

ClosureTurf® CCR Industry Symposium Summary

WG WatershedGeo®
Unearthing Solutions



Introduction

The objective of this symposium was to gather CCR industry utility representatives to discuss applications, experiences, lessons learned, approaches, and long-term maintenance of ClosureTurf® in CCR applications. Six presentations were made by representatives from Duke Energy, Evergy, Southern Company, Santee Cooper, TVA, and Watershed Geo. The symposium closed with a round table discussion with the industry professionals from each of the above companies.

This recap will include discussions of the following presentation topics:

- Selection and Procurement
- Design
- Installation
- Post Installation Performance
- Operation and Maintenance
- Round Table

Selection and Procurement

Selection:

- Cost - It is generally cheaper to use ClosureTurf in comparison to a traditional cap, especially when off-site borrow soils are needed.
- Farm Land – There has been increasing push back on utilizing farm land for borrow soils as part of the cap construction. In some areas, the closest borrow sources are farm land and this has resulted in increased trucking distances and costs.
- Safety - DOT statistics indicate increased potential for accidents with large volumes of dump truck traffic associated with off-site borrow delivery.
- Schedule – ClosureTurf has significantly improved the construction schedule which also has reduced the volume and cost of treating contact water.
- Grass Germination – With traditional caps, we've seen significant costs associated with getting the grass to grow and maintain. In addition, during drought conditions, contractors have struggled to maintain grass on traditional cap systems. These same concerns do not exist with ClosureTurf.
- Grass Maintenance – There are increased challenges with a reduced labor force, particularly at sites in remote areas. This makes it extremely challenging to adequately maintain traditional cap sites.
- Weeds – These are a significant issue at some sites where invasive plant species such as phragmites grow and are extremely difficult and costly to maintain on traditional caps.

Procurement

- MSA - There have been good experience utilizing a direct purchase Master Services Agreement (MSA) with WG for ClosureTurf®. It has resulted in 20% savings compared to traditional procurement through Civil Contractor.
- Installer Contract - To support procurement through an MSA, a direct contract has also been setup with the geosynthetics installer.
- Laydown - Areas need to be identified on-site and coordinated with the party taking ownership of the material once it arrives on-site.

Design

Access Roads

- Access road layout needs to be integrated early into the grading design and not impede drainage patterns and systems.
- Access road loading is controlled by subgrade due to thin nature of the ClosureTurf system.
- Geocells and concrete curbs have been utilized when designing aggregate access roads on ClosureTurf. These are also utilized to minimize aggregate loss/movement.
- A pilot study is currently underway to facilitate crossing of a HydroTurf® lined perimeter ditch using geocells.

Drainage Features

- Downchutes have been designed with Rip Rap to reduce velocities at perimeter ditch entrance and to prevent trampoline effect.
- Ditch dimensions have been modified in some cases to a 9 ft width to match construction equipment.
- It has been observed that ditch sizing and the volume of discharge will increase with ClosureTurf in comparison to traditional cap.

Pipe Penetrations

- It is preferred to use solid wall HDPE pipe. Techniques used to transition from the pipe to ClosureTurf include using stainless steel stirrups to band the turf to the pipe.
- Others have seen that band clamps of the liner and turf to a pipe did not hold due to expansion and contraction. They are now welding liner directly to the HDPE pipe.

- It was requested that WG develop a pre-fabricated boot detail to transition from the HDPE pipe to the liner.
- Do not use corrugated metal pipe with the system.

Grading

- Integrating WG into the design process as soon as possible has proven to be beneficial in reducing benches and maximizing air space.
- When changing the design from a traditional cap to ClosureTurf®, the loss of 24 inches of cover soil needs to be considered at all drainage structures.
- Grades less than 1% are too aggressive for the system due to seams and construction tolerances and could result in ponding of water.
- Caution should be used when providing TIN files to grading Contractors. Due to the thin section of ClosureTurf, any inconsistencies or subtleties in the grades will be reflected visually with the ClosureTurf.

Transitions

- When utilizing ClosureTurf on a site that already has a traditional cap, placing a 3 ft wide transition zone of gravel is effective in preventing erosion at the transition and serves as a buffer zone for mowing.

Installation

Installation Considerations

- Color - When installing along a slope section, use same lot of turf for color consistency.
- Infill - ClosureTurf needs to be installed as quickly as possible to add ballast and prevent movement between the turf and liner following installation.
- Infill – Some prefer to have the contractor pay for the infill so that they are more diligent in managing the material and associated costs.
- Rip Rap - When placing Rip Rap or stone on ClosureTurf, place a separation geotextile, use smaller stone sizes, and hand placement to prevent damage to the system. If the geomembrane is damaged, it can be very difficult to locate and repair.
- Wrinkles - Wrinkles in the turf should be anticipated at the intersection between areas with aggregate infill versus stone and in ditches with only infill.

- Timing – On a large scale installation, 27 acres of ClosureTurf® was installed in 1 week. Typically, they are averaging 1.5 to 2 acres per day on this project.
- Installer – Having a qualified installer is extremely beneficial and helps meet the schedule and maintain quality.

Lessons Learned

- Infill Installation - In July, a large installation experienced a 100-year storm event. At the time, approximately 15 to 20 acres had been installed without infill. The storm caused the turf portion of the system to move downslope. The area was repaired in approximately 2 days. However, it should be noted that areas with infill installed saw no movement.
- Infill – Sand sources need to be checked prior to bidding. On a remote project site, the nearest source was about 100 miles away and resulted in increased costs.
- Instrument Penetrations – 4 inch diameter PVC pipe boots were originally installed at instrument locations. However, movement of the system caused the boot to damage the instrument. It was determined that a larger void space was needed between the boot and instruments. A larger boot (12 inch diameter) is being installed and appears to have addressed the issue.
- Downchutes – Hydrobinder was utilized and would not hydrate due to a variety of factors. The binder should be tested prior to installation.
- PowerCap™ – When installing PowerCap on ClosureTurf, a sacrificial amount of turf should be installed on the surface to prevent excessive wearing when using vehicles to support the installation.
- Liner Under Roadways - Membrane should be installed under all turf, even if under a roadway. The turf is permeable and may transmit water to the unlined area.

Post Installation Performance

Observations

- Stone Movement - When stone is installed in heavy velocity drainage areas, the stone can move over time, which can also result in damage to the separation geotextile or turf.
- Wrinkles/Trampoline Effect – The ClosureTurf system moves. It stretches during the warmer summer months and contracts in the winter resulting in wrinkles, and in some instances, trampoline conditions between the ClosureTurf system and the subgrade.
- Wrinkles - There are two types of wrinkles typically observed post-installation: those that do not fold over and those that do. Most of the wrinkles are aesthetic in nature and need to be shown to the system owner and O&M team and not considered a performance issue. However, wrinkles that fold over can impede flow and need to be assessed.

- Bird Bath - When poor surface drainage conditions such as a bird bath exist, it is typically due to a loss of material below the liner portion of the ClosureTurf®, likely resulting from erosion prior to or during the installation process.
- Dirt Bikes/Equipment – Joy riding has occurred on some sites and has resulted in the displacement of some of the infill but no damage to the system.
- Animals – It is common for birds to eat their prey on top of the system and leave bones or other fragments from the kill.
- Reduced Leachate Generation – At a coastal site landfill, decreasing leachate generation rates have occurred post installation. Current generation is approximately 4% of the peak generation experienced while the landfill was open.

Operation and Maintenance

Inspections

- Infill - Typically performing infill verification on a 5 year cycle. The inspections are performed by a crew certified to work on the ClosureTurf system and conduct measurements on a 50ft by 50ft grid. To date, no significant infill loss has been measured on the monitored sites.
- Turf Seams - When performing inspections, closer attention is typically paid to the butt seams of the turf which have increased potential for separation.
- Regulatory – A regulator required installation and monitoring of a test pad at the first ClosureTurf installation site in the state. The test pad was located off the landfill and is being sampled and tested on a 5 year interval. Subsequent installations have not required a test pad.

Maintenance

- Minimal Maintenance – A coastal site has experienced over 17 storm events since installation with very minimal maintenance performed to date.
- Overfill of Infill – If too much infill is placed during the installation, material has been observed to migrate downslope and accumulate in the perimeter stormwater ditch.

Round Table

To conclude the symposium, we had a round table discussion with industry representatives from Duke Energy, Evergy, Southern Company, Santee Cooper, and TVA. We asked six questions, and their answers are noted below.

Describe your key decision factor in deciding to use ClosureTurf® on a project.

- Schedule
- Reduced water management (CCR contact water)
- Risk mitigation
- Availability of soil; vegetation/mowing challenges
- Inflation/cost increase of fertilizers
- Flexibility for solar

Describe your key decision factor in deciding to not use ClosureTurf on a project.

- Cost (when soil is available on-site)
- Team members not fully convinced yet (e.g., longevity and need for future turf replacement)
- Natural vegetation desired by owner or regulator

What do you consider to be the most significant advantage of ClosureTurf?

- Visibility: problems can be seen on surface and detected early on
- Performance: no soil cover sliding or stresses from soil cover
- Once you put it down, it's done: minimal maintenance
- Risk mitigation
- Airspace gain
- Performance certainty: can't tell difference between pre- and post-storm performance; for soil covers, grass may not come up, or grass may overgrow and become hard/expensive to manage (too dry or too wet)
- Schedule certainty
- Stormwater discharge quality
- Land reservation for solar (no farmlands; not in my backyard)

What do you consider to be the most significant challenge of ClosureTurf?

- Regulators: potential long-term liability
- Educate regulators and internal people
- Internal approvals: get people on-board
- Convince management team (life cycle; cover replacement)
- Set expectations of regulators
- When construction cost options become neutral, it becomes hard to take advantage of future savings: grass – known; synthetic turf – unknown
- Thermal expansion/contraction without a soil layer

How frequently do you perform maintenance on your ClosureTurf® sites and what does the maintenance include?

- No major maintenance events
- Low maintenance
- Virtually nothing
- Very little
- Zero maintenance in 3 years

What type of improvements or enhancements to ClosureTurf would you like to see?

- ClosureTurf connection details (e.g., stormwater discharge pipe connection)
- Reduce cost, while maintaining quality
- Turf salvage edge trimming – labor intensive
- Winkles in ditches
- Cap integrity testing/monitoring
- Data management: QR codes on each roll

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