

Preserving Your Airspace

Let's talk about compaction....

FLORIDIAN PSC

- Airspace as an asset
 - How compaction effect your costs
- Airspace effects on site life
- Daily cover and impacts to site life
- Value of monitoring compaction

Compaction and the modern landfill

FLORIDIAN PSC

- Tipping Fee cost per ton
 - \$25 to \$50
- Compaction rate
 - 750 to 1,500 PPCY
- So the question is....
 - What is your airspace worth???

Airspace as an Asset

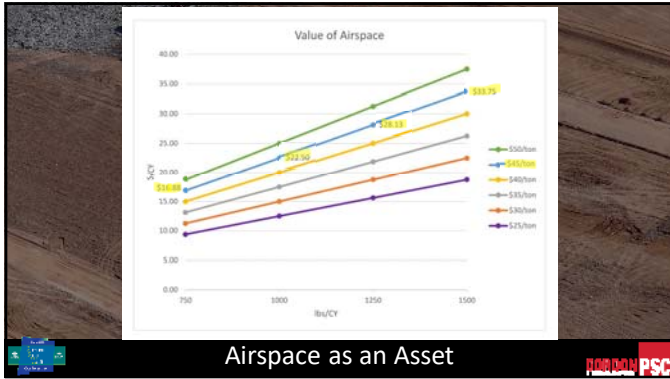
FLORIDIAN PSC

Value of Airspace

Compaction Rate (lbs/CY)	\$25/ton	\$30/ton	\$35/ton	\$40/ton	\$45/ton	\$50/ton
750	10	12	14	16	18	20
1000	12	15	18	21	24	27
1250	14	18	22	26	30	34
1500	16	21	26	31	36	41

Airspace as an Asset

FLORIDIAN PSC



Airspace as an Asset



• How compaction affects your bottom line

Airspace as an Asset

- Landfill #1 (tipping fee \$45 per ton)
- Daily Rate: 50 tons per day, 6 days/week
- Annual tonnage
 - 15,600 tons/year
- Density at 750 PPCY
 - 41,600 CY/year

How compaction effects your costs

- Landfill #1 (tipping fee \$45 per ton)
- Daily Rate: 50 tons per day, 6 days/week
- Annual tonnage
 - 15,600 tons/year
- Density at 750 PPCY
 - 41,600 CY/year
- Increase compaction by 250 PPCY to 1000 PPCY
 - Decreases consumption to 31,200 CY/year
 - Saves ~10,400 CY of airspace
 - 10,500 CY at \$22.50/CY
- Saves ~ \$234,000/year

How compaction effects your costs



- Landfill #2 (tipping fee \$45 per ton)
- Daily Rate: 150 tons per day, 6 days/week
- Annual tonnage
 - 46,800 tons/year
- Density at 900 PPCY
 - 104,000 CY/year

How compaction effects your costs




- Landfill #2 (tipping fee \$45 per ton)
- Daily Rate: 150 tons per day, 6 days/week
- Annual tonnage
 - 46,800 tons/year
- Density at 900 PPCY
 - 104,000 CY/year
- Increase compaction by 250 PPCY to 1150 PPCY
 - Decreases consumption to 81,400 CY/year
- Saves ~22,600 CY of airspace
- 22,600 CY at \$28.13/CY
- Saves over \$635,738/year

How compaction effects your costs




- Landfill #3 (tipping fee \$45 per ton)
- Daily Rate: 300 tons per day, 6 days/week
- Annual tonnage
 - 93,600 tons/year
- Density at 1,000 PPCY
 - 187,200 CY/year

How compaction effects your costs




- Landfill #3 (tipping fee \$45 per ton)
- Daily Rate: 300 tons per day, 6 days/week
- Annual tonnage
 - 93,600 tons/year
- Density at 1,000 PPCY
 - 187,200 CY/year
- Increase compaction by 250 PPCY to 1250 PPCY
 - Decreases consumption to 149,760 CY/year
- Saves ~37,440 CY of airspace
- 37,440 CY at \$29.25/CY
- Saves over \$1,095,120/year

How compaction effects your costs





- Lower compaction
 - Increases frequency of cell construction
 - Increases operations cost
 - Reduces site life
 - Hard to regain lost airspace

Airspace Effects on Site Life



- How the numbers add up (or down)
 - Small improvements have bigger impacts
- Previous examples

Airspace Effects on Site Life



- Landfill # 1
 - Increasing compaction from 750 to 1000 PPCY
 - Reduces volume consumption
 - 41,600 CY/year to 31,200 CY/year
 - Adds 1 year of life every 4 years

Airspace Effects on Site Life



- Landfill # 2
 - Increasing compaction from 900 to 1150 PPCY
 - Reduces volume consumption
 - 104,000 CY/year to 81,400 CY/year
 - Adds 1 year of life every 4.6 years

Airspace Effects on Site Life



- Landfill # 3
- Increasing compaction from 1000 to 1250 PPCY
- Reduces volume consumption
 - 187,200 CY/year to 149,760 CY/year
- Adds 1 year of life every 5 years

Airspace Effects on Site Life

Waste Placement – Dozer feeds compactors



Landfill Operations

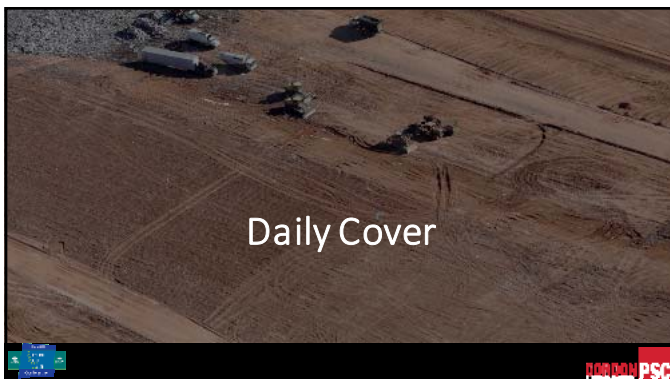
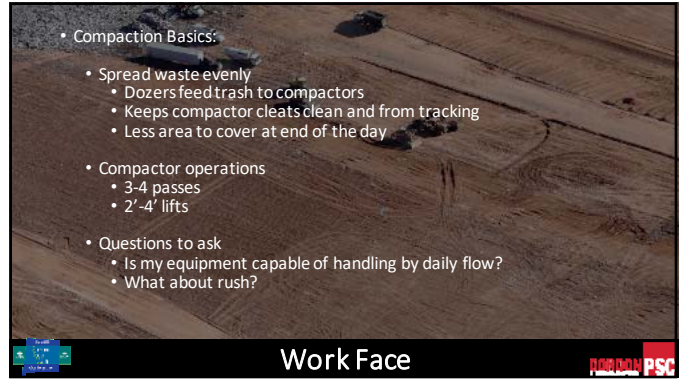


Is there anything else that can help???



- Working Face
 - Size
 - Thickness
- Daily Cover
 - Soil
 - Tarps
 - Sprayed mulch product
- Compactor Operations

YES...





- **Cover Thickness**
 - 5,000 SF work face
 - 6" of cover = 93 CY
 - 8" of cover = 125 CY
 - 10" of cover = 155 CY
- **6 days a week, 52 weeks a year**
 - 6" of cover = 29,016 CY
 - 8" of cover = 39,000 CY
 - 10" of cover = 48,360 CY
- 6" cover vs. 10" cover = 19,344 CY savings!!!

COVER THICKNESS COMPARISON




- **Soil needed for 6" cover**
 - 100 x 50 = 5,000 SF = 93 CY
 - 120 x 60 = 7,200 SF = 133 CY
 - 150 x 70 = 10,500 SF = 194 CY
- **6 days a week, 52 weeks a year**
 - 5,000 SF = 29,016 CY
 - 7,200 SF = 41,496 CY
 - 10,500 SF = 60,528 CY
- **Yearly airspace savings**
 - 5,000 vs. 7,200 = 12,480 CY
 - 5,000 vs. 10,500 = 31,512 CY

WORK FACE COMPARISON



- **Truck loads**
 - 6-inch Cover
 - 93 CY = 5 loads/day = 1,450 loads/year
 - 8-inch Cover
 - 125 CY = 6 loads/day = 1,950 loads/year
 - 10-inch Cover
 - 155 CY = 8 loads/day = 2,500 loads/year
- **2,500 loads vs. 1,450 = 1,050 extra loads/year**
 - Assume it saves 15 minutes/load
 - ~6.5 gallons/hour for 40-ton truck at \$2.25/gallon diesel
 - \$3,850 savings annually
- **Save fuel and save or repurpose time for other projects**

Cover Material Costs



- **Smaller Landfill Example**
 - 50 tpd, 6 days/week
 - 15,600 tons/year
 - 1000 PPCY
 - 10 Years remaining life
 - Tipping fee of \$45.00/ton
- **Working Face Size**
 - 5,000 SF = 93 CY
 - 7,200 SF = 133 CY
 - 10,500 SF = 194 CY
- **Smaller work face extends landfill life**
 - 7,200 SF vs 5,000 SF reduces life by 1.72 years
 - Lost Revenue \$1,207,440
 - 10,500 SF vs 5,000 SF reduces life by 3.44 years
 - Lost Revenue \$2,414,880

WORK FACE SIZE



- Each site has unique challenges
 - Cover Soil Usage
 - Rocky
 - Maybe thicker than 6"
 - Silt
 - Tough to build haul roads
 - Working Face Size
 - Filling Sequence
 - Tight spaces?
 - New Cell
 - Finishing an area

WORK FACE SIZE




- Multiple Variables
 - Volume
 - Peak volume
 - Number of machines/operators
 - Maximum wait time for unloading
 - Public(safety)

WORK FACE SIZE




- Keep flat as possible.
- Slopes are less efficient
- Slopes can require more soil
 - Up to 1/3 more soil!!!!
- Safe area to work.

WORK FACE

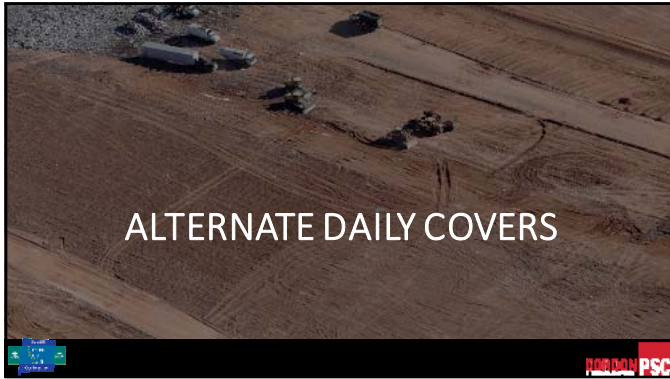



- How do you know you have 6-inches of cover??
 - "Eyeball"
 - Dig holes to check?
- Measure your work face each day.
 - Best with survey equipment
 - Measuring wheel works too!
- Calculate how much soil to haul
 - Measure area
 - Calculate how much soil is needed.
 - Determine number of trucks, and...
 - MAKE IT WORK!!!



Daily Cover ... Soil





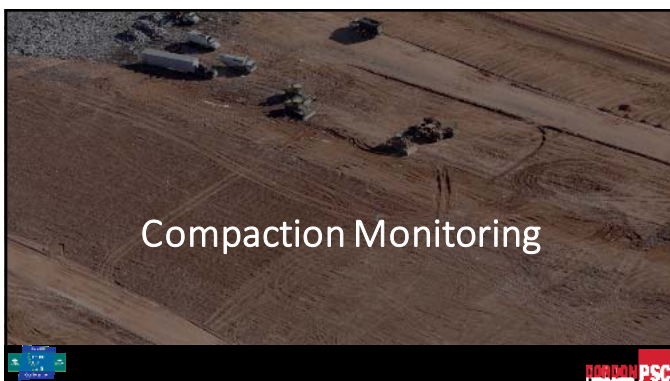
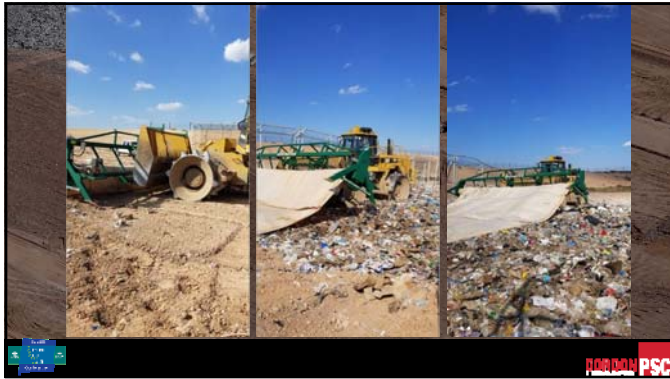


- Custom manufactured to specific sizes
- Deployed manually
 - Can be difficult
- Machine deployed
 - Bar Spreader
 - Automatic rollers
- Reduces soil cover to once per week
 - Saves \$\$\$\$

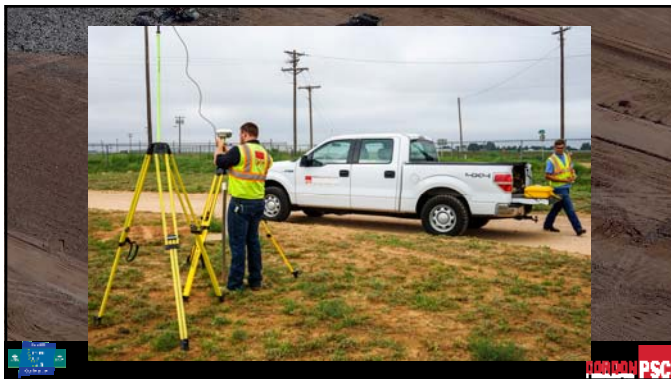


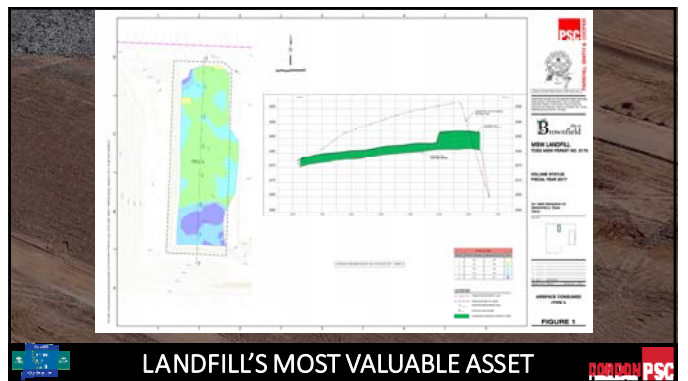
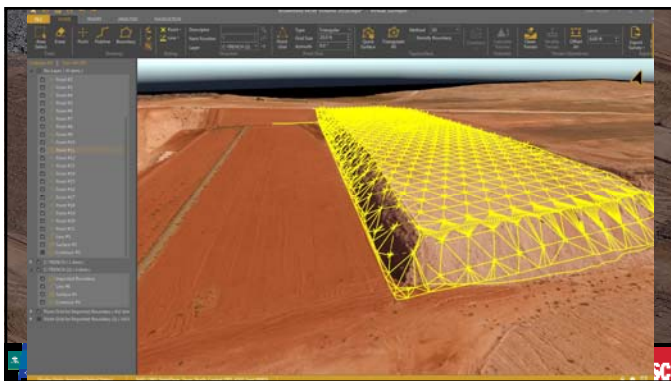
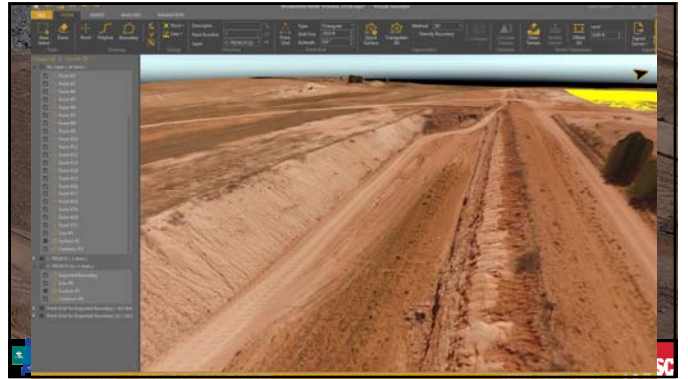
TARPS













- **How do you measure your most important asset?**
 - Ground Survey
 - Aerial Survey
 - Drone Survey
 - Field Measurements
- **How often do you measure your most important asset?**
 - Monthly, quarterly, yearly?
 - Daily?
- Daily is strongly suggested....

LANDFILL'S MOST VALUABLE ASSET 



WAIT....Did he say Daily???

LANDFILL'S MOST VALUABLE ASSET 



- **Real-time data**
 - Correct bad trends immediately, if compaction is decreasing
 - Time travel hasn't been invented.....yet
 - Can never get airspace or dirt out of the landfill
- **Feedback to operators**
 - Hard to fix something you don't know is broken
 - Provide measurable goals

Why would you measure daily??? 



- **Make it easier on haul trucks**
 - Construction of better haul roads
 - Develop better wet weather areas
- **Project future operations**
 - Ability to estimate fill progression
 - 5-10 year plans
 - Only good the day the survey was done
 - Day after, everything can change

Why would you measure daily??? 

