FACTS

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EROSION CONTROL Products Guaranteed SOLUTIONS
A tensar Company

CASE STUDY

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Residential Drainage Channel Protected with P550 C-TRM

Introduction

A new residential subdivision in Comstock Park near Grand Rapids, Michigan was to be built adjacent to an existing neighborhood. In the expanding suburbia around Grand Rapids, many housing developments were being constructed as extensions to already existing neighborhoods to relieve the deficiency of housing in the metro area. But with the addition of new housing developments, the need for expanded stormwater runoff plans was required. The Comstock Park development was no different. It too needed additional resources to accommodate the added stormwater generated from the new development.

Before the re-design, the existing drainage channel was lined with broken concrete slabs, and erosion was occurring in the channel.

Problem

Initially the stormwater runoff from the new development was to be diverted into an existing channel currently serving the established neighborhood. While this plan elevated the need to construct a new drainage channel, the developers had concerns as to whether the existing channel could sustain the additional runoff quantities. The local engineering firm, Medema, VanKooten & Assoc. analyzed the present channel consisting of broken concrete and confirmed that it would not withstand the additional volume of stormwater from the new subdivision, and that without additional engineering the channel in time would washout under the increased flows.

During heavy rain events, the large amounts of stormwater runoff flowing over the broken concrete slabs were creating unnecessary turbulence and added to the erosion process.

Solution

With the additional volume of stormwater that would be generated from the new subdivision, the engineers recommended reshaping the existing channel within its original location and removing the broken concrete. It was also recommended that a new flexible channel liner be installed where the concrete remnants had been. Two options were considered as adequate

The P550 turf reinforcement mat provided the erosion protection needed in the channel.

channel linings. The first option would be to install a layer of large rock riprap (D^{50} = 30 inches) over a geosynthetic liner. The second option included installing a turf reinforcement mat (TRM) to obtain a permanently reinforced vegetated swale.

After consulting with North American Green's authorized distributor Price & Company, North American Green's P550, a polypropylene fiber filled composite turf reinforcement mat (C-TRM), was chosen for the project. The P550 is a C-TRM comprised of a permanent, ultra-high strength three-dimensional matting structure incorporated with a 100% polypropylene fiber matrix. The P550 is designed to provide both long-term, pre-vegetated erosion protection and permanent vegetation reinforcement.

After running the project through the three phase design process using North American Green's Erosion Control Materials Design Software (ECMDS®), the P550 was shown to provide the necessary erosion protection to withstand high flows in the channel at discharges exceeding 1000 cubic feet per second and velocities reaching 11 feet per second. The three phase design ensured proper product selection and stabilized protection during the unvegetated, partially vegetation, and fully vegetated stages of the channel lining. In addition to providing the necessary erosion protection, the P550 created a natural aesthetic appeal that blended well with the existing residential areas, especially compared to rock riprap.

Before installation of the P550, four inches of topsoil were added to the channel, improving the sandy loam soil bed. Then the entire channel surface was seeded and fertilized. A standard turfgrass mix was chosen for the site. Sod forming grass was chosen for its potential to increase the erosion control in the channel as well as the ease in maintaining the vegetation in the residential area. After seedbed preparation, the P550 was installed in the channel bottom and along the side slopes.

Results

The use of the P550 C-TRM demonstrated the ability to utilize a green soft-armor alternative to solve problems that previously depended on designing with hard-armor materials such as rock riprap and concrete. By employing P550 reinforced vegetation, the project designers were able to enjoy a 40% cost savings compared to using rock riprap.

The high performance of the P550 became apparent soon after installation as just before vegetation had established, three large rain events occurred each dumping several inches of water. The P550 withstood excessive discharge rates, and protected both the soil and seed from erosion. The project was started in June 2005, and by the end of that growing season the vegetation had matured in the channel.

Within one growing season, the P550 had vegitated, leaving a natural channel bed that was pleasing to the nearby residents. The removal of the concrete also aided in easier maintenance and improved flow conveyance.

The project developers were looking for a flexible channel liner with the highest level of performance at a good price while still being aesthetically pleasing for the residents living in the area. The P550 was the best choice, meeting all the design criteria put forth by the site developers. At the end of the project they were pleased with the finished look of the channel and the high performance of the P550 is exceeding the design requirements and expectations.