USE OF GEOSYNTHETIC TURF CAP FOR A CONFINED LANDFILL SITE

Presented By:

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SITE DESCRIPTION AND HISTORY

- Blydenburgh Road Clean Fill Landfill (CFL)
- Suffolk County, Town of Islip Hauppaugue, NY
- Approximately 50 miles east of New York City

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SITE DESCRIPTION AND HISTORY (CONT.)

- Operated by the Islip Resource Recovery Agency (IRRA)
- 30 acre CFL situated on 135 acre site which includes closed and capped MSW landfill
- CFL was constructed in two phases in 1989 and 1995
- Receives approximately 50,000 CY/YR primarily from Town facilities, parks, highways, IRRA compost, and MRF bypass

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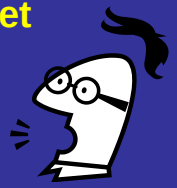
OPERATIONS

- Leachate
  - AVG generation of 18 MGY
  - All leachate trucked off site, 3000 trucks/yr
    - 2.8 MG onsite storage, lagoons and tanks
    - 50% operating budget



- LFG
  - Collected primarily by horizontal collection system with some vertical wells
  - Two enclosed flares for C&D and closed MSW LF with 3000 scfm capacity
- Grading 15.4 acres
  - Final grade was reached

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SITE OVERVIEW

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LEACHATE REDUCTION BENEFITS FROM CAPPING ONE HALF OF THE SITE

- Leachate disposal costs
- Number of leachate hauling truck trips
- CO_2 vehicle emissions approximately 186,000 lbs/yr
- Leachate pump run time
- Reduce need for storage

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ISSUES TO ADDRESS

- Limited buffer from toe of slope to property boundary
- Limit cutting/filling/benches
- Limited contractor laydown area
- Storm drainage to meet new 6 NYCRR 363 requirements for 100-yr/24-hr and 500-yr storms
- Demonstrate gas control system will control gas
- Allow existing operations to continue
- Plan for future capping

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ADVANTAGES TO GEOSYNTHETIC TURF (CLOSURE TURF(Trade mark))

- **Utilizes limited foot print at toe of slope**

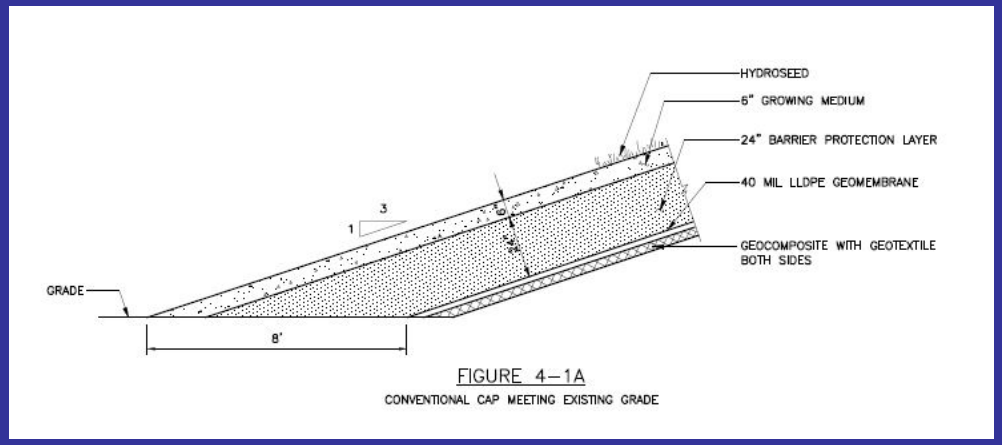

FIGURE 4–1A
CONVENTIONAL CAP MEETING EXISTING GRADE

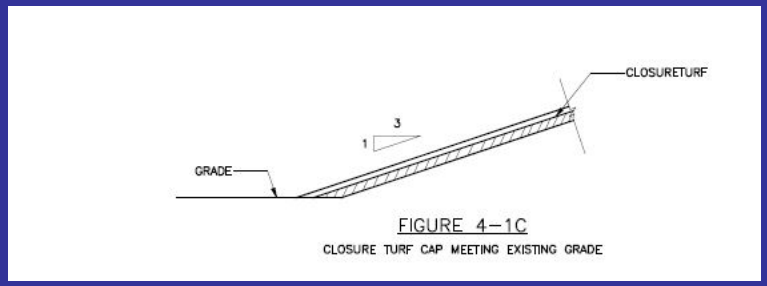

FIGURE 4–1C
CLOSURE TURF CAP MEETING EXISTING GRADE

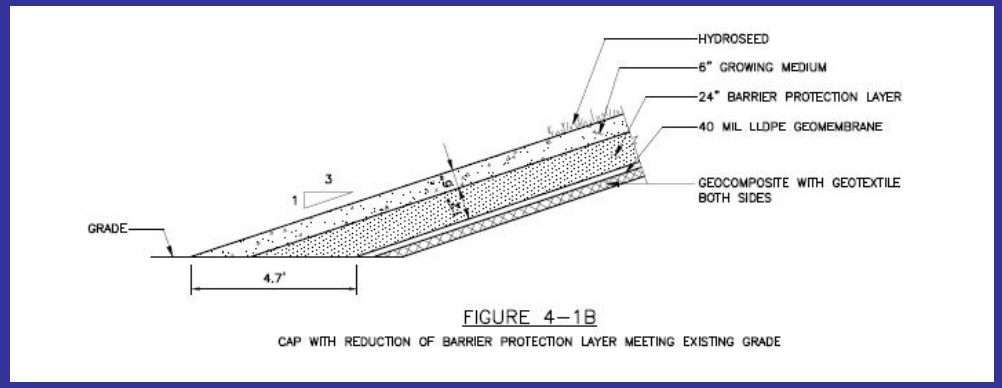

FIGURE 4–1B
CAP WITH REDUCTION OF BARRIER PROTECTION LAYER MEETING EXISTING GRADE

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OTHER ADVANTAGES

- No need for benches (dependent on slope angle and length)
- Cost saving over traditional cap $120,000/acre vs $200,000/acre
- Fairly rapid installation compared to traditional cap
- Reduction in maintenance
- Smaller quantities of fill needed which minimizes trucking to site and laydown area (62,100 cy + inplace reqd for conventional cap vs 2,100 cy for geosynthetic turf)
- 6 NYCRR 363 Considers Geosynthetic Turf equivalent to conventional cap

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STORM DRAINAGE VOLUME AND INTENSITY

Table 1

Design Storms, Rainfall Intensities, and Volumes

Design storm	Rainfall Inches	Intensity Inches per hour	Volume Required Gallons rounded to nearest 100	Volume available in Basin Gallons	Excess capacity In Basin Gallons
100 year, 24 hour	8.72	.363	3,883,000	10,419,800	6,536,800
500 year, 24 hour	11.9	.496	5,299,000	10,419,800	5,120800
100 year, 1 hour	3.04	3.04	1,352,000	10,419,800	9,067,800

- Assumes 100% runoff

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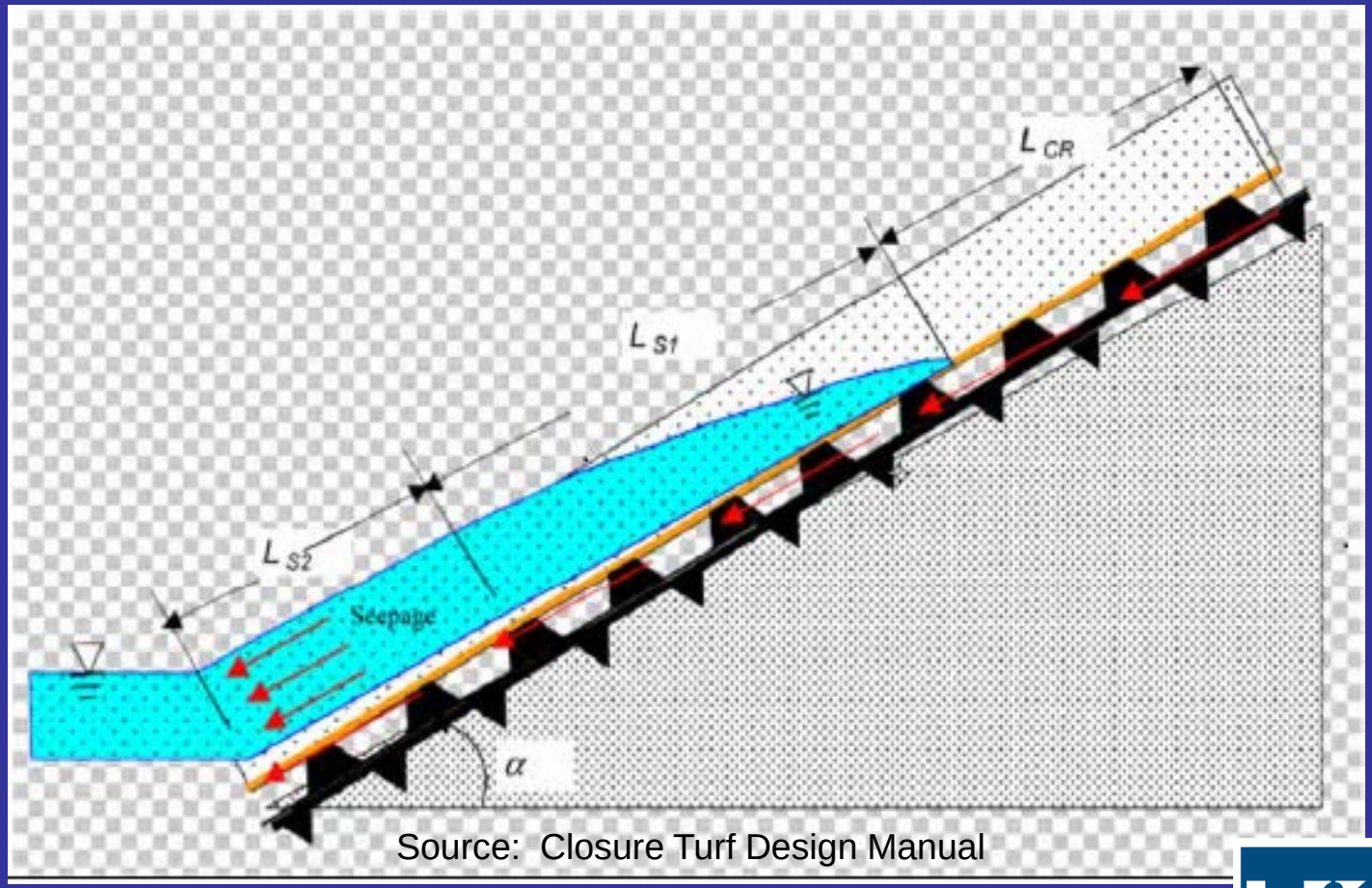
SLOPE LENGTH / INFILL DESIGN CONSIDERATIONS



Source: Closure Turf Design Manual

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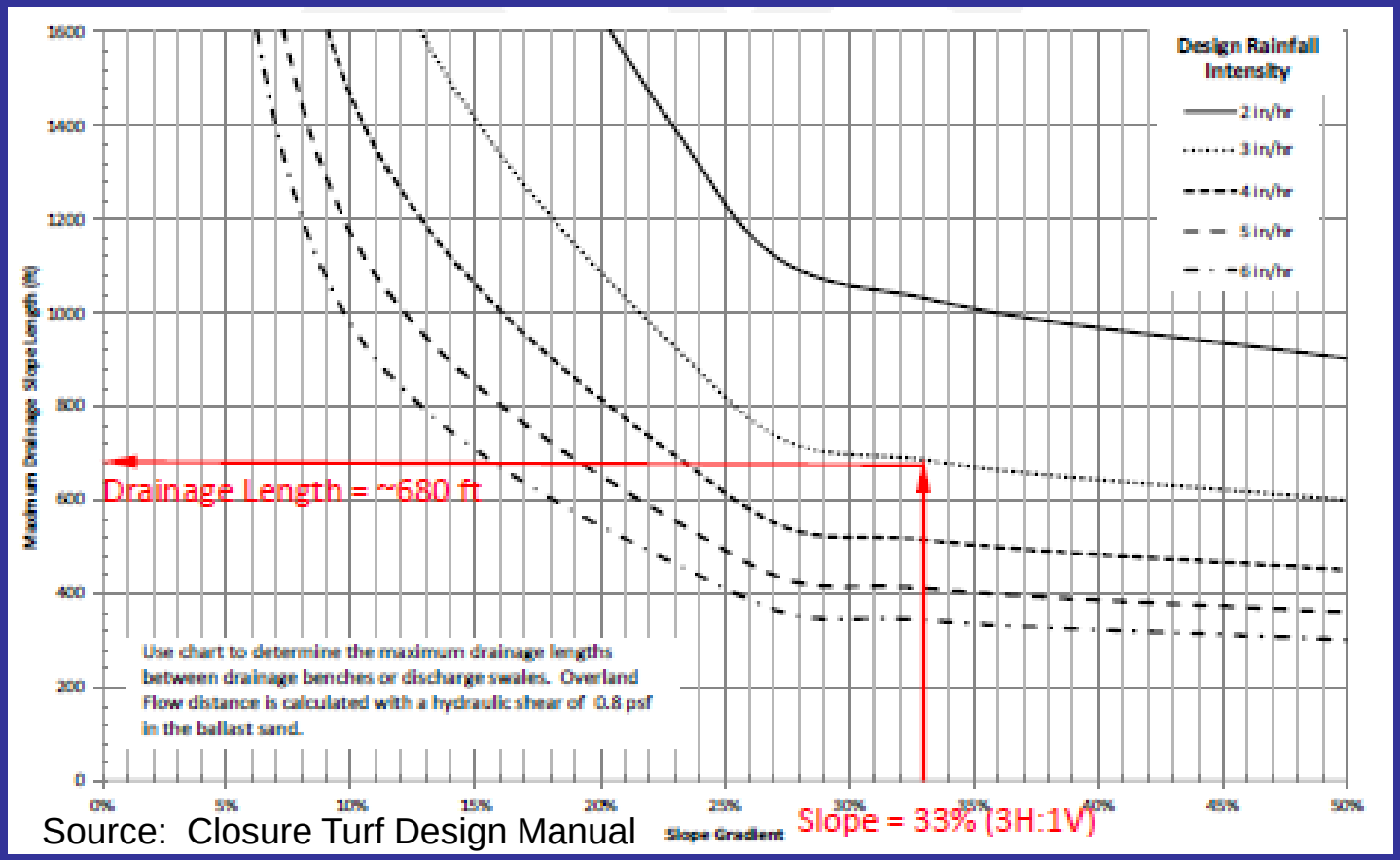
SLOPE LENGTH / INFILL TYPE



Source: Closure Turf Design Manual

- **Longest slope is 295 ft therefore no benches or hydrobinder are required.**

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FOR STORM DRAINAGE COLLECTION

- Use a combination of
  - Swales at toe of slope
  - Swales up slope of road
  - Existing 18 inch drainage pipe

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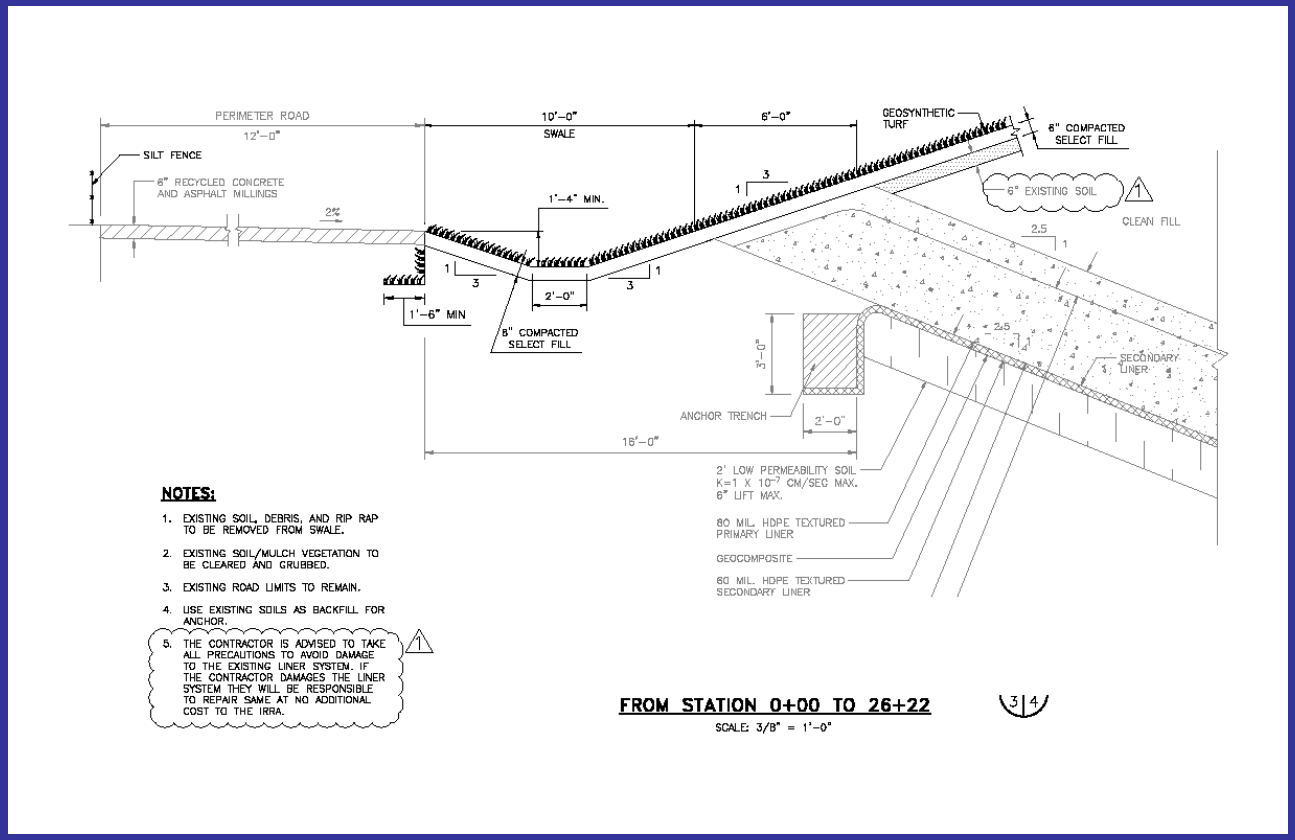
TYPICAL SWALE AT TOE OF SLOPE

- Hydrobinder in swale only to provide n value at 0.03 vs 0.22 without hydrobinder



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GAS CONTROL SYSTEM

- Utilize geosynthetic gas vent layer (Draintube) spaced as per flux rate and gas transmissivity Approximately 150 feet apart
  - Connect to new below grade HDPE piping
  - New piping daylights to existing above grade valve system
  - Condensate drains to existing system
  - Passive emergency gas vents if active system offline

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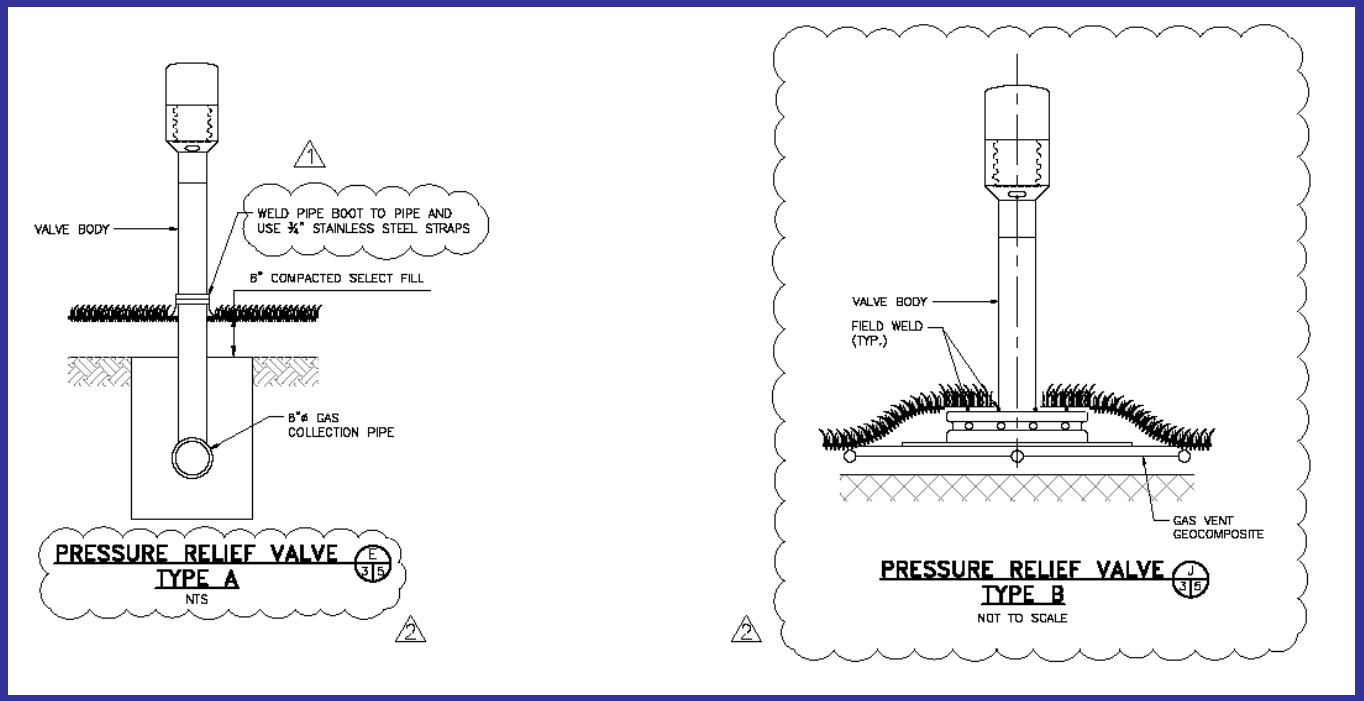
PASSIVE EMERGENCY GAS VENTS

- Based on flux rate of 0.00047 $ft^3/ft^2/min$ 6 required.
- Manufacturer recommends 1/Acre therefore minimum 16 required however using a F.S. of 1.5, 24 were provided.
- Two types, one connects directly to header, one above drain tube on slope and drain tube connects to header.



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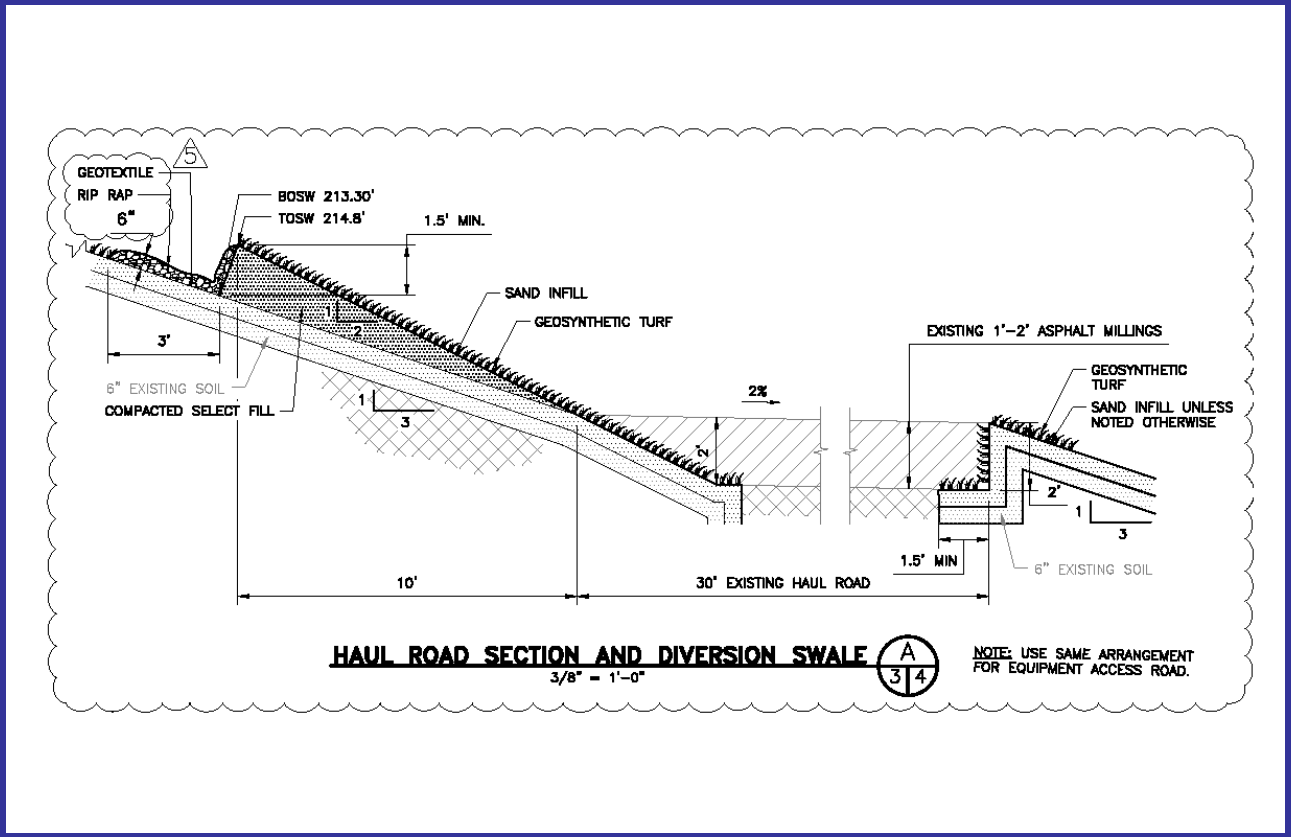
ALLOW EXISTING OPERATIONS

- **Avoid cap in haul road and equipment access road**
  - Potential settlement / penetration issues
  - Swales up slope of roads prevents washouts.



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FINAL CAPPING

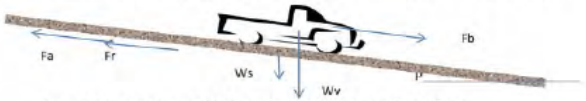
- Haul Road 8 % Max
- Can drive maintenance vehicles up to 10 % slope

CALCULATIONS:

Bench vehicle slide potential

From interface friction testing by WGS

	Fric. Ang. ϕ	Adhesion c	
Foundation soil vs. SGN (spiked) Res. friction angle =	44.0	118.3	
Ballast sand vs. Engineered turf Res. friction angle =	36.0	1.0	
"Grass" GT vs. SGN stud (from CTL) Res.friction angle =	**33.0**	**32.0**	**<=Use**



Assume a tire contact area of **83.3 sq.in** for this calculation (eq. to 120 psi)
Assume a bench fill depth of **1.0 inches** and material weight of **110 pcf**.
Assume maximum bench slope at 10%

Driving Forces:

Ws = Weight of Roadway = 83.3 sq.in/**144** x 0.5/12 x 110 pcf = 5 lbs
Wv = Vehicle Tire Load = 10,000 lbs (dual wheel rear axle)
Fb = static friction force on the turf product (assumed as the lowest friction angle)
Assuming dead stop time is 2 sec, a = $\Delta v/t$ = 15 MPH / 2 sec = 11 ft/sec^2
Vehicle tire load mass, m = 10000/g = 311 slugs
Fb = ma =Vehicle Braking force = 3,416 lbs

Resisting Forces:

Fr = Frictional Force = (Wv + Ws) X cosβ X tanϕ_{min}
Fa = Adhesion force = Bench width X Bench length X C_{min} (neglect c)

Driving Force	Static (Ws +Wv)sinβ	Dynamic Static + Fb
	996	4,412
Fr =	6,465	6,465
FS = Resisting Forces/Driving forces		
=	6.5	1.5
	Okay	Okay

CONCLUSION:

The engineered turf based final cover system will resist sliding forces on benches from vehicle travel from the friction resistance alone. This calculation considered the worse case scenario of local fire district water tender vehicles traveling on the topdeck roadways. The occurence of heavy fire equipmment travel will be only in times of local fire events hence rare.

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SOURCE: ClosureTurf Design Manual Jan 2018

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END USE

- Typical solar array on closed MSW LF
- Possible expansion of existing solar array when fully capped

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CONCLUSION

- **Use of geosynthetic cap suitable for this applications since:**
  - **Limited areas available for traditional capping**
  - **Existing infrastructure can be utilized for gas/ storm water control**
  - **Fairly rapid installation can reduce leachate generation**
  - **Cost savings**
  - **Allows final end use of solar panels in future**

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? QUESTIONS?

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