GCLs at Auburn Lake

by Murray Banting, R.E.T., Bruno Herlin, P.Eng., and Kent von Maubeuge

You get what you pay for in life. Want cheap? Expect it, but don't expect quality and performance from it. Someone will sell it to you. Will they provide you with a warning? It's to be hoped that they will provide you with the limitations of the product. Want something reliable? Every company can offer reliability at a reasonable price. Want the "creme de la creme" with all the built-in safeguards and back-up systems? Every manufacturer would love to sell its premium brand, but expect to pay a premium for that. In our world, however, the cheapest price often prevails. A manufacturer's premium brands probably represent only 10% of their overall sales—if that.

So the geosynthetic arena is no different. The variety of available geosynthetic products is so great that clients seek advise from a particular distributor, supplier and/or manufacturer. But are clients provided with all of the information? Suppliers would love to provide their particular premium brands, of course; but at the end of the day, the cheapest price frequently prevails. Buyers beware.

What follows are some thoughts about what influences geosynthetic clay liner (GCL) selection (primarily regarding purchase, not design), a brief discussion of a gap in field knowledge, and a short project study.

GCLs

One can obtain many types of GCLs: stitched, glued, needle-punched, different bentonite content, different fabric weight, scrim reinforced, non-scrim reinforced, an enhanced polymer, etc. The list is long. Over the years and through increased use, this area of geosynthetic engineering seems to see ever-cheaper GCLs being requested for particular projects. This may mean thinner textiles and/or less bentonite, almost to the point of becoming less a GCL than a double-layered textile. What is the lowest mass per unit area of bentonite that a GCL can have and still achieve, for example, the quoted manufacturer's hydraulic conductivity of 5×10^{-11} m/s? It's getting to the point where 0.5 lb./ft.^{2} seems acceptable from the standard 0.75 lb./ft.^{2}. (The design community originally used 1.0 lb./ft.^{2}.) There has to be a limit, but only specific project engineers will ask for those limits.

This year's GCL topic is "scrim reinforcement." Too many have no idea what a scrim reinforcement is. An example would be a nonwoven geotextile that is needle-punched of a woven textile with a nonwoven textile. Scrim reinforcement can be a very important component of a GCL for various reasons. Importantly, the lack of reinforcement can lead to the internal erosion of the GCL and an increase in the hydraulic conductivity. Also, scrim support can add a bit of protection against improperly prepared subgrade or subgrade that is extremely difficult to prepare because of the site's specific challenges.

However, the presence of scrim reinforcement requires higher up-front product costs, and in a construction culture so heavily pressured to select the cheapest product, the scrim issue is muted and those products are far less utilized. Project engineers need to be aware of this design concern and actively consider scrim-reinforced products too. In situations where they are more appropriate, they should be selected.

Lining the banks and bottom of Auburn Lake, looking north.

South view of Auburn Lake. Construction of the Auburn Bay community in the background with some homes having a direct access to the future lake.

The project

The Canadian oil province of Alberta has experienced an extensive construction boom in recent years as oil prices have risen sharply. The Fort McMurray area has been found to have an extensive supply, though much of it is "sand oil." Still, there's promise as the region may contain more oil than Saudi Arabia, so a great deal of investment has come to Alberta as companies attempt to extract the oil from the sand and secure a steady, profitable future supply.

Not everything in Alberta is about oil extraction, though. A great deal of commercial and residential development is occurring too, and geosynthetics are playing a key role. One such project is the Auburn Lake lining project. This future development located on the south end of Calgary is a community being built around a stormwater management lake. Auburn Bay, touted as Calgary's cottage country, is one of the city's hottest destination communities thanks to the future 43-acre freshwater lake, a 13-acre private beach and numerous other amenities.

The actual liner covers 55 acres and utilizes a Bentofix® CNSL GCL. The product includes a polypropylene coating applied to the woven fabric side of a standard GCL. This safeguards it with a built-in subgrade—a polypropylene coating for the bentonite to sit on and perform its liner duty while the nonwoven fabric provides a suitable friction angle between layers (e.g., cover soil and nonwoven). Some might call it a belt and suspenders system.

GCL deployment started in early June, but the southern end of the province received record rainfalls. Numerous floods delayed construction around Auburn Lake. When the rain ceased in August, the project was completed. On average, 6,000–9,000 m^2 (7,175–10,760 $yd.^2$) were installed per day, depending on the area being worked on (e.g., flat and straight vs. slopes and corners).

Project information

Project engineer: Stantec Consulting Ltd.
General contractor: Kidco Construction Ltd.
GCL installer/supplier: AGES Inc. (Applied Geo-Environmental Solutions Inc.)
Geosynthetic design engineers: McIntosh & Lalani Engineering Ltd.
GCL: Bentofix CNSL from Bentofix Technologies Inc. (A joint partnership of Albarrie, Terrafix Geosynthetics Inc., GSE Lining Technology Inc., and NAUE GmbH & Co. KG)

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