

# Use of Geosynthetic Clay Liners (GCLs) as Groundwater Protection in Infrastructure Constructions

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## Abstract

For traffic routes, it is possible to use soil material with limited contamination for the construction (environmentally concerning materials - ECM) of e.g. road dams. Such fill materials include slag, ash, contaminated soils from remediated sites, and residue from construction waste recycling or industrial processing.

The German M T S E guideline (2017) of the Road and Transport Research Association lists various alternatives for the use of ECMs with geosynthetic barriers. It also recommends the use of geosynthetic clay liners (GCLs) - also known as bentonite mats as they can have economic and design advantages over conventional compacted clay liners. In the following, the construction methods in general and the sealing options with geosynthetic clay liners are presented as well as a project regarding a noise and bullet barrier in the shooting sport club SSC Schale in Hopsten, Germany.

The use of excavated soil, industrial waste products and recycled building materials in earthworks contributes to the conservation of resources and the currently necessary reduction of landfill space. Nevertheless, there is a special need for action for the selection of technical safety measures which are necessary for the installation of soils and building materials with environmentally concerning materials (ECM).

The shooting sport club SSC Schale in Hopsten, Germany, had to build a new noise and bullet barrier (figure 1). Next to the old shooting facility, a completely new facility had to be built that also meets the requirements of an Olympic base training camp. Additionally, during the construction of the extension, shooting training should be allowed and possible, as the top athletes still had to run their regularly training program.

The design of the expansion was very challenging and the structural requirements of the huge barrier system were challenging. To ensure noise and bullet protection, a 23m high wall was required. The front side of the wall had a special design with a geomembrane and a special netting system which allowed to stop the bullets and to collect them for further recycling.

The costs of the required fill material were enormous. The project designer ran various calculations and found a possibility to finance the project. The governmental funding and the financial support from the shooting club at no time could have covered the entire project costs. However, several local contractors had a huge amount of ECM which they could not use and would have had to deposit in a landfill at high costs. For that reason, they gave this material free of charge and in

some cases even with a payment to the SSC Schale. With the material and the financial support, it was then possible to finance this outstanding project.

Due to the unusual height and slope of the wall, it was built as a geogrid reinforced wall. The challenging part was now to follow the German M TS E guideline and encapsulate the ECM fill material according to figure 2 and ensure that rain water cannot enter the construction body and therefore leach out any environmentally critical contaminants.

The selected geosynthetic clay liners (GCL) were designed according to the M TS E method B and meet all the regulated requirements as well as the life time expectation of > 100 years.



Figure 1. Bird’s view of the noise and bullet barrier in Hopsten

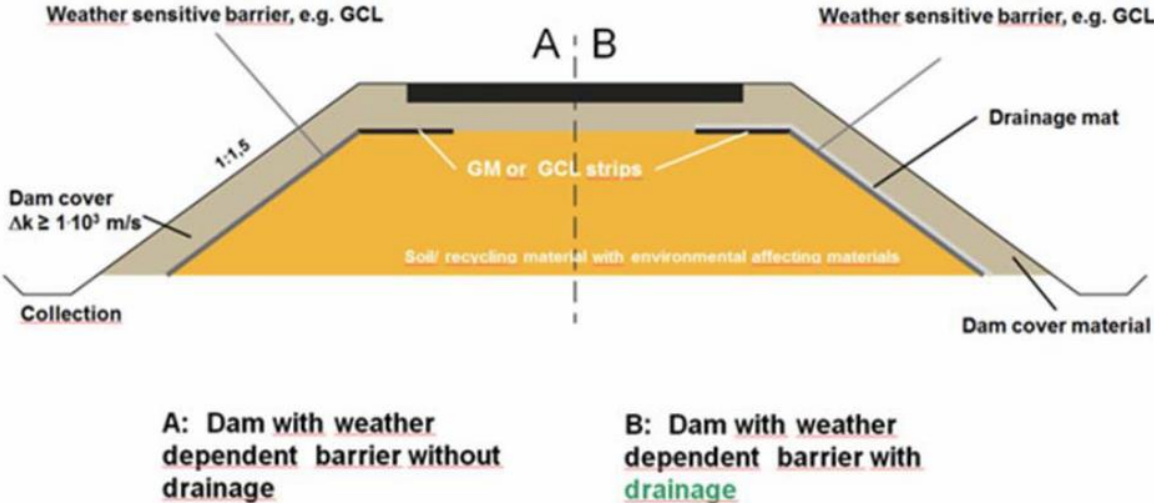


Figure 2. Typical cross section of geosynthetic barrier system for the encapsulation of contaminated soils in road constructions