application

location

product

Voids Bridging in Landfill
Marion County, Florida
Mirafi® HS500

THE CHALLENGE

The Baseline Landfill in Marion County, Florida consists of three municipal solid waste landfill cells, covering an area of some 60 acres. This landfill is located in highly Karst (irregular solutioned limestone) geology, generally characterized by sinkholes and ground surface depressions. The initial geotechnical evaluation of a proposed landfill expansion indicated potential foundation support inadequacies. Investigation and evaluation of the limestone subsurface conditions revealed that subgrade improvement measures were needed to ensure stability and integrity of the landfill containment system.

THE DESIGN

To provide protection against the development of potential voids (sinkholes) under the bottom geomembrane liner, a blanket type protection system was designed using two layers of woven reinforcement geotextile, to safely span a cylindrical cavity of 4.5m (14.8 ft) in diameter or a slot cavity of 3m (9.8 ft) wide. During design review, the Florida Department of Environmental Regulation (FDER) showed concern about possible cavities larger than 4.5m (14.8 ft) and asked for additional data supporting the design. Design requirements were introduced requiring that no more than 30 cm (11 in) of leachate head could develop above the liner, resulting in additional investigations (Phases II through IV), to better define geological conditions for Cell III-B, and to determine an appropriate foundation stabilization technique to reduce the risk of sinkhole subsidence.

To improve existing foundation conditions a three-stage construction program was developed. It Included:

- deep compaction grouting to stabilize foundation conditions.
- Installation of a two-layer geotextile reinforcement system.
- Impermeable geomembrane liner, and accompanying drainage systems installation.

Compaction grouting was used to stabilize the Cell III-B foundation. The objective was to reduce sinkhole potential by constructing a 3.4m (11ft) -thick zone of compaction grout, including the compacted grout and horizontally densified sand, covering those areas of limerock surface most likely to provide points for sand ravel inflow and subsequent sinkholes.

Through extensive investigation, areas were defined where significant raveling has or may have occurred. These areas were treated with compaction grouting. The purpose was to reduce void potential and potential large differential settlements under the landfill liner system.

The second form of protection consisted of two layers of geotextile reinforcement, which was designed to enhance landfill liner integrity, providing support in the event of development of a void. Geotextile reinforcement provides support for the liner over the assumed area, reducing deformation or strain in the liner system

CONSTRUCTION

The geotextile was to be installed in two layers, one oriented at 90° from the other. Seam strengths were assumed to develop only 50% of the geotextile tensile's strength. As a result, no seams were allowed across the machine direction in either layer. This allowed the full material strength without reductions because of sewn seams to be utilized in design. The biaxial strength was determined to be the intact machine direction strength added to the seam strength for each direction.

Deployment of **HS500**

Geotextile specification requirements called for a woven high strength polyester material which achieved a minimum average roll (MARV) ultimate wide width strip tensile strength of 77 kN/m (500 lbs/in) in the machine and cross-machine direction at 10% strain, determined using ASTM D 4595 test procedures.

Additionally, each layer required sewing of the individual rolls into one complete pane. This required that the two geotextile layers would be field fabricated to completely cover the site area. Seams were butterfly type stitched, with two parallel rows of stitchlines.

JOB OWNER
Marion County, FL

ENGINEER
John H. Schmertmann, Ph.D., P.E.
Schmertmann & Crapps, Inc.

CONTRACTOR
S & E Contractors

Case Study

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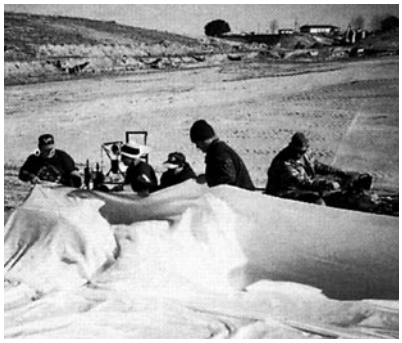


Seaming of **HS500**

The long dimension of the cell mandated an intact geotextile roll to be produced with unseamed lengths of more than 375m (1230ft). Because of this, manufacturing required special care and attention. Each roll length was to be slightly different because the area to be covered by reinforcement geotextile was not rectangular, but rather trapezoidal in shape. This was due to the angle the reinforcement layout pattern assumed when it came into contact with the previous cell surface on the existing northern slope.

All seams were sewn in the "up" position for visual inspection. High strength polyester sewing thread was used to sew the seams. Field sewing took approximately two months.

PERFORMANCE

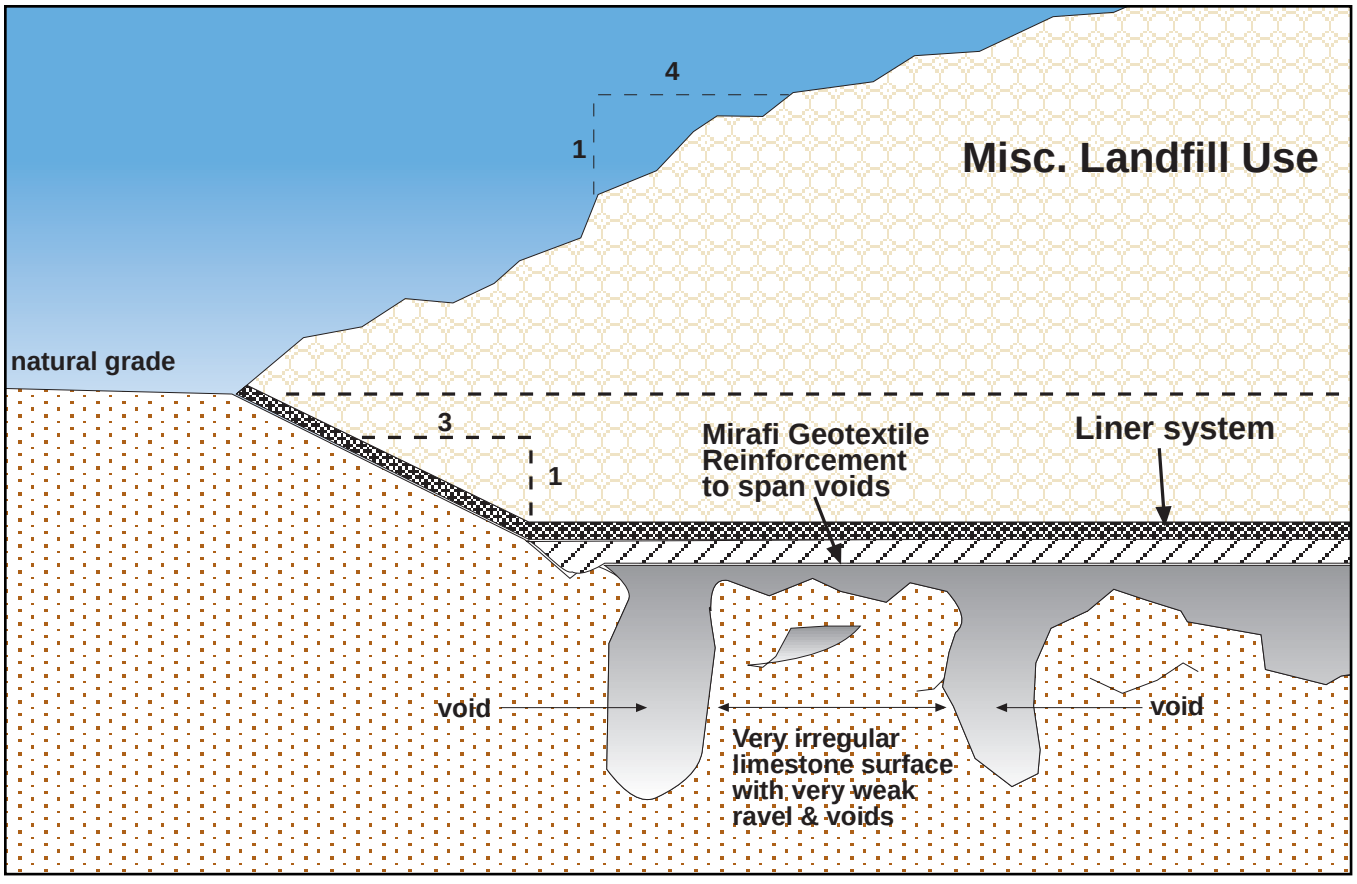
Because of the unique subsurface condition of this site, a three component prevention and protection approach was used to design the foundation support system for the III-B Cell in Marion county, Florida. A compaction grouting program was developed and executed to minimize or eliminate the potential for sinkhole development.

A two layer goetextile reinforcement design and installation followed to provide liner support and maintain liner integrity. This reinforcement was designed to support the landfill overburden in the remote event that subsidence developed at a later date. The two layers were positioned at 90° to each other and field sewn.

The geomembrane liner provided the isolation medium that would contain leachate and eliminate the potential for water flow into the underlying soils, potentially initiation sinkhole development.

References: Paulson,J.N. and Parker, L.W. "Multiple Geotextile Layers Used for Geomembrane Supporting a Landfill : The Marion County (Florida) Landfill Project, "Proceedings form Geosynthetics '93-Vancouver, Canada. pps. 1287-1300

Typical Voids Bridging Application using Mirafi® **HS-Series** geotextiles



365 South Holland Drive
Pendergrass, GA 30567
(888) 795-0808
Fax (706) 693-4400
www.tcnicolon.com

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