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

Existing Borrow Source
ClosureTurf® Final Cover System

50-MIL HDPE SuperGripnet

INTERMEDIATE COVER

SYNTHETIC TURF

MINIMUM 0.5” SAND/ArmorFil™ LAYER

12"

INTERMEDIATE SOIL COVER

WASTE
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 \( \frac{1}{2} \) 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. WatershedGeo has developed a sand spec to eliminate the need for ArmorFill.
• 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?