Design and Construction of a ClosureTurf® Final Cover System

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Site/Project Background

• NABORS Landfill operated MSW and C&D landfills from 1987-2012

• Located in north central Arkansas

• NABORS entity went bankrupt...The ADEQ took over closure activities

• ADEQ selected SCS Engineers to provide design and construction management/CQA services
Site/Project Background

- Borrow soil has historically been poor quality and challenging to build low perm layers. Assumed a 50% spoil ratio for screening operations to remove rocks.

- Very difficult to regrow vegetation in borrow areas.

- Approximately 93,000 CY of overfill to relocate.

- The original design/bidding was for the permitted traditional Subtitle D final cover systems (low perm soil, geosynthetics, vegetative layers).

- ADEQ rejected bids and asked SCS to redesign with ClosureTurf® (CT)… within 1 month.

- A typical permit modification application was not submitted to the ADEQ.
Site Layout

**AREA 1-2 (26 ACRES):**
- MSW
- PRE-SUBTITLE D AND SUBTITLE D CELLS
- SIGNIFICANTLY OVERFILLED WITH STEEP SLOPES

**AREA 1-3 (22 ACRES):**
- MSW
- SUBTITLE D CELLS ONLY
- USED TO RELOCATE AREA 1-2 OVERFILL

**CLASS 4 (8 ACRES):**
- C&D WASTE
- PRODUCED LARGE VOLUME OF LIQUIDS
ClosureTurf® Final Cover System
Design Considerations

- Stormwater Runoff – Expect high volume of runoff and velocities.
  - Removed all HDPE pipe down chutes and all but 1 terrace from original design.
  - Lined perimeter stormwater channels with CT.
  - Designed larger energy dissipaters at outlets.
  - Resized stormwater culverts and existing stormwater ponds.
  - Included ArmorFill binder with the sand to prevent sand erosion.
Design Considerations

- **Original Design:**
  - 16,000 LF tack-on terraces
  - 2,700 LF HDPE pipe down chutes

- **CT Design:**
  - 1,250 LF tack-on terrace
  - No HDPE pipe down chutes
Design Considerations

• Active gas collection not required but passive venting needed to be accounted for...CT system has malfunction relief valves for gas accumulation (approximately 1 per acre).

• Passive gas vents were drilled into the waste mass for additional passive gas collection.

• Perimeter roads/grades were redesigned to accommodate anchor trenches and revised ponds.
Construction

- Final covers were installed in phases (Class 4, Area 1-2, Area 1-3).
- HDPE geomembrane CQA procedures were similar to other geomembrane projects (trial welds, destructive/non-destructive testing, etc).
- CQA procedures for turf/sand installation included visual observation, sand thickness measurements, and repair documentation.
Construction

- 50-mil HDPE SuperGripnet is rolled out onto subgrade.
- Panels are joined using fusion/extrusion welding techniques.
Construction

• Turf is then rolled out on top of the liner and turf panels are seamed together utilizing heat.
Construction

- Geosynthetics are secured in an anchor trench.
- Panels of turf are joined by heat.
Construction

• Sand is spread to a thickness of ½ inch thick.
• The sand is then brushed into the turf fibers.
Construction

• ArmorFill is then placed on the sand to provide a durable protective coating and prevent sand from washing away.
Construction

• Malfunction Relief Valve

• Passive gas vent
Challenges - Weather

• Rain: ArmorFill required 24 hours curing period after placement. The sand needed to be dry prior to installation so we really needed a 48-72 hour window.

• Shut down for winter season, VERY wet spring caused delays in installation.
Challenges - Wrinkles

• Large wrinkles developed on Areas 1-2 and 1-3:
  • We think the waste relocation/regrading activities created differential settlement.
  • We were told the site didn’t always use compaction equipment when they were open.
  • Wrinkles developed over time and moved towards the perimeter stormwater channel.
  • Wrinkles larger than 1 foot in height were cut out and repaired.
  • Did not appear to impede stormwater flow since they were oriented along the flow line.
Challenges - Wrinkles
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- Repairing wrinkles after ArmorFill installation was challenging as it was very hard to cut through.
Challenges - Culverts

• Existing culverts were CMP and was difficult to tie the CT into.
• Poured concrete around the headwalls.
• Secured CT to the concrete using steel battens.
Challenges - Culverts
Post-construction Observations

• Stormwater discharge is very clear!
• Installation of the ClosureTurf® was quick outside of the sand infill which was greatly effected by weather.
• The wrinkles that developed did not effect stormwater drainage...more of an aesthetic issue.
• Sharp angles in the stormwater channels/terrace were difficult to construct...would recommend design with gradual angles.
• Would look into HDPE culverts/headwalls so the CT could be welded to the outlet structures.
Questions?