ClosureTurf™

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U.S. Patent Nos. 7,682,105 & 8,585,322 • Canada Patent No. 2,663,170 • Other Patents Pending

Over 13 million square feet and closing...

ClosureTurf PERFORMS IN REAL WORLD SITUATIONS.

ClosureTurf™ ensures fast, cost-efficient and environmentally-friendly erosion control—even in some of the toughest applications.

ClosureTurf™ is a three component system comprised of an impermeable, highly transmissive structured geomembrane, a specialized engineered turf, and sand infill. The structured geomembrane component is the foundation of the system and provides for the highest interface friction values available in the market. The engineered turf component is placed on top of the geomembrane giving the system its natural look and feel of a grass while protecting the geomembrane component from extreme weather conditions for the long term. Finally, the sand infill placed in the engineered turf enables the system to be trafficked, while also providing for additional protection and an additional factor of safety against weathering. A virtually maintenance free technology designed to last, ClosureTurf has proven to be the most sustainable closure option available for the waste industry. See how ClosureTurf performs in some of the most demanding applications.

1

LASALLE-GRANT LANDFILL

QUICK STATS

Location: Jena, LA
Completed: 2009
Owner: Progressive Waste Solutions
Size: 9 acres

PROJECT SCOPE

The soil of the LaSalle-Grant Landfill in central Louisiana was highly erodible, had a high plasticity index, and had a natural pH of 4.0, so its characteristics weren't conducive to side slope maintenance. In fact, every spring the existing vegetative slopes required slope repair, reseeding and liming in order to remain intact. Pressure to find a more stable solution led the operator to implementing Closure Turf's 43 degree interface friction technology, which is more than a 3.0 factor of safety against sliding failure, over 10 acres of the landfill.

2

CRAZY HORSE LANDFILL

QUICK STATS

Location: Salinas, CA
Completed: 2013
Owner: Progressive Waste Solutions
Size: 68 acres

PROJECT SCOPE

Situated adjacent to the San Andreas Fault in California, the Crazy Horse Landfill in Salinas, CA, required a solution that would enable capping without modifying steep slopes of 2.25H:1V. And, since most available borrow soil was expensive and environmentally impacted with agricultural chemicals, the site was especially challenged in producing surface water quality that met the regulations. The 65-acre landfill is also situated in a residential area that demanded a final cover system that was aesthetically-pleasing and not subjected to on-going erosion and maintenance noise.

3

TIMBER RIDGE LANDFILL

QUICK STATS

Location: Richwoods, MO
Completed: 2010
Owner: Progressive Waste Solutions
Size: 10 acres

PROJECT SCOPE

Due to its location in a seismic area, concerns over slope stability that could compromise gas collection and containment was a major concern for this landfill. The lack of quality borrow soil and the high cost of procuring it made a ClosureTurf system an easy choice. Likewise, gas collection using deep wells would drastically increase installation costs and compromise speed of closure. A system that could perform effectively without deep vertical wells was greatly advantageous.

4

HARTFORD LANDFILL

QUICK STATS

Location: Hartford, CT
Completed: 2013
Owner: Connecticut Resources Recovery Authority
Size: 38 acres

PROJECT SCOPE

The vision that the owner had for the Hartford Landfill was one where they would be able support the initiatives to promote renewable energy that were consistent with both the CTDEEP and the City of Hartford, CT. ClosureTurf enabled them to do just that, by providing for the best closure technology available and is capable of incorporating traditional rigid or flexible solar photovoltaic panels.

RESULTS

Operators quickly learned of Closure Turf's ability to provide long-term erosion control as the system controlled rainfall runoff in excess of 4 inches per hour at times during it's first year in action. In fact, the system has endured more than 300 inches of rainfall since 2008. And, three months after phase one of the project was completed, a tornado producing shear winds of 70 mph hit across the front of the landfill without damaging the turf cap. Finally, the LaSalle sand infill remained in place with no erosion when a levee broke, releasing water over 5 acres of the project area.

The Closure Turf system requires no mowing, little maintenance, and has remained in tact even under the most extreme weather conditions. Low maintenance costs can relate to significant savings over the 30 year post closure period. Best of all, soil erosion, water infiltration, leachate reduction and fugitive gas emissions were immediately controlled once the ClosureTurf system was installed.

"We'd been killing ourselves working and reworking our slopes, but after we installed the Closure Turf system we didn't have to do anything to it again. The grass looks great, the sand hasn't moved and there's no erosion."

Delaney Lewis,
District Landfill Manager,
IESI Corp, A Progressive Waste Solution Company

RESULTS

Installation of the ClosureTurf system was successfully achieved with currently developed slopes under earthquake loading, eliminating 11,000 round trip truck loads (equivalent to 660,000 miles) that would have been required for soil borrow. The combination of soil import elimination and reduced heavy equipment needs reduced the project's carbon footprint by 70%.

ClosureTurf eliminated dirty storm water runoff by replacing a traditional vegetated cover with a cover system that produces very clear and clean water free of fertilizer and muddy runoff. In addition, ClosureTurf eliminated slope veneer failures from high seismic loads and reduced yearly maintenance activities for the SVSWA to essentially zero. These would have included rebuilding slopes because of erosion, revegetation, dust control efforts, mowing of weeds and grasses to reduce fire danger, and controlling rodent populations.

"We've been extremely impressed with the stability of our slopes and quality of the water runoff. Plans now include a 2 mega-watt solar array system down the road, which will mean this land will produce renewable energy source that gives back to the environment."

Dave Meza, P.E.
Project Manager
Salinas Valley Solid Waste Authority

RESULTS

ClosureTurf's patented system precluded the need for gas wells or piping. This resulted in a cost savings of $15,000 per acre that would have been required for installing deep gas wells. ClosureTurf's structured membrane reduces oxygen in the system that results in higher quality methane gas to be vented for flaring or alternative energy generation.

Under the ClosureTurf system, the gas rises to the surface due to positive pressure and generates little condensate to be collected and managed. The Timber Ridge system is consistently venting 500 SCFM of gas over a ten-acre closure with no vertical wells. This achievement has resulted in Timber Ridge winning an International Achievement Award for a combined gas collection and closure system and the Solid Waste Association of North America (SWANA) Gold Award for landfill gas collection in 2012.

"Capturing 100% of methane has provided options for carbon credits and given us more fuel to burn for generating energy. As soon as an area is closed, all emissions can be controlled which is great. And, the structured membrane protects against oxygen infiltration, eliminating that as a fire pathway."

Mike Freisen, P.E.
Regional Engineer
IESI Corp, A Progressive Waste Solution Company

RESULTS

ClosureTurf was selected for use by the owner for the following reasons: ClosureTurf's geomembrane component had a proven track record in landfill closure applications, the engineered turf with sand infill was durable and strong protecting the underlying geomembrane from ultraviolet degradation while also enabling the system to be driven across by light rubber tire vehicles without damaging the SGN required for normal solar field operations. As the best long-term solution for Hartford, ClosureTurf also provided for an aesthetically-pleasing environment in a high-profile area.

Other successful installations:

Industrial Sludge and Ash Lagoon
- **Location** Rincon, GA
- **Completed** 2013
- **Owner** GA Pacific
- **Size** 70 acres

Weatherford Landfill
- **Location** Weatherford, TX
- **Completed** 2010
- **Owner** Progressive Waste Solutions
- **Size** 8.5 acres

Berkeley County Landfill
- **Location** Moncks Corner, SC
- **Completed** 2013
- **Owner** Berkeley County
- **Size** 12 acres

Lanchester Landfill
- **Location** Narvon, PA
- **Completed** 2013
- **Owner** Chester County
- **Size** 7 acres

Tangipahoa Parish Solid Waste Facility
- **Location** Independence, LA
- **Completed** 2013
- **Owner** Tangipahoa Parish Government
- **Size** 22 acres

Timberlane Landfill
- **Location** Oakdale, LA
- **Completed** 2011
- **Owner** Progressive Waste Solutions
- **Size** 4 acres

Saufley Landfill
- **Location** Pensacola, FL
- **Completed** 2012
- **Owner** Escambia County
- **Size** 22.5 acres

Sandtown Landfill
- **Location** Sandtown, DE
- **Completed** 2013
- **Owner** Berkeley County
- **Size** 4 acres

Bi-County Landfill
- **Location** Woodlawn, TN
- **Completed** 2013
- **Owner** Montgomery County
- **Size** 5 acres

B&W Pantex Landfill
- **Location** Amarillo, TX
- **Completed** 2013
- **Owner** Department of Energy, EPA Region 6
- **Size** 5 acres

Contact Agru America for information on other successful ClosureTurf™ landfill applications across the U.S.

ClosureTurf delivers superior performance.

ClosureTurf was specifically designed to address and solve erosion, slope integrity, gas emissions, installation and maintenance cost control, EPA regulation compliance, and longevity of structure and appearance. Discover the solution that delivers on its promises. Choose ClosureTurf.

For more information on ClosureTurf, visit closureturf.com, or email us at info@closureturf.com or call 800-373-2478.

Watershed Geosynthetics™

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