

LANDFILL OR STORMWATER DETENTION?

THE CHOICE IS OBVIOUS ACCORDING TO THIS P. E.

MANY TIMES, a site will need to be drastically excavated and sculptured to meet the building requirements. This naturally includes leveling but also importing soil to fill voids. Grooming the site can be used to great advantage to meet the continuing importance of controlling water flow and quality according to Bill Shelton, P.E. Senior Civil Engineer at ZMM Architects & Engineers (Blacksburg, VA).

Primarily focused on projects in Virginia, Shelton works to help his clients meet the Virginia Department of Environmental Quality's regulations for stormwater. "The Department of Environmental Quality has some pretty stringent guidelines for water quality and quantity," he said.

In early 2021, Shelton and his team completed a project that required a stormwater management system that could handle up to nearly 2.5 million gallons of water. "This system is one of the largest we've designed. It can manage a 100-year storm with the volume capacity it has."

"According to the plans, this new construction would increase the amount of impervious area to nearly 25 acres, which included all the associated loading docks and employee parking lots and road paving, plus there would be a 350,000 square foot building on the property. This all added up to a significant impervious area and meant that we had quite a bit of water to control and store. It's a pretty substantially sloped area which would require a lot of cut and fill. I figured that since the area would need to be filled in, we might as well use the storm water detention system to help bring it up to grade."

"The way our system works is that we collect all the water, run it through a water filtration units for pre-treatment and then into the chamber units that have an added section to trap additional sediment."

The stormwater management system consists of four beds of underground detention chambers to handle 330,000 CF of storage. More than 1,700 ADS StormTech® MC-4500 chambers were utilized to improve water quality and for storage. For the removal of total suspended solids (TSS), the StormTech Isolator® Row was incorporated into each unit. "StormTech with the Isolator row gives us a leg up on meeting the quality and quantity requirement," Shelton stated.

For pretreatment, each of the units in the system is equipped with an ADS Barracuda® Hydrodynamic Separator in either four, six or eight-foot diameter. The fourth unit, a 3K ADS BaySeparator® water quality unit with a 60-inch diameter and an eight-foot depth and two 60-inch manholes, was placed upstream for additional treatment due to the volume of the water entering that particular chamber unit. The BaySeparator utilizes three flow paths to route stormwater between the precast structures and trap pollutants, keeping them separate until they are removed during routine maintenance.

The Barracuda is a high-performance vortex hydrodynamic separator designed to remove 80 percent of total suspended solids to protect the public waterways. It does this by using density differences and gravity to remove suspended solids and floatables from stormwater runoff. Named for its "teeth", the Barracuda mitigates turbulence in the sump area to prevent resuspension of captured contaminants.

The chamber units drain to a common point using ADS N-12 corrugated HDPE pipe for conveyance of the water to the pond. ADS Nyloplast® Water Control Structures were used for the stormwater basins. A key feature is the ability for the installer to make changes "on the fly", which was important given the terrain. For example, if the inlet is sitting above grade, the PVC riser can easily be cut flush to grade. Or if the riser ends up sitting below grade, the inlet can be raised up using extension pieces. The project utilized 30 ADS Nyloplast® PVC curb/drop inlets.

Because mostly in-fill material was used and there were concerns of infiltration of fines into the conveyance pipeline, Shelton specified 9,000 linear feet of ADS N-12® corrugated high-density polyethylene (HDPE) pipe with watertight connections. The storm water system used InsertaTee® for lateral connections.



“The StormTech system combined with the Barracuda is a great combination that addresses stormwater quantity and quality on all sizes of projects,” he offered. “The StormTech online design tool, specifications, details, and knowledgeable engineering staff made this one of the easiest and cleanest systems to design.”

“This chamber system is just such an easy system to model on the computer, it’s easy for reviewers to understand and wrap their heads around, easy to maintain for the owner at the end of the day,” Shelton explained. “So, we just really like using these systems. And because of the quantity of the water and the different areas the water was coming from, we decided to break it up into the four beds, which we located under employee parking areas. But we still didn’t meet the DEQ requirement and so the water actually discharges from that system into an aboveground, extended detention basin that offers another amount of water quality and quantity to meet those requirements.”

“The water does sit there for a while to settle out any remaining sediments, which would be minimal, if any. The pond holds the water and lets sediments settle out so that cleaner water will discharge through the upper layers of the pond. The pond does have a clay liner so there’s really not much infiltration, but it does permit any sediments to settle out.”

Selecting the Proper Systems

“We have used some different systems before. This included permeable pavements to other underground storage like the milkcrate container-type boxes. They all work. But what we found is that the StormTech and Barracuda for most of the clients we work for, especially a lot of school systems, they don’t have the time and energy and the personnel to maintain these things. So, the ease of maintenance and inspection is huge in our minds particularly for our school clients because typically they are usually running on a tight budget and they can’t really hire someone to inspect it all the time. So, they can just open an inspection port and look down in, stick a measuring rod in to see if the sediment has built up and that’s it. It’s easy. You don’t have change the filter like you would in a cartridge system and you’re not relying on plants that may live or die and need frequent replacement. Maintenance on the entire underground systems can be performed using a vacuum truck or comparable equipment.”

“Typically, if we are going to do an underground system, it just makes sense to use the Isolator Row because the DEQ allows a 40 percent preliminary reduction, which can be accomplished just by putting that in. You’re going to put in the underground detention so, you might as well get 40 percent of your water quality requirement while you’re at it. A good design practice in an underground detention system is to filter out the water sediments and trash and everything, and the Barracudas are built for that in regard to getting the bigger stuff out before it even gets to into the underground system.”

“When doing an underground detention system anyway and you have to have the pretreatment using the Barracuda, why not add what little it takes to add an Isolator Row, and then you have around 60 percent of your pollutant removal level right there. It’s a win-win. And it’s usually pretty easy to convince the owners that it’s a good way to go.”

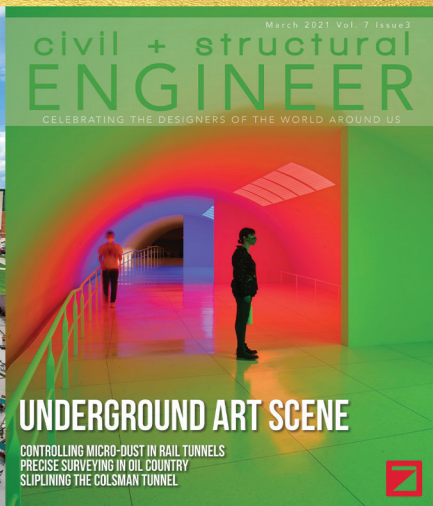


Filling in the Requirement Gap

“A lot of times the owners can buy pollutant credits from a nutrient bank. Even when we have the Barracuda and the Isolator Row combination, for whatever pollutant removal that’s left the owner can buy nutrient credits, even when those sediments or TSS are negligible. Unfortunately, as design engineers we’re bound by the percentages that the regulatory agencies allow. Even when a lot of these systems can get up to 80 percent removal, the regulatory agencies only allow a certain percentage. But in reality, the water is coming out of there real clean.”

About the Company

Advanced Drainage Systems is a leading provider of innovative water management solutions in the stormwater and on-site septic wastewater industries, providing superior drainage solutions for use in the construction and agriculture marketplace. For over 50 years, the Company has been manufacturing a variety of innovative and environmentally friendly alternatives to traditional materials. Its innovative products are used across a broad range of end markets and applications, including non-residential, residential, infrastructure and agriculture applications. The Company has established a leading position in many of these end markets by leveraging its national sales and distribution platform, overall product breadth and scale and manufacturing excellence. Founded in 1966, the Company operates a global network of 63 manufacturing plants and 32 distribution centers. To learn more about the ADS, please visit the Company’s website at www.ads-pipe.com.



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