

AMAZON FULFILLMENT CENTER

TORONTO, ONTARIO - STORMWATER CASE STUDY

Recently, construction began on a new state-of-the-art fulfillment center by Amazon in Ontario, Canada. This new center, located in the Scarborough neighborhood of Toronto, will have a surface area of 1 million square feet and will create more than 600 full-time jobs for Canadians in the area. The Amazon center focuses on fulfilling customer orders with new robotic technology that makes it easier to pick, pack and ship small items to customers, ranging from toys and baby products to small electronic products. This type of large infrastructure requires an extensive subsurface stormwater management system to support the construction and eventual stormwater events that could affect the site.

The pre-construction lot consisted of an agricultural field and a tributary of a local river through the eastern portion of the site, which is where the majority of the site naturally drains into. Since it has never been excavated, soil remediation was not required but special attention would need to be paid towards the natural flow of stormwater runoff – especially since this would be such a large development. When faced with the need for a stormwater system of this magnitude, the civil consultant looked towards CULTEC to recommend a solution.



Recharger® 330XLHD Chambers

System Specs	
Storage Provided	12,873 m ³
Area	15,013 m ²
Chamber Models	Recharger® 150XLHD, 330XLHD and 902HD
# Units	5,078
Project Engineer	The Municipal Infrastructure Group Vaughan, ON
Contractor	Memme Construction Bolton, ON

To meet local regulations, The Municipal Infrastructure Group (TMIG), Ltd. realized they would need support in designing a system for both quantity-control as well as water-balance storage. Water-balance storage is where water is infiltrated into the native soils to recharge the aquifers. TMIG contacted the CULTEC technical department to discuss a strategy for a system that could serve a site of this size. There were several considerations to be made to ensure adherence to site restrictions. Due to size, the 100-year discharge rate from the industrial development will be controlled to 60L/s/ha or less prior to discharging into the stormwater management pond.

The attenuation of the runoff will be provided through the CULTEC system located in the proposed parking areas. CULTEC's technical department worked directly with the civil consultant and provided calculations and technical drawings of the stormwater system. In fact, they worked closely with the engineer to complete seven different design iterations over the course of six months. Four open bottom CULTEC systems were proposed to provide 10 mm retention for the entire subject site and were installed under the parking lots and loading dock.

CULTEC CONTACTOR® & RECHARGER® STORMWATER SOLUTIONS

Additional oil grit separators were designed upstream of the CULTEC system to provide pretreatment and remove any additional oil and sediment that may enter the system. The designed oil grit separators provide 50% TSS removal.



The proposed CULTEC system consisted of both stormwater storage chambers and a CULTEC Separator™ Row for water quality. The Separator Row removes sediments and debris prior to draining into the infiltration CULTEC chambers. In addition to providing storage within the voids of the gravel layer and chambers, the CULTEC Separator Row provides pre-treatment to the runoff prior to entering the infiltration chambers. The Separator Row is a row of chambers encased in geotextile. A layer of CULTEC No. 4800 Woven Geotextile is placed between the clean foundation stone and the bottom of the chamber. The chambers are then completely wrapped with CULTEC No. 410 Non-woven Geotextile.

This configuration is designed to trap any sediment and/or debris that may pass through the upstream water-quality structures and into the chamber system. The CULTEC Separator Row has been third-party verified by GLOBE Performance Solutions for Environmental Technology Verification (ETV) to achieve 80% TSS removal rating. The installed CULTEC system provided a minimum of 0.6 m of separation between the high groundwater level and the base of the CULTEC system.

The CULTEC units are designed to store 2,163 m³ as dead storage, which is equivalent to more than 7.5 mm from a drainage area of 20.15 ha. Based on statistics from Environment Canada for Toronto, there are 43.9 days per year on average with storm events greater than 5 mm. Thus, if the dead storage provides a conservative rainfall depth of 5 mm of dead storage for a drainage area of 20.15 ha, on average a minimum of 44,229 m³ (5 mm x 20.15 ha x 43.9 days) of water can be infiltrated and will satisfy the site water balance.

This was a very complex system that needed to conform to the variety of depth restrictions of each chamber bed. CULTEC's design team was able to work seamlessly with engineers without any intermediaries or slow-moving internal processes. Easily accessible, the technical team can answer questions in real time and provide revised calculations and drawings within 4-5 business day on average. Often deemed an excellent turnaround time within industry, the fast-tracked design capabilities were demonstrated a great benefit to the engineering team at TMIG – especially having required multiple design revisions.

With CULTEC's help, the engineering team decided to use a variety of CULTEC Recharger® models: namely, the Recharger® 150XLHD, 330XLHD, and two Recharger® 902HD systems.



CULTEC CONTACTOR® & RECHARGER® STORMWATER SOLUTIONS

CULTEC's line of Recharger® chambers are able to accommodate a wide variety of site requirements such as different water storage capacities and groundcover requirements. The Recharger® chamber series consists of higher profile, higher capacity chambers. The high capacity units allow for maximal land use within a condensed overall footprint. The Recharger® 150XLHD is an 18.5" (470 mm) tall, lower profile chamber and is typically used for installations with depth restrictions or when a larger infiltrative area is required. On the other hand, the Recharger® model 330XLHD and 902HD chambers are two of CULTEC's larger capacity stormwater chambers. Combining a variety of different chamber sizes from one manufacturer allows flexibility to meet varying depth restrictions typically experienced on large site development projects.

"This complex system required constant communication with the engineering team, and troubleshooting by both the engineering team and our technical department", said Dan Gera, CULTEC's Technical Manager. "We are proud to offer the best customer service in the industry, with unparalleled turnaround times and direct access to CAD designers and estimators."



"The CULTEC technical team was great to work with while preparing the stormwater management design for this project. They were very responsive and communicative throughout the design process. Due to tight site constraints and an expedited project schedule, there were several moving parts throughout the design process. This caused the need to make multiple revisions to the chamber designs along the way before finalizing", said Brendan Grimes, Site Plan Engineer on the project.

"Each time I contacted CULTEC to request or discuss a change to the design, Dan and his team always provided a timely, insightful response which provided suggestions and options for design alternatives and answered any questions I had", continued Grimes. "This allowed our stormwater management design to be updated quickly, while still achieving our design goals, with minimal impact to the rest of the site. CULTEC's ability and willingness to provide design guidance, answer questions, provide suggestions and turn around design revisions in a timely fashion ensure that I will look to work with them on future projects."

Construction of the fulfillment facility began in August 2019 is slated for completion in August 2020.



CULTEC, Inc.

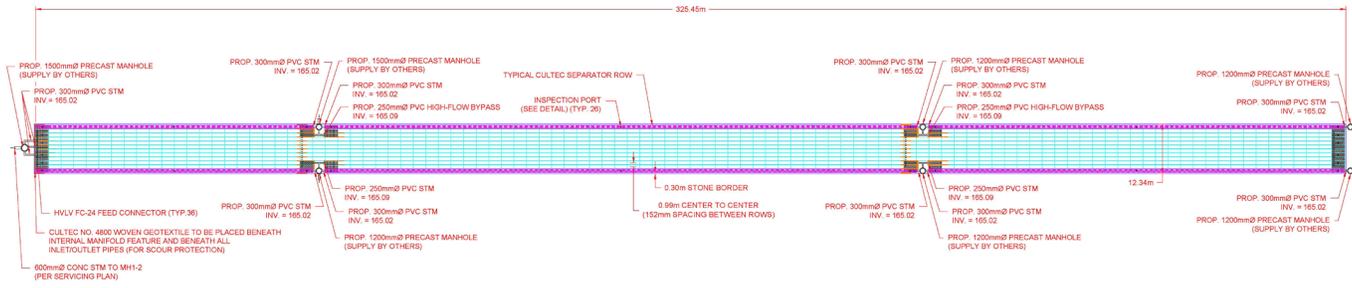
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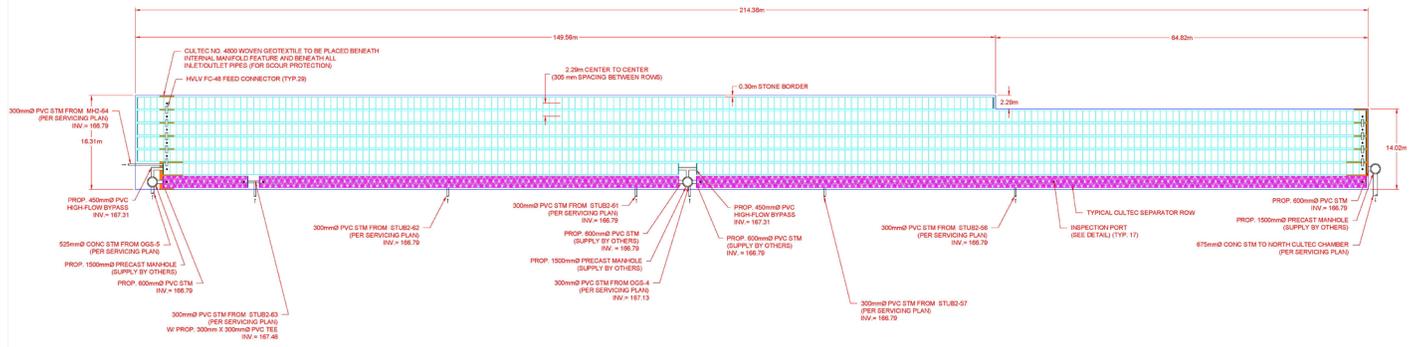
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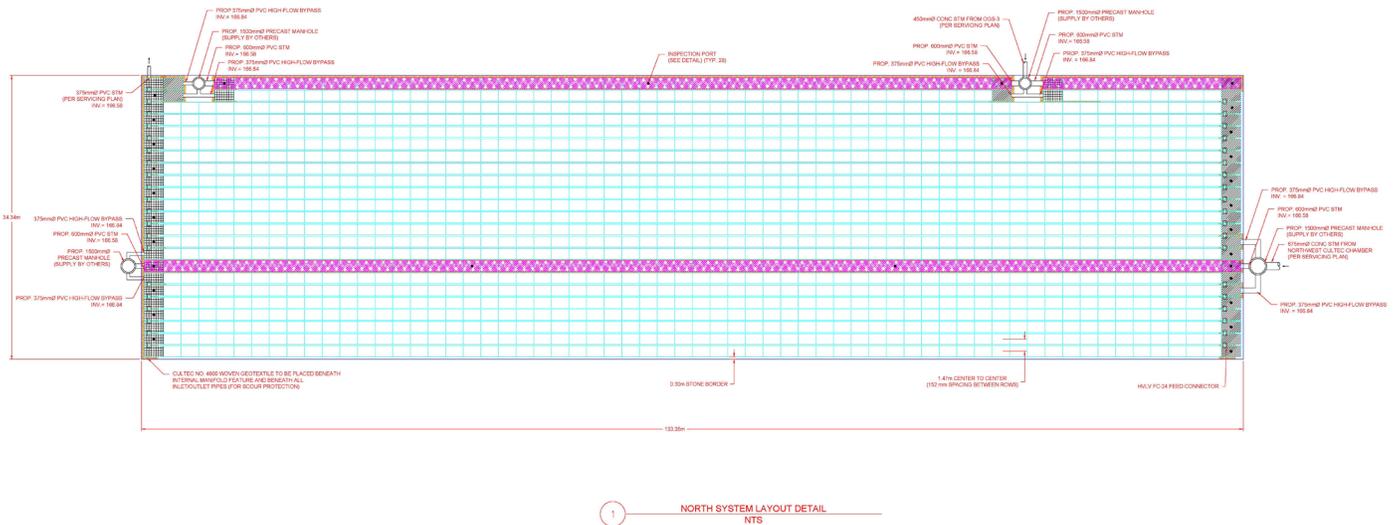
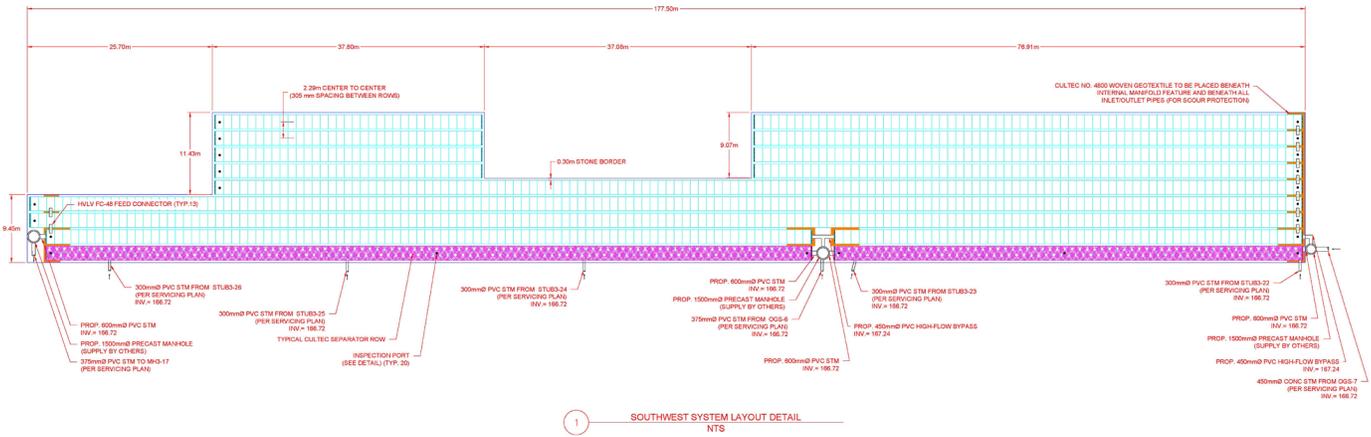


1 EAST SYSTEM LAYOUT DETAIL
NTS



1 NORTHWEST SYSTEM LAYOUT DETAIL
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