefits that the properties in this subdivision would see, but also other areas downstream that experience flooding as well. Having flooding become an afterthought rather than a primary concern would be a great success."

The village embarked on making the Wescott Park Stormwater Storage Facility project a reality in May of 2013. Northbrook consulted with civil engineering firm Baxter & Woodman, Inc. to conduct a detailed study of several improvement options, including above ground, below ground, and hybrid detention configurations. The decision to go underground stemmed from the village's desire to maintain the highly valued open space and recreational amenities at the park. Two ballfields, an outfield grass area, walking trail, and two playgrounds are enjoyed by residents and used frequently by both the Northbrook Park District and Wescott Elementary School.

Going green with rainwater harvesting

A way to creatively combine large-scale flood mitigation with green infrastructure was identified during the study phase of the project. The addition of a rainwater harvesting system would allow the village to use a portion of the stored stormwater to meet typical seasonal water needs of the park's new irrigation system without requiring a domestic water source. With the estimated price tag nearing \$9.7 million for the base project, the village knew they would need a little

help if they wanted to incorporate this innovative feature.

The Metropolitan Water Reclamation District of Greater Chicago (MWRD) had been looking for a project on which to collaborate with the village and showcase the benefits of sustainability. The Wescott Park project presented an opportunity for the village to secure \$475,000 in green infrastructure funding from MWRD for the addition of the rainwater harvesting system.

"There is a movement to combine grey infrastructure, such as sewers and pumping stations, with green infrastructure, such as rain gardens and permeable pavement, in order to conserve water and reduce flooding. The MWRD is committed to being a leader in this movement," said MWRD Principal Civil Engineer Jim Yurik. "This project was an innovative use of excess stormwater that would have otherwise caused flooding."

Managing stormwater as a resource

Baxter & Woodman worked with Wahaso Water Harvesting Solutions, Inc. to design a system that filters, stores, and sanitizes the stored stormwater before pumping it to the park's new irrigation system. The village's typical irrigation usage is 60 water cycles per year, requiring more than 1.3 million gallons of water. The sump area located below the gravity outlet of the storage facility is capable of holding more than 177,400 gallons of stormwater for reuse, which will provide eight complete irrigation cycles without replenishment. An analysis of past rainfall data confirmed that the need for domestic water for irrigation is extremely unlikely with the use of the rain harvesting system. "In dry weather, the system will utilize the captured rainwater instead of taking fresh Lake Michigan water for irrigation," Yurik said.

A spigot was also added to the system so the harvested water could be used for trees and plants at locations outside the park, and for use with non-sanitary equipment, such as vacuum trucks and street sweepers.

“The primary reuse of the water will be for irrigation of the ballfield on top of the detention facility. Previously, the park district had to use a portable sprinkler system,” Hamill said. “Another usage of the rainwater harvesting system will be the filling station. This will allow both the village and park district to fill water tanks onsite for use in other areas.”

Water used for spray irrigation must meet NSF 350 standards for water quality, as required by the Illinois Department of Public Health. Two main components of the rainwater harvesting system reduce contami-



Locked enclosures housing water treatment equipment, control panels, and other rainwater harvesting and irrigation system components

nant concentrations: Suntree Technologies’ Nutrient Separating Baffle Box® filter and an ultraviolet (UV) sanitization system.

Pretreatment filtration is provided by a precast concrete chamber located in line with the stormwater storage facility’s inflow pipe. Water flows through

a metal screen that captures leaves, trash, and other floatable debris. After a storm event, the vegetation and litter are held above the static water to prevent the system from going septic. Sediment collects in a series of three chambers where deflectors prevent resuspension, and a boom and skimmer remove hydrocarbons.



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The underground stormwater detention facility lies beneath the reconstructed north ballfield and outfield grass area in Wescott Park.

Up to 90 percent of suspended solids are removed at this stage, resulting in cleaner discharge to the downstream storm sewer and, ultimately, to the West Fork of the North Branch of the Chicago River. The baffle box filter requires quarterly maintenance inspections and periodic cleaning of the filter screen and sediment chambers with a vacuum truck.

Before water is pumped from the sump area of the stormwater storage facility to the park's irrigation system, it passes through a UV sanitization system. The sanitization system includes additional filtration to remove suspended solids that can reduce the effectiveness of the UV treatment. UV bulbs then kill bacteria and pathogens with radiation. This treatment method requires minimal contact time, and has the advantage of being chemical and odor free.

An automated controls system developed by B&W Control Systems Integration uses online weather forecast data to pump stored water to the down-

stream sewer in advance of large storms. By draining down the water stored in the sump area, the maximum stormwater storage volume is available when it is needed most. A touchpad control screen is located onsite in a locked enclosure. This touchpad screen can be used to perform system checks, adjust system settings, view alarms, and shut down or start up the system. A web interface is also available to monitor the system remotely.

Scoring a win for flood mitigation

The village celebrated completion of the Wescott Park Stormwater Storage Facility project and renovated park amenities with an official ribbon cutting ceremony on Nov. 15, 2016.

"The number one goal of the project was to provide property protection from flooding conditions," Hamill said. "We were able to supplement this goal by including a rainwater harvesting system, which is a great example of stewardship for the environment."

This approach to stormwater management and reuse earned the village and Baxter & Woodman a 2017 Special Achievement Award for Engineering Excellence from the American Council of Engineering Companies of Illinois.

"This project demonstrates innovative thinking on solving several problems," Yurik said. "If communities are willing to partner with local agencies to fund and construct similar projects, future water shortages and flooding could be greatly reduced."

Paul Siegfried has focused on designing effective flood mitigation projects and implementing creative stormwater management solutions for more than 10 years. He can be reached at (815) 444-3360 or psiegfried@baxterwoodman.com. 