
The Future is Here – New Technologies on the Cutting Edge and Industry Perspectives
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Environmental Business Council of New England
Energy Environment Economy

Introduction

David Murphy

Conference Chair

Chair, EBC Solid Waste Management Committee

Vice President, Tighe & Bond
Massachusetts Materials Management Capacity Study Findings

John Culbertson
Principal
MSW Consultants

Environmental Business Council of New England
Energy Environment Economy
Massachusetts Materials Management Capacity Study: Findings

Presented to:
Environmental Business Council of New England

April 29, 2019

Objectives

• Compile current annual “materials management” capacity data

• Identify qualitative trends for how this capacity is likely to change in the coming decade

• Identify disposal capacity trends in the states that currently receive waste from Massachusetts

• Provide information about the costs to transport waste materials from within Massachusetts to more distant facilities
Targeted Facility Types

<table>
<thead>
<tr>
<th>Category</th>
<th>Type</th>
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</thead>
<tbody>
<tr>
<td>Disposal</td>
<td>Landfill</td>
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<tr>
<td></td>
<td>Waste to Energy (WTE)</td>
</tr>
<tr>
<td>Transfer</td>
<td>Transfer &amp; Handling</td>
</tr>
<tr>
<td>Processing</td>
<td>Material Recovery Facility (MRF)</td>
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<tr>
<td></td>
<td>C&amp;D Processor</td>
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<tr>
<td></td>
<td>Compost</td>
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<td>Anaerobic Digestion</td>
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<td>Animal Feed Operation</td>
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<tr>
<td>Reuse</td>
<td>Food Rescue Operation</td>
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<td>Textiles &amp; Household Goods</td>
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<tr>
<td></td>
<td>Building Materials &amp; Household Furnishings</td>
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<tr>
<td></td>
<td>Institutional/Commercial Furniture &amp; Equipment</td>
</tr>
</tbody>
</table>

Excluded Facility Types

- Computer & electronic appliance remanufacturers
- Motor vehicle parts (used)
- Tire retreaders
- Pallet remanufacturing and reuse
- Materials exchange services (virtual marketplaces)
- Retail used merchandise sales including:
  - Surplus stores
  - Used book dealers
  - Used household appliance stores
  - Secondhand sporting goods stores
  - Specialized secondhand stores
  - Flea markets
  - Antique stores
Geographic Coverage

- **In-State**: All facilities in Massachusetts

- **Out-of-State**
  - All disposal, transfer, or processing facilities within 30 miles of the Massachusetts border
  - All disposal facilities receiving ≥5,000 tons of Massachusetts waste, regardless of distance
  - No reuse operations

Primary Geographic Boundary

- District boundary within 30 miles of the Massachusetts border

Research Overview

<table>
<thead>
<tr>
<th>1,137 facilities identified</th>
<th>867 tonnage data points collected</th>
<th>Over 100 source files compiled</th>
</tr>
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<tbody>
<tr>
<td>Over 120 organizations contacted directly (representing more than 225 facilities)</td>
<td>8 state regulatory agencies interviewed</td>
<td></td>
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</tbody>
</table>

In-State Solid Waste Capacity
Massachusetts Tons Managed

- Total Tons Managed: 7.39 million in Massachusetts
- Wast-to-Energy: 44.02%
- Landfill: 17.07%
- Transfer & Handling: 15.86%
- MRF: 8.51%
- C&D Processing: 8.86%
- Compost: 5.41%
- Reuse Organization: 0.38%
- Animal Feed: 0.18%
- Anaerobic Digestion: 1.50%

Note: The Town of Bourne Landfill is projected to be capable of an increase in MSW capacity after its ash disposal contract with Covanta SEMASS expires in Dec. 2021.

Massachusetts Projected Landfill Capacity

- Year: 2017 - 2027
- Projected Capacity (million tons): 0.0 - 1.4
Facilities identified within 30 miles of Massachusetts, or accepting ≥ 5,000 tons

1.65 million tons of solid waste exported from Massachusetts

10.4% of tons received at these facilities originates from Massachusetts

Export Market Summary

Landfill Capacity Projections
(at Importing Landfills)
Out-of-State Disposal Trends

Conclusions

- Disposal is increasingly reliant on export markets
- C&D processing can absorb another 1.3 millions tons
- There is meaningful capacity for source separated recoverable materials
- Reuse sector has minimal impact by tonnage (but higher value)
Projections

- Exported disposal tonnage will continue to increase
- Source separation will be necessary to capitalize on Massachusetts solid waste capacity
- The above bullets point to higher costs for materials management in Massachusetts

Site Assessment

- Facility usage
  - Employees
  - Customers
  - Third Parties
- Recycling program containers and signage
- Custodial arrangements
Full Waste Audit

Performance Measures

Disposed Waste

Recyclables

Organics
Capture Rates: Example

Questions

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jculbertson@mswconsultants.com

Resources
www.mass.gov/guides/massachusetts-recycling-markets-update
Industry Perspective on Municipal Recycling Contract Changes

Bob Cappadona

Vice President

Casella Recycling, LLC
EBC 6th Annual “Talking Trash”

Bob Cappadona, Vice President
April 29, 2019
Casella Company Overview:

- Founded in 1975 with a single truck
- Approximately 2,100 employees serving over 200,000 customers and 500,000 households across the Northeast
- Traded on NASDAQ as CWST
- Over $660M in annual revenue
- Operations in MA, ME, NH, NY, PA, and VT
- Vertically integrated collection, transfer, disposal and recycling operations
- Provide professional resource management services to major businesses and industry throughout North America
- Recover over 700,000 tons of recycling and over 400,000 tons of organics for beneficial use each year = More than 1 million tons per year of recyclables and organics
The Casella Recycling Arm

- 17 Recycling Operations
- 6 Single Stream Recycling Operations
- Merchant plants, Operating Contracts, Industrial Processing
- Process and market over 800,000 tons/year
- Auburn, MA MRF – 90,000 tons/year
- Boston, MA MRF – 6th largest in the U.S. (230,000 tons processed in 2017)
Chinese Government initiative to reduce imports of dirty material and reduce pollution.

Contamination – items that do not belong in the Curbside Recycling Stream.

Most notably banned – Mix Paper (40% of curbside recycling stream).

Baled Paper and Plastic cannot contain more than .05% contaminants.
The Dilemma

- 13.2 millions tons per year of Recyclables diverted from China to smaller export markets (India, Korea, Indonesia).
- Shift in economics – Supply and Demand
- “Quality rippling impact” globally
Impacts to the MRF

- Manufacturing Operations
- Added Labor
- Processing design per ton/hour (or slower).
- Capacity issues
- MRF retrofits
- Focus on Quality
- Dealing with Contamination
Myth: Recycling Should Be Free

There’s often an assumption that recycling should be free, however the same number of steps are involved for both trash and recycling!

**TRUTH:** Whether trash or recycling, there are still costs involved to collect, transport and process the materials. Though the market value of recyclables has had historical cycles when these costs were covered, this is no longer true.
How Have Contracts Been Impacted?

- Simplification of Acceptable list
- Commodities have very little value – since 2017 a loss of 65% of the total stream
- Cost of recycling has increased – quality restrictions, added labor, technology
- Contamination Charges – average plant contamination 25%
Commodity Changes

- Example:
  - 2017 - mixed paper sold for $100/ton
  - 2019 - mixed paper sells for $4/ton
- Glass Bottle recycling market "disappears"
- Revenue from commodities no longer offsets cost to sort/bale/sell materials
- Direct result of turmoil in global marketplace
Contamination in the Stream

• Creates downtime and safety concerns
• “Unacceptables” will get through the system
• 25% contamination to produce 0.5% finished good
Back to Basics... What’s Acceptable?
Universal Lists – MassDEP RecycleSmart

**CARDBOARD/PAPER**
- Corrugated Cardboard (Wavy center layer)
- Boxboard (Dry-food boxes, egg cartons, & rolls)
- Junk Mail, Periodicals, & Office Paper (Paper bags, envelopes, & catalogs)

**PLASTIC**
- Plastic Bottles, Jugs, Tubs, & Lids (Empty kitchen, laundry, & bath containers)

**METAL**
- Aluminum & Steel Cans (Foil & empty food & beverage cans)

**GLASS**
- Glass Bottles & Jars (Empty food & beverage bottles & jars)
Casella Perspective – The Good News!

• Consumers still want to Recycle!
• Recycling volumes are still strong!
• Domestic Paper Mill Infrastructure being built!
• Equipment upgrades will be considered.
• We will Recycle Smarter and Better.
• Cleaner Recycling Stream to produce a improved quality.
Together!

Teamwork
To learn more, please visit:

casella.com
Solid Waste’s Long Haul Transportation Solution: the Railroads

Mike Clements

Vice President, Marketing & Strategic Planning
Pan Am Railways
Who we are
Who we are

• Based in North Billerica, MA
• 1700 Route Miles
• Operate in 6 states and New Brunswick
• 2 major yards
• Extensive repair facilities
• 100 locomotives
• 2000 railcars
• 750 employees
Pan Am Railways History

1981-84 – Guilford Transportation Industries acquires MEC, B&M

1984-2006 – Guilford Rail System operates as New England’s Largest Rail Network

2006 – Guilford Rail System becomes Pan Am Railways

2009 – Pan Am Southern JV with Norfolk Southern
Pan Am’s Class 1 Connections
Divisions of Pan Am Systems

- Pan Am Railways
- Perma Treat
- Pan Am Services
- Pan Am Brands
Pan Am Markets: The Past
Pan Am Markets: The Past

- Coal
  - Mt. Tom, MA
  - Bow, NH
- Paper & Pulp
  - 25 paper mills to 8
  - Uncertain future
Pan Am Markets: The Future

1. Food (via intermodal)

2. Fuel

3. Waste / Recycling
Current Pan Am Waste Traffic
Current Pan Am Waste Traffic

- Contaminated Soil
- C&D
- Scrap Metal
- TDF
- Scrap Paper
2019 The year of MSW by Rail

• The Landfill Crunch is here

• Cogen burn plants at full capacity

• Trucking not economic for long hauls

• Rail can be the solution
Best Practices

- Containerized or Carload?
- Baled or Covered in railcar, or both?
- Direct Loading Site or Transload Facility?
Our Preferred Option
Our Preferred Option

• Simplified permitting

• Smaller footprint

• Pop-Up Operation is Possible

• Pan Am is an owner of TTX - we can get cars!
We Are Here to Serve
Southbridge – A Town in Transition

Andrew Pelletier

Director, Board of Health
Town of Southbridge, MA
A TOWN IN TRANSITION
THE GOOD
DING DONG THE WITCH IS DEAD

NEW ATTITUDE/POTENTIAL FOR NEW DEVELOPMENT
NEW BOH OPPORTUNITY

- Childhood lead poisoning prevention
- Air quality
- Beneficial programs
- Blighted properties
- Housing quality
- State mandates
- Recreational waters
- Communicable diseases
- Preventative health clinics
- Complaints
- Environmental impact review
- Waste and water
- Substance abuse
- Tobacco cessation
- Food protection
- Support from other boards
- Local regulation review/updates
- Emergency preparedness
- Public health nuisances
- Zoogenic diseases
- Animal control
- Preventative programs
THE UGLY
COMMUNICATION

PREVIOUSLY THE GOOD

RECENTLY: THE Ugly
ENTER THE:

DUN DUN DUN
Turning MSW into Biomass Pellets, Recyclable Materials, and Diesel Fuel

Keith Van Scotter

US Development and Operations
Sustane Technologies, Inc.

Environmental Business Council of New England
Energy Environment Economy
Leading the world to **Zero Landfilled Waste**

Environmental Business Council
Talking Trash April 2019
Unsustainable  Unaffordable  Sustainable + Affordable
About Sustane

- Nova Scotia company that has developed and is now deploying disruptive technologies that deliver near complete separation and recycling of municipal solid waste (MSW).

- Technology is proven. European origins and full scale facility in Nova Scotia is currently in testing and start-up. Start-up is proceeding well and fully operating by June, 2019.

- Nova Scotia Department of Environment recognized the Sustane process as recycling/diversion.

- Strong support and endorsement from Canadian Provincial and Federal Governments.

- Sustane owns, operates in exchange for secure MSW supply at fee less than current gate/tipping fee:
  - Easily scalable to 1,000 tons per day and beyond
  - Delivers MSW diversion levels around 90%
  - Flexibility in feedstock – can also consume organics and recyclables (existing single of multi-stream systems)
  - Flexibility in offtake - Biomass to fuel pellets, gasification or agricultural (assuming organics in)
  - Extraordinary greenhouse gas attributes

- Significant pipeline of projects globally.
Near complete separation is a game changer

- NOT incineration
- NOT gasification
- Process makes clean fuel products and recyclable materials
- Processes are low impact, thermo-mechanical in nature (relatively low temperatures and pressures)

MSW – After curbside recycling
(also prefer organics separation)

- ~ 10%
- ~ 50%
- ~ 20%
- ~ 5%
- ~ 15%

Glass/inorganic
(Aggregate)

Clean Biomass Pellets
(fuel)

Synthetic Diesel
(fuel)

Metals
(to recycling)

Water
The breakthrough... Separation → Purity → VALUE

Sustane’s clean biomass and diesel

- Clean biomass fuel
- High efficiency combustion (> 2x)
- High value

Previous best biomass fuel from MSW

- Dirty fuel
- Low efficiency combustion
- Low value
Dear Mr. Vinall:

Thank you for your email of December 7, 2015, regarding Sustane Technologies Inc. and your system for producing fuel pellets from components of the mixed municipal solid waste stream.

Nova Scotia Environment considers that the proposed technology for separating and recovering biomass from mixed municipal solid waste is distinct from incineration and is a beneficial use of wastes that would otherwise be landfilled. This is consistent with the commonly accepted waste hierarchy, where recovery is a preferred option to landfilling.

The resulting biomass fuel pellets along with other recyclable materials would be considered a recovered product derived from the waste stream and eligible for inclusion in the diversion credits program. Please note that payment of the credit is to the municipality that generated the waste materials and not to the processor.
GHG lifecycle analysis  (Chester, NS at full capacity)

**Lifecycle Greenhouse Gas - Net Impact** (70,000 tonne/yr MSW, Sustane vs Landfilling)

- Net annual CO2e reduction: 185,651 tonnes/year
- CO2e reduction:
  - Sustane fuels replace fossil fuels: 62,073 tonnes/year
  - Recycling of materials: 27,060 tonnes/year
  - Elimination of landfilling (CH4): 103,713 tonnes/year
  - Plant energy consumption: 7,039 tonnes/year
  - Plant construction: 155 tonnes/year

Equivalent cars permanently removed from roadways = 41,256
Chester commercial facility

- 70,000 tonne per year capacity
- MSW supply secured (20 years+)
- Broke ground Q2 2017, start-up Q2 2019
- Equipment procurement and installation complete
- 25 Employees (many higher skills)
- Energy self-sufficient (25% of plastic derived diesel)
- Pellet offtake signed
- Diesel offtake secured
Majority of Process Stages in Operation!  
...Full Operation within Weeks

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<th>Operated</th>
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<td>22</td>
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</table>
Chester commercialization project
Equipment (3)
Equipment (4)
Equipment (5)
Advanced Waste Processing – The time is now!

Craig Stuart-Paul

Chief Executive
Fiberight
Advanced Waste Processing

We Can.
Advanced Waste Processing – The time is now!

- Why we need a new solution
- Fiberight’s Hampden Plant – MBT designed for the US
- Building on the platform
- What does the future hold?
Significant value creation must be realized from the non-recyclable fraction of MSW for waste processing to compete with US Landfill.
2nd Generation MBT

Second Generation MBT - Europe

Mechanical Treatment

Material Recycling Facility "MRF"

Food & Paper

Analytical Digestion

Biological Processing

Shredding, Pelletizing or Wrapping

Outputs

Bio-Gas (Electricity or Pipeline)

Low-Value Compost

Refuse Derived Fuel (Disposal Cost)

Recyclable Metals

Recyclable Plastics

Residue (Disposal Cost)

Screening & Sorting

Upgrading

Outputs
A fully integrated “end-to-end” solution

Delivering refined products from MSW
Our Process

MSW

Pre-Sort

- > 16"
- 9" - 16"
- 2" - 9"
- < 2"

Film Plastic
- OCC
- Residues

Traditional Recovery

Pulping & Washing

Organics
- 3D
- 2D

Fines Processing

Aggregates
- 3D

Plastics

Processing

PET
- HDPE
- Metals
- Market Pulp
- Solid Plastic Fuel
- Biogas
- Aggregates

OCC Bales
Commercialization
The Future - Organics Refining

Food Waste → Screening → Solubulization → VOC's

Soluble Organics → Biogas Production

PHS Fuel → Biochemicals
The Future - Cellulose Refining

Clean Cellulose

Fractionation

Long Fibers

Refining

Cellulose Nano Fibers

Enzymatic Hydrolysis

PHS

Biofuels & Biochemicals

Digester gas

Energy

Market Pulp
The Plan

Fiberight’s 3-Year Optimization Plan

2018
- Core Fiberight Process

2019
- Core Process Optimization
- Hydrolysis & Plastics Bolt-Ons

2020
- Automation of Manual Sorting
- Hydrolysis & Plastics Bolt-Ons

2021
- Higher Value Products

Tip Fees (net)

Value Creation [$/Ton MSW]
How is the landscape changing?

- Massachusetts disposal is in a state of disruption
- Recycling markets are in a state of disruption
- Long-Haul freight options are in a state of disruption
- New options are emerging – we don’t yet know all the details and impacts
- Innovation is needed!

_Market conditions and political pressures are causing a shift in sustainable waste disposal and recycling solutions. The result of this shake-up may be a better solution than the current status-quo._
Thank You!

We Can.
Panel Discussion

Moderator: David Murphy, Tighe & Bond

Panelists:
- Bob Cappadona, Casella Recycling LLC
- Mike Clements, Pan Am Railways
- Andrew Pelletier, Town of Southbridge, MA
- Craig Stuart-Paul, Fiberight
- Keith Van Scotter, Sustane Technologies, Inc.