



IOWA CONFERENCE • OCTOBER 5–7, 2026

Space Is All You Have to Sell

Protecting landfill capacity through better daily decisions

Milton F. Knight

Iowa Conference | October 5-7

01

1



The Space you have created is a finite inventory

Net Space: Berms, final cover, daily cover, haul roads, intermediate cover, piping all are a subtraction from space you created

Private & Municipal Responsibility: To fill that inventory of Airspace with the greatest return possible.

- Cost to Build
- Cost to operate
- Yellow Iron Cost – maint./fuel/labor
- Changing Regulations – Dust, Emissions, leachate
- Monitoring Cost

The question: how much value does each cubic yard deliver?



Knight, The Value of Space | Photo: Potomac Landfill

02

2



Space goes to more than waste

03

Waste occupies space – depends upon compaction (inplace specific density of waste)

- Did you include the cover in your compaction number & inplace specific density of waste
- Density of sewage sludge vs Solid waste

Daily Operating Costs: The \$ cost of daily cover materials can eat into the difference between 'cost of creating the space' and per ton tipping fees.

- Ash can be overwhelming – how much do you receive
- Customer took wet clay material from dredging and placed in it landfill – clay caused landfill gas piping to collapse
- Fines (wallboard or gypsum) from Transfer stations can cause odour problems)
- ASR (autofluff) can affect future leachate costs of Treatment.



3



Veolia Studies Soils Impact on Compaction

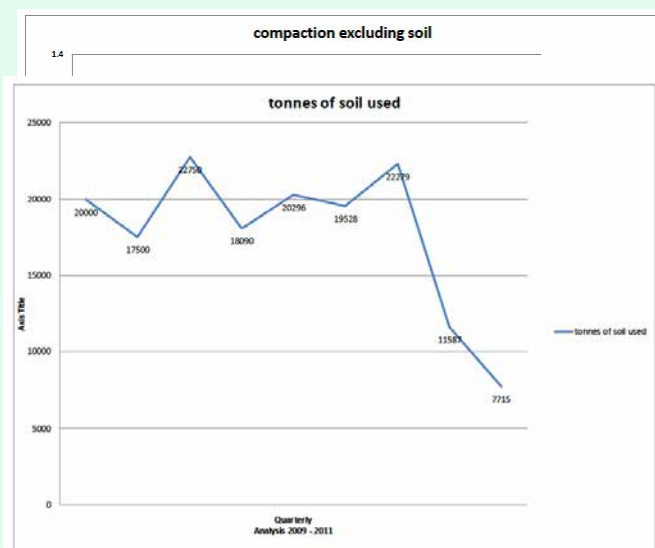
Minimization of soil – Improves Compaction:

- Veolia at Blue Haze landfill in the UK examined compaction without soil layers in between
- Response was less soil consumed

Operational costs went down:

- Payment for Labor, fuel and maintenance costs – excavator / dump vehicle / dozer went down
- Response was less soil consumed and less loads were transported

Count the capacity the Soil occupied in Cubic Yards.



04

4

Keep score with 'airspace utilization factor' & 'In Place Specific Density of Waste'

AUF = waste tons ÷ airspace consumed

$$203,875 \text{ tons} \div 345,400 \text{ yd}^3 = .590 \text{ tons/yd}^3$$

Includes 'daily cover, intermediate cover & operational errors in the calculations

IPSD = waste tons ÷ waste volume

$$203,875 \text{ tons} \div 275,400 \text{ yd}^3 = .74 \text{ tons/yd}^3$$

Includes only the weight of the waste and the space it takes up. GPS Technology helps. Good rate

Match the dates. Use consistent boundaries. Account for settlement.

Bolton, Landfill Insights, Airspace Part 5 (July 16, 2025) and NWC1

05

5



"Free dirt" still has a cost

Excavate it. Haul it. Place it.

Pay for labor, equipment and fuel.

Count the capacity it occupies .

- Working face is 110 ft x 120 ft
- Estimated Articulated Dump Vehicle loads -32 loads
- Calculating the cubic footage hauled to the working face
- Average – is 1.178 ft not 6", not even 11"



$$32 \text{ loads} \times 18 \text{ yd}^3/\text{load} = 576 \text{ yd}^3$$

$$576 \times 27 = 15,552 \text{ ft}^3$$

$$15,552 \text{ ft}^3 \div (110 \text{ ft} \times 120 \text{ ft}) = 1.178 \text{ ft}$$

Knight, The Value of Space; Bolton, Landfill Insights

06

6



Measure What It Costs to Cover Daily

- Know the Square Footage of Your Working face
- Know the thickness of the lift you are laying down
- Know the Tonnage of ASR or ASH you receive daily
- Know if you are stockpiling it by the working face or elsewhere
- Know how much your Labor, Fuel, Maintenance and allocation of equipment time it takes you to spread the cover

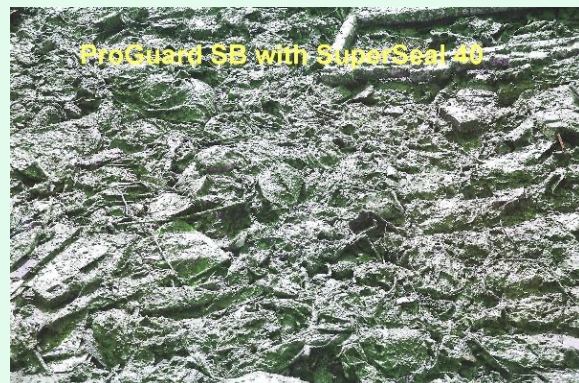
07

7



Prepare a surface that covers well

- Reduce rough pockets and large voids.
- Finish the surface consistently.
- Inspect coverage after application.



08

8



See the application at the working face



- Be Able to Reach All The Areas.
- Apply the Cover Consistently.
- Include Setup and Cleanup in the Cycle.

Sunny Farms | NWC Supplied application photograph

09

9



ADC's comes in several forms

ADC = Alternative daily cover



Film placement equip



Spray application - Foams

Suitable waste-derived materials are another site-specific option - RGC

Bolton, Landfill Insights; Knight, The Value of Space | Supplied photos

10

10



Why Would you Purchase a Machine that Does one Thing

- **CAT D8 Dozer - multiple work jobs**
- **CAT 836 Compacter – 8-10 hrs a**
- **CAT 3 Axle Articulated Trucks – 27 yds³**
- **CAT Excavator**

- Purchase price: \$600,000
- Resale value: \$100,000
- Useful life: 5,000 hrs
- Fuel burn: 5 gal/hr, diesel \$3.50/gal → \$17.50/hr
- Operator wage: \$40/hr + 25% burden → \$50/hr
- Maintenance: \$45/hr
- Ownership: \$80/hr
- Overhead: \$18/hr

D8 - \$210.50 / hr

Total: \$210.50/hr (includes all operating costs; add markup for profit).

NWCI – Catapillar Research

11

11



Why Would you Purchase a Machine, Rent a Machine or Pay for a product that Does only one Thing

- **Atmos Foam Machine**
- **EPI – Enviro Cover Tracked application Vehicle**
- **Posishell Machine (close but it has to be towed)**
 - Seeding – Daily Cover – Intermediate Cover – Long Term Cover
- **CAPS P8 or P12 Series Machine**
 - Daily, Intermediate and Long Term Covers
 - Dust & Erosion Control
 - Minimization of Storm Water intrusion / leachate with HydraGuard



NWCI – Research

12

12



SWACO: put the CAPS P12 to work all year



CAPS P12 TAV & 2,500-gallon Mixing Platform



More than just equipment that sprays daily cover

Hydroseeding and slope work
Dust and erosion control
Storm Water minimization & Penetration
Heavy-equipment cleaning

Match the system to each job

Daily Cover Workflow (mix & spray) – 1 operator
Continuous Hydroseeding - 2 operators
Continuous Dust & Erosion Control - 2 operators
Continuous HydraGuard Applic – 2 operators

Value comes from useful work performed across the site.

13

NWCI SWACO benefits summary, May 2026 | Proposed capabilities

13



SWACO: an application example



About 5 min

Time stated on the supplied image

30,000 sq ft – 35,000 sq ft

There is a flat area above the slope area

Supplied annotated image dated June 6, 2023

14

14



Operator Safety and Ergonomic Design - MP

CAPS P series Mixing Platform – 2500 gallon .

Decision factor	What to compare
Single Operator Use	Everything is in a position of convenience – if you are trying to do a continuous operation for Hydroseeding than 1 guys stays on MP platform
Cellulose Pallet Lift	Automatic lift operation – Fork lift puts pallet on lift (single operator) Mulch grinder located and debagging table – no lifting
HydraGuard Platform	Auto addition to main mixing tank via piping – totes are measured on side
Pallet of Chemical Bags	Pallet is located next to the chemical bag shelf
Loading TAV Tracked Applic Vehicle	8 min to load from MP to TAV Tank. A couple of flexible hoses and cam locks



Knight and NWCI Analysis and design

15

15



Operator Safety and Design - TAV

CAPS P series 'Tracked Application Vehicle' – 2500 gallon tank

Decision factor	What to compare
Single Operator Use	In a cab with A/C and Heat Controls – loads main tank with one person
Capable of climbing	31 deg / 60% (2:1 = 26.6 deg) and turning on 21.8 deg / 40% slope (3:1 = 18.4 deg). Lowest center of gravity of any of the tracked vehicle
Large Idler Wheels with Rubber Tracks	Easy to clean of imbedded waste and wire
Easy to Load	P8 loads in 4 min / P12 loads in 8 min
Self Cleaning	100 gallon flush tank with a PLC and selection dials
Cannon at front 8 nozzle Spray bar at rear	Can spray 110 ft off the front cannon Can spray 80 ft to 90 ft at the rear of machine



Knight and NWCI Analysis and design

16

16



Hydroseeding

Flat Slopes – Difference is negligible,
Outside Slopes (3:1 or steeper) - Savings of \$2,400 / acre

- Consider Continuous operation – **15 acres per day** (Mixing while you are spraying)
- Hydroseeding: 267 lbs seed/acre
- Broadcast seeding: 100 lbs seed/acre

COST COMPARISON AT A GLANCE

Flat / moderate slopes (≤4:1)

Hydroseeding (updated)		\$1,794
Straw seeding		\$1,664

Steep slopes (3:1 — outside landfill face)

Hydroseeding (updated)		\$1,869
Straw + ECB		\$4,403



ground preparation, pH adjustment and operating discipline make a difference

Knight & NWCI – Experience with Machine

17

17



Minimization of Rain Penetration

Cost of using HydraGuard™ vs Cost of leachate treatment – 100 acre site

- 100 acre site – generates 40" rainfall per year
- Engineering studies indicate that 25% of rainfall becomes part of leachate
- The site generates 27.2 million gallons of excess leachate due to rainfall
- Cost to apply HydraGuard - \$0.02/sq ft or \$106,893 per application
- Need to apply 3 times year



Cost Scenario	Rate per Gallon	Annual Cost
Low end – sanitary sewer access (treatment only)	\$0.03	\$814,681
Norm – standard treatment and hauling charges	\$0.15	\$4,073,404
High end – hauling + treatment with surcharges	\$0.80	\$21,724,824
Total annual leachate management cost range		\$814,681–\$21,724,824

Leachate disposal costs vary widely between sites. Where the landfill has direct sanitary sewer access, treatment costs alone are typically around \$0.03 per gallon. The normal range — sites paying standard treatment and hauling charges — is approximately \$0.15 per gallon. Where leachate must be hauled to a wastewater treatment plant and is subject to high-strength surcharges, all-in costs can reach \$0.80 per gallon or more.

Annual Leachate Cost	Annual HydraGuard Cost	Net Annual Savings
\$814,681 – \$21,724,824	\$320,680	\$494,001 – \$21,404,144

This represents an ROI of approximately 2.5-to-1 at the low end, 12.7-to-1 at standard treatment and hauling rates, and nearly 67.7-to-1 at the high end — making HydraGuard™ one of the best tools to reduce costs to landfills

Reported site case

18

18



SWACO: compare with the current ADC

75,000 ft² combined face × 312 operating days = 23,400,000 ft²

Annual cost	Posi-Shell baseline	CAPS P12 proposal
Material / product (\$0.07 sq ft)	\$1,638,000	\$782,184
Labor + fuel	\$70,493	\$47,093
Equipment + maintenance	\$50,000	\$95,375 (net of \$56,625 of credits)
Total	\$1,758,493	\$924,652

\$833,841 Projected annual reduction

NWCI projection, May 2026, Section 6 | Year 1

19

19



Tarps manual system vs CAPS P Savings

Three Rivers SWA – 35,000 to 40,000 sq ft Working face

Annual cost	Tarps (non-flammable – weighted)	CAPS P8 proposal
Material (assume life of tarp is 3-4 months)	\$72,000 - \$96,000	\$153,816 - \$188,136
Labor – 2 oper / 2 – laborers	\$82,000	\$15,600 *a
Fuel (@ \$20 per hour)	\$12,480	\$6,240
Equipment(2 - D8) maintenance	\$50,000 \$28,080	\$66,320 \$5,000
Total	\$268,560	\$246,976



*a: Labor is for 1 hour each day so that the load can be mixed, transferred and sprayed

- Frees up Dozers and Crew to do other jobs at site
- WM in Northwood, Ohio talks about time it takes to spread the tarps and secure them – 1 hour
- One platform – many jobs (odor, dust and bird control, hydroseeding, minimization of leachate)

Reported site case at WM site in Northwood, Ohio

20

20



We Give You Back – Credits

Applicable toward the purchase of Product but not rent

Description	%	CAPS P12	CAPS P8
Rent		\$12,500	\$8,500
Credit towards Product each month (for the first 6 months)	35.5%	\$4,437.50	\$3,017.50
Credit towards Product each month (for the 2 nd - 6 months)	40%	\$5,000.00	\$3,400.00
Credit towards Product each month (for each year that the purchases at the discounted rate exceed \$250,000)	45%	\$5,625.00	\$3,825.00

This includes both the TAV & MP (Tracked Applic Vehicle & Mixing Platform)

Reported site case to Three River SWA and SWACO

21

21



ASR:

The price the cost of the space, then choose the cover

- Consider a higher ASR acceptance fee if you are close to your cost to create a cubic yard of space.
- No one wants to accept waste at their cost to create the space
- Force the Market to Come up with Alternatives
- Consider the impact on Leachate
- Compact it within the waste lift.

Choose the Cover:

- **CAPS P8 TAV + 1,350-gallon Mixing Platform**
- **Cover with ProGuard SB3 or SB2.**

Retain ASR revenue; evaluate pricing, placement and cover together.

NWCI Loess Hills proposal, pp. 6–8 | Malvern, Iowa | Proposed operating change

22

22



Value of each cubic yard

BACKUP / PRESENTER REFERENCE

ILLUSTRATIVE COMPARISON	ASR	MSW
Assumed gate receipts per ton	\$25	\$55
Gross receipts per cubic yard (using AUF of .59)	\$14.75	\$32.45-AUF Adjusted gross Rev \$40.7-IPSD Adj gross Rev
Less \$15/yd ³ airspace construction basis	(\$0.25/yd ³)	\$17.45/yd ³ - AUF gross profit \$25.70/yd ³ - IPSD gross profit

\$17.70/yd³ to \$25.95/ yd³ gross revenue difference

Use this comparison to test ASR pricing; retain and compact the material.

Presenter reference | NWCI proposal, p. 6 | Assumed tonnage fees & AUF of 0.59 ton/yd³ density

23

23



Measure the hours for equipment to move & Spread

Assumed fleet: 2 D8 dozers + 2 loaders at \$690/hour combined

Annual cover cost	1 hr/day ASR/ASH	2 hr/day ASR/ASH
Current ASR placement	\$215,280	\$430,560
P8 + SB3 product mix	\$284,958	\$284,958
P8 cost difference	\$69,698	(\$145,602)
	1.32 x / day	.66 x / day



SB3 model; excludes any gain from charging more for ASR.

NWCI Loess Hills proposal, pp. 7-8 | Year 1 model | 312 operating days

24

24



Sources behind the presentation

BACKUP / PRESENTER REFERENCE

- Milton F. Knight — The Value of Space (article)
- Neal Bolton — Landfill Insights, Airspace Parts 1–5
- Neal Bolton — Process Improvement for Waste Facilities (2016)
- Neal Bolton — The Handbook of Landfill Operations, Chapter 7
- Neal Bolton — Is Fear of Change Holding Back Your Operation? (2022)
- Garth Lamb — The dirt on landfill covers, Inside Waste (2009)
- Milton F. Knight — NWC memo on ADC materials (file labeled 2012)
- Sustainable Ireland — Cutting landfill cost effectively (Article)

Full claim and image references are also included in each slide's speaker notes

25

25



QUESTIONS ?

Full claim and image references are also included in each slide's speaker notes

26

26