


The Use of Global Positioning Systems to Improve Landfill Performance

SWANA 18th Annual Landfill Symposium
March 26, 2014

John Carlton, PE, BCEE, GBB
James Stenborg, PE, GBB
David Hildreth, CEC



GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS



Established in 1980

Solid Waste Management and Technology Consultants

Helping Clients Turn Problems into Opportunities



Established in 1989

Environmental Services and Engineering

Senior Leadership, Integrated Services & Personal Business Relationships

Civil & Environmental Consultants, Inc.




GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

2



SWANA
SOLID WASTE ASSOCIATION
of North America

IT'S ROCKET SCIENCE



GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

3

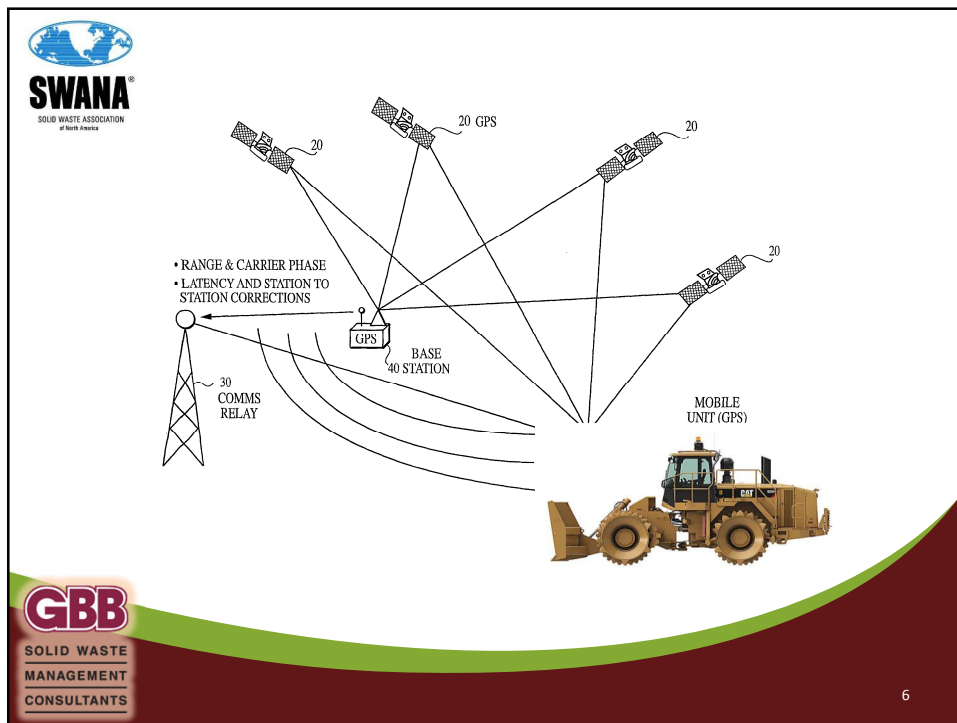
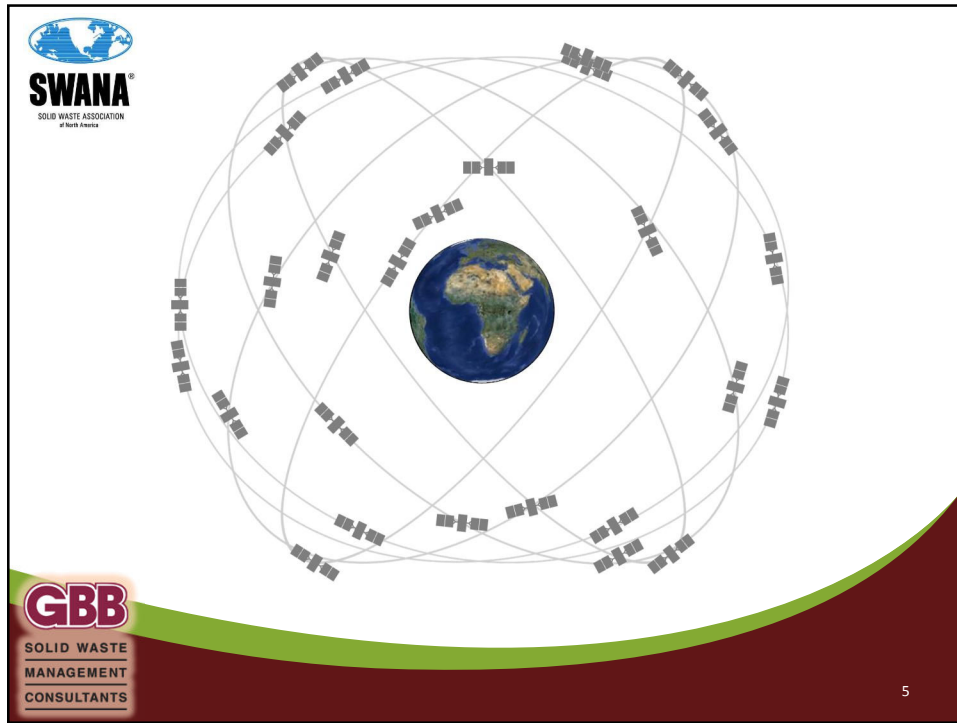


SWANA
SOLID WASTE ASSOCIATION
of North America



GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

4





NAVSTAR
US
Airforce

GLONASS
Russian
Military

GALILEO
European
Union





7



**WHAT ARE THE
POTENTIAL
BENEFITS?**





8





Operator Feedback	• Real-time waste compaction monitoring
Compaction	• Increased waste density and uniformity
Less Fuel	• Improved fuel efficiency and productivity
Compliance	• Monitor final grades to maintain compliance
Construction	• Used for liner and final cover construction
Record Keeping	• Records locations of special waste
Less Surveying	• Reduced need for professional services
Less Soil	• Reduction in soil cover quantity

9




GPS SYSTEMS


10




Caterpillar CAES System




AMW Waste Master



Geologic Computer Systems, Inc.

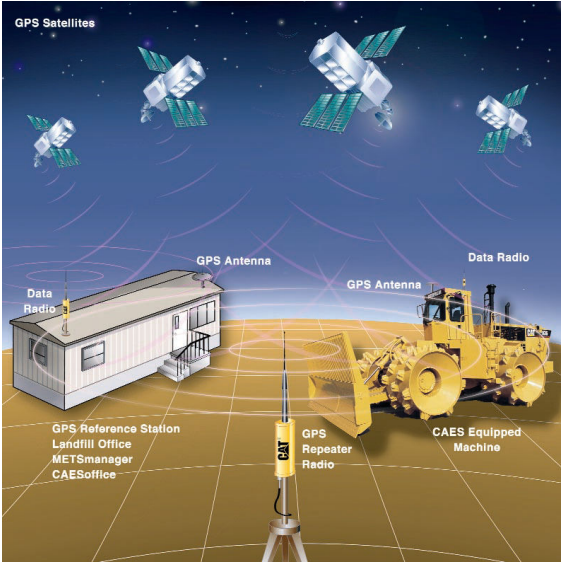



GeoShack



GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

11



GPS Satellites

Data Radio


GPS Antenna

Data Radio

GPS Reference Station
Landfill Office
METSmanger
CAESoffice

GPS Repeater Radio

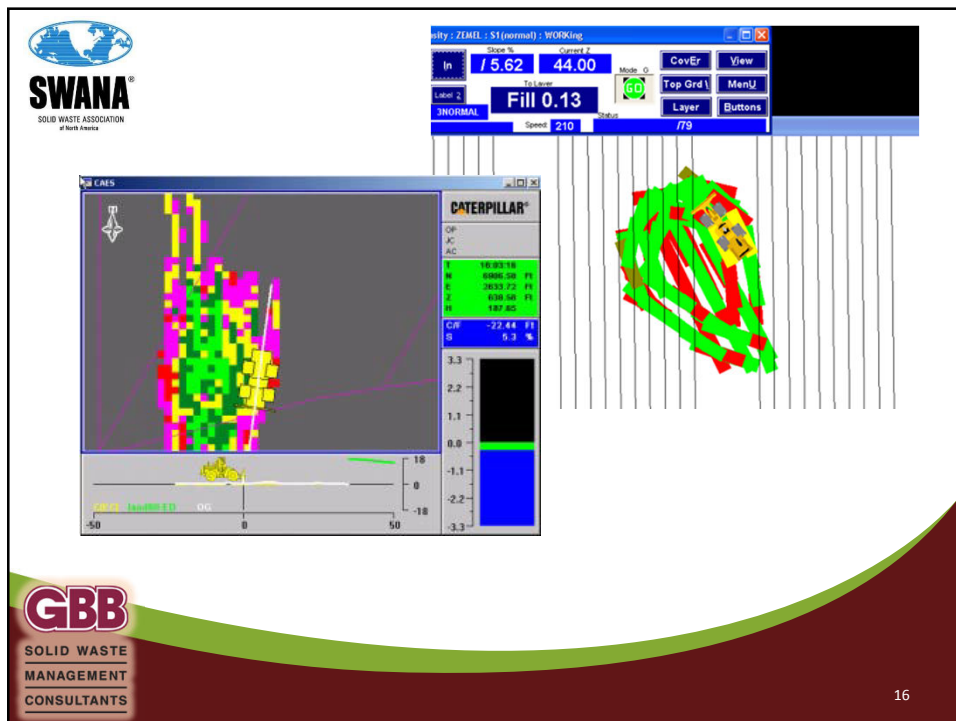
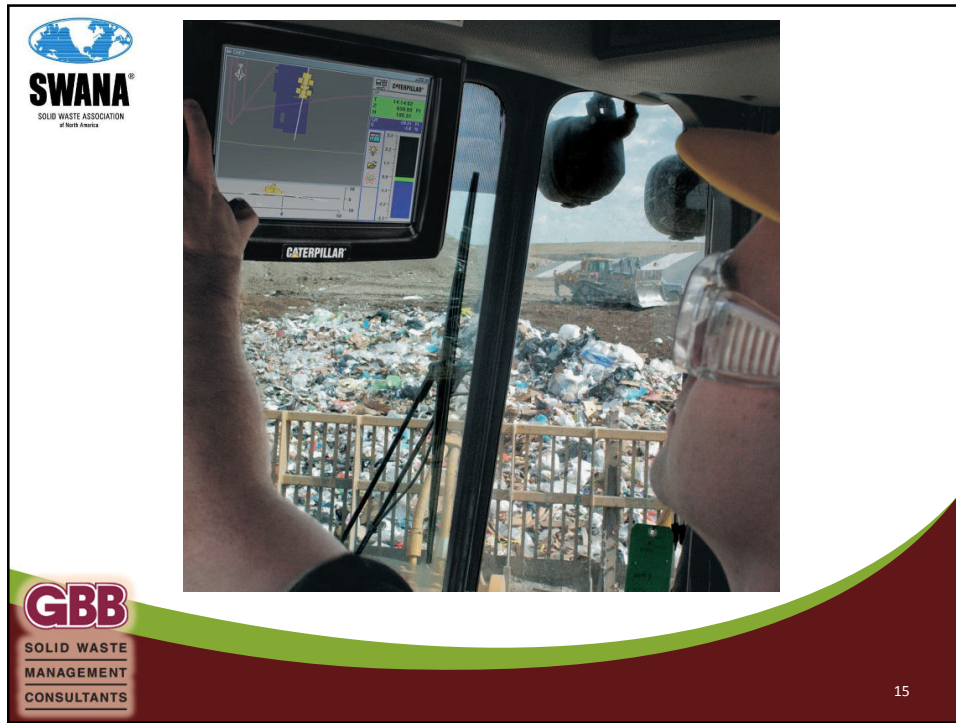
CAES Equipped Machine



GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

12



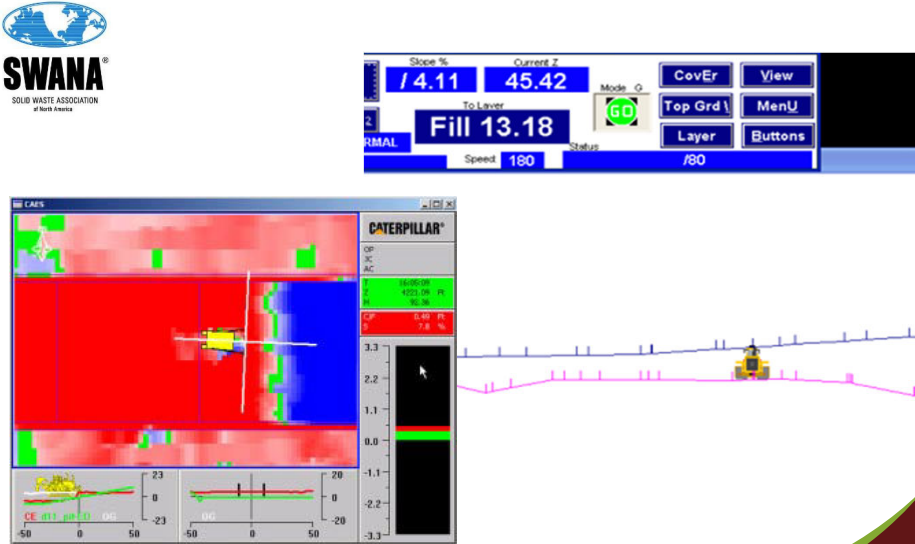




SWANA
SOLID WASTE ASSOCIATION
of North America

GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

17




SWANA
SOLID WASTE ASSOCIATION
of North America

Slope %	Current Z	CovEr	View
14.11	45.42	Top Grd \	MenU
Fill 13.18	Mode G	Layer	Buttons
Speed 180	Status	80	

CATERPILLAR


CE 013 010 010 010

18




SWANA
SOLID WASTE ASSOCIATION
of North America

CASE STUDIES




GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

19



SWANA
SOLID WASTE ASSOCIATION
of North America




**CHESTER COUNTY
SOLID WASTE
AUTHORITY**

Lanchester
Landfill, Honey
Brook PA

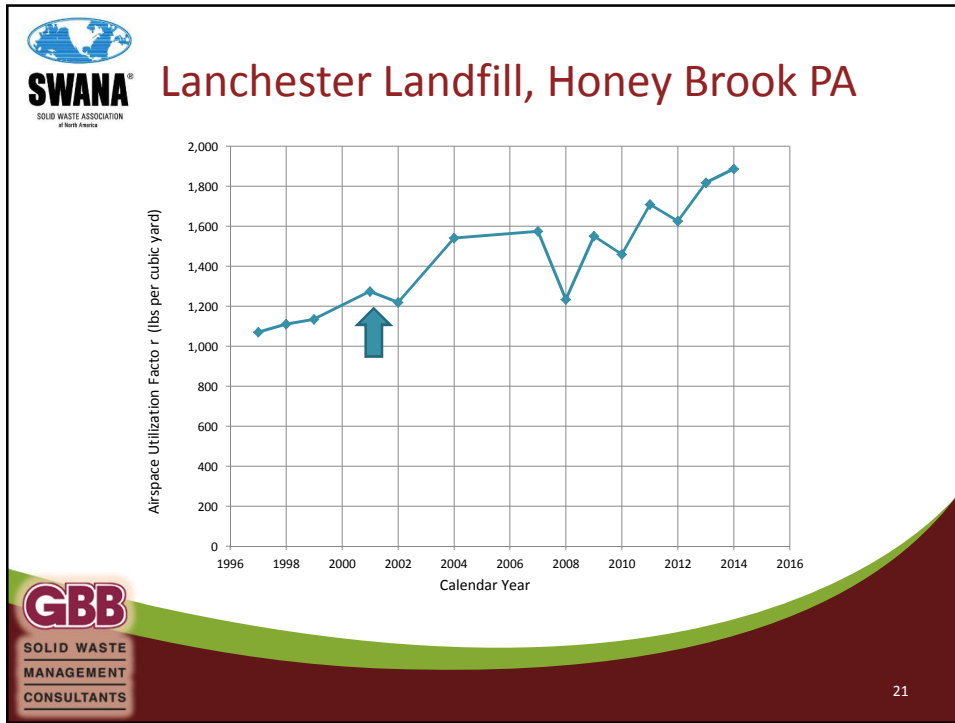
- 1,100 tpd
- CAT CAES System (2001)
- CAT 836 Compactor
- Improved compaction
- Reduced survey costs
- Reduced cover
- Increased machine productivity
- Reduced fuel usage
- Better slope management

Thanks to Bob Watts of Chester
County Solid Waste Authority



GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

20



SWANA
SOLID WASTE ASSOCIATION
of North America

Development Authority
of the North
Country

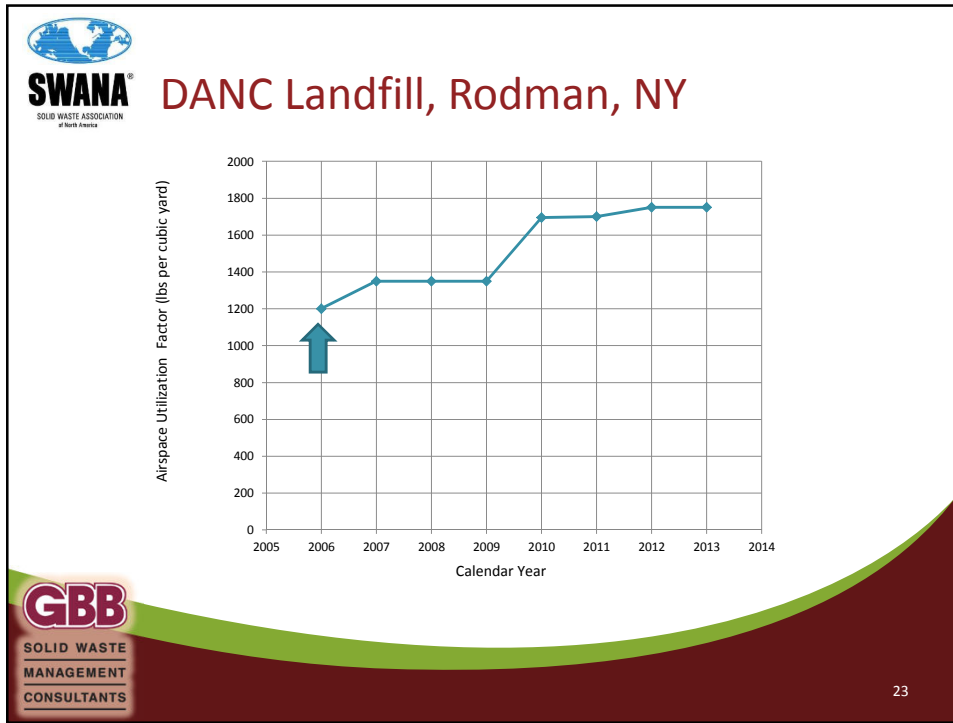
DANC Landfill, Rodman, NY

- 770 tpd
- GeoLogic Computer Systems (2006)
- CAT 836 Compactor
- Improved compaction
- Spot surveys
- Reduced fuel usage
- Good tool for outer slopes
- Seeking to connect GPS and GIS

Thanks to Steve McElwain of DANC

GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

22



23

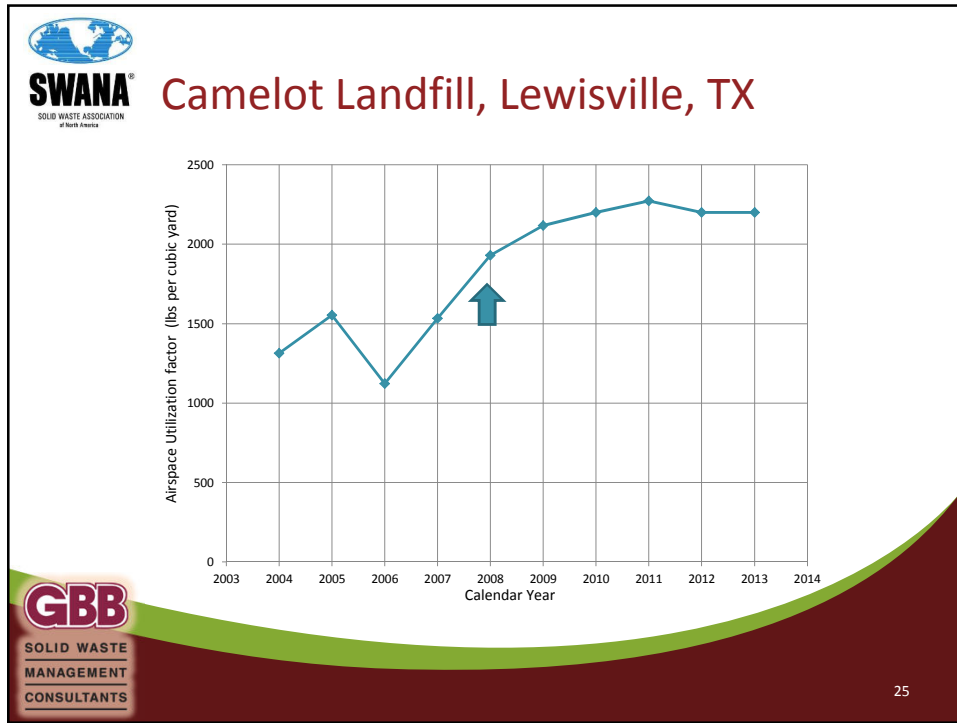
REPUBLIC SERVICES

Camelot Landfill,
Lewisville,
Texas

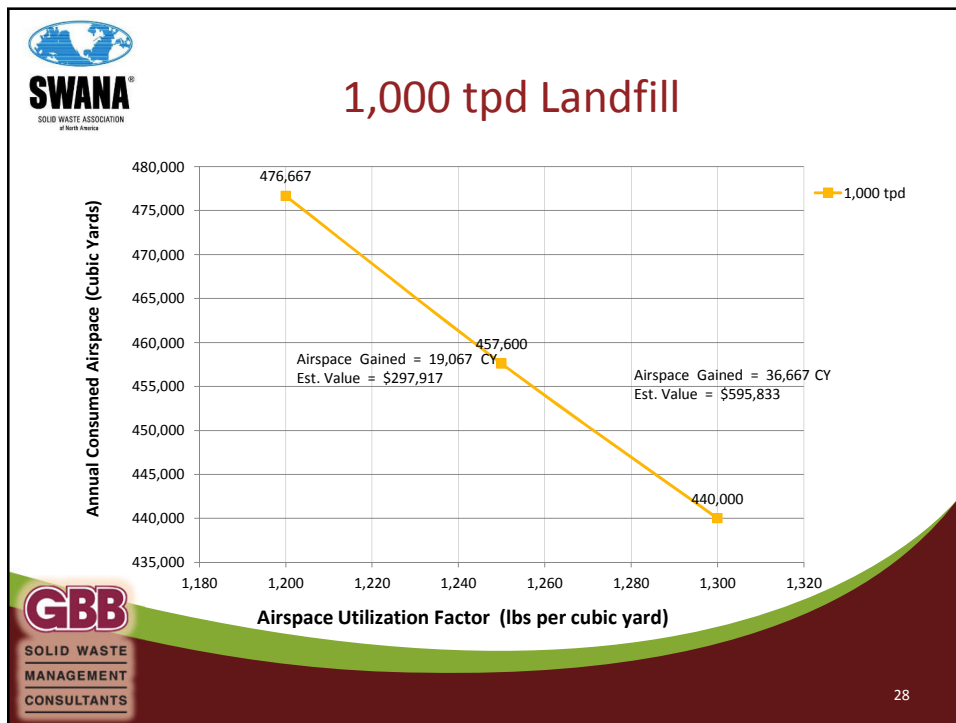
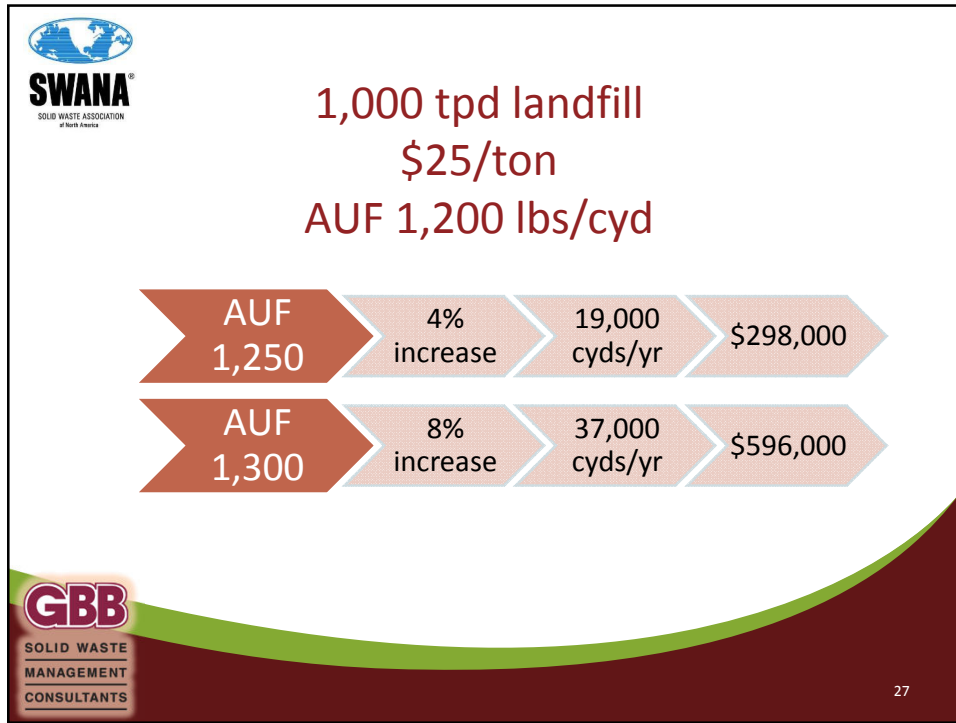
- 1,300 tpd
- Topcon with Terramodel Software (2008)
- CAT 836 Compactors
- Improved compaction
- Reduced survey costs
- Reduced cover
- Reduced fuel usage
- Increased machine productivity
- Better slope management
- Occasional software problems

Thanks to Kate Van Sanford of Republic Services, Inc.

24



AIRSPACE = \$



SWANA
SOLID WASTE ASSOCIATION
of North America

IT'S NOT ALL

GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

29

SWANA
SOLID WASTE ASSOCIATION
of North America

Cost	<ul style="list-style-type: none">• Expect \$100,000 + capital and additional O&M
Vendor Support	<ul style="list-style-type: none">• Choose vendors who will provide training and support
Personnel Acceptance	<ul style="list-style-type: none">• Dogs and new tricks
Things will go wrong	<ul style="list-style-type: none">• Software, hardware, bad data

GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

30



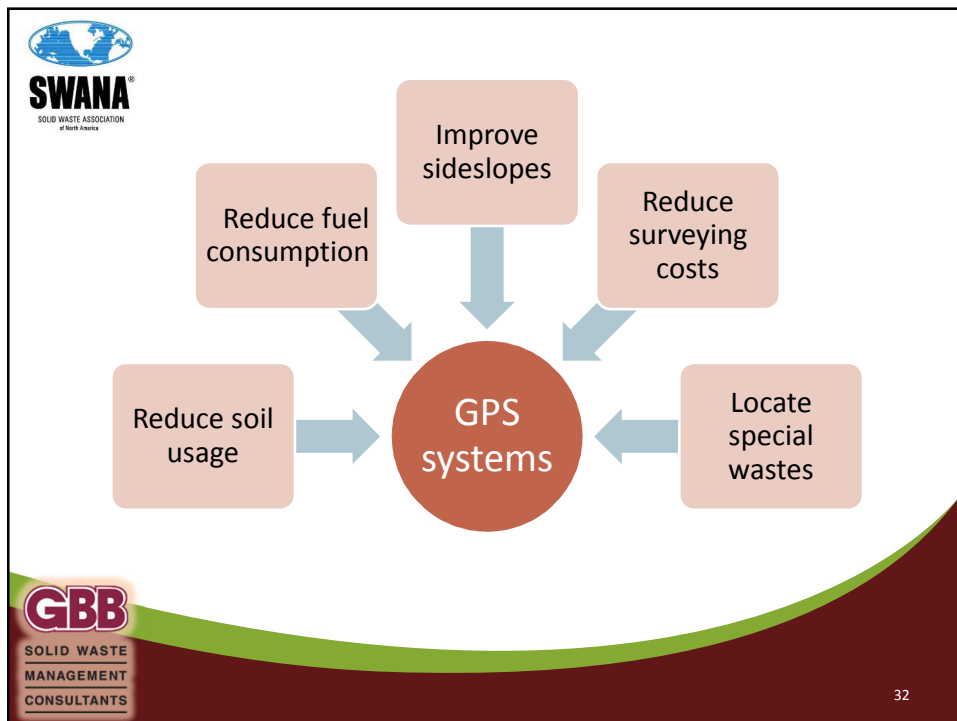
SWANA
SOLID WASTE ASSOCIATION
of North America


CONCLUSIONS



GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

31






SWANA
SOLID WASTE ASSOCIATION
of North America


Evidence from 3 case studies supports that GPS can improve landfill compaction

- Compaction improvements can be significant
- Even small compaction improvements bring large \$ gains



GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS


33



SWANA
SOLID WASTE ASSOCIATION
of North America

Manage the GPS Systems

- Choose a responsive vendor
- Train operators
- Update hardware and software as necessary
- Add repeaters as needed



GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

34



Thank you!!
Questions and comments?

John G. Carlton, P.E., BCEE
Senior Vice President, GBB
908-319-5992
jcarlton@gbbinc.com

Jim Stenborg, P.E.
Senior Project Engineer, GBB
703-663-2097
jstenborg@gbbinc.com

David Hildreth
Senior Project Manager, CEC
855-365-2324
dhildreth@cecinc.com



35