

HDR

Organics: things that were once alive (food, paper, yard waste)

ORGANICS DIVERSION





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Diversion

02 Key Drivers – Why Consider a
Program

03 Residential Organics Programs

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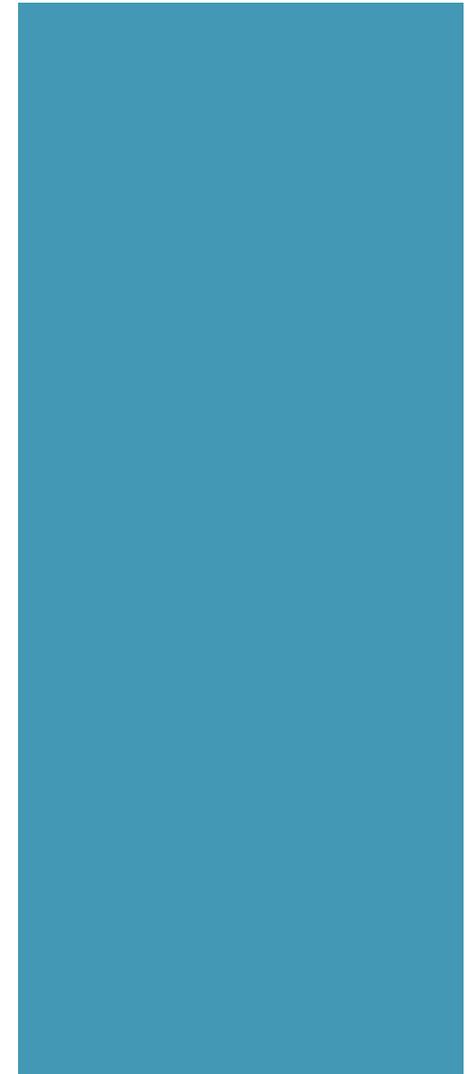


GENERAL STATUS OF ORGANICS DIVERSION

GENERAL STATUS

- European Union (EU)
 - Common practice reflecting directive that organics cannot be disposed in landfill
 - Over 200 operating Anaerobic Digester (AD) plants at commercial scale, majority using organic fraction of Municipal Solid Waste (MSW) as feedstock
 - AD supported by EU directives PLUS renewable energy interests

- Canada – Growing since late 1990's
 - 2.64 million tons composted annually as of 2008
 - Large metropolitan areas with programs – incl. Toronto, Montreal, Vancouver
 - In Ontario, 80% of large municipalities have curbside food waste diversion, serving over 9 million residents, 2.4 million homes
 - Most materials are composted (aerobic processing), more AD facilities are being developed



GENERAL STATUS

- U.S. is in early 'growth' part of the curve
- 36 million tons of food waste generated/year (2012)
- less than 1 million tons composted 2009 (2%) – less than 2 million tons composted 2012 (5%)
- As of 2012 150 curbside food organics programs, across 16 states, majority in California, Washington, Minnesota
- Large metropolitan areas with residential programs – incl. San Francisco, Seattle
- Large metropolitan areas considering programs – incl. NYC, Boston, Baltimore.....
- State initiatives: Massachusetts, Vermont, Connecticut



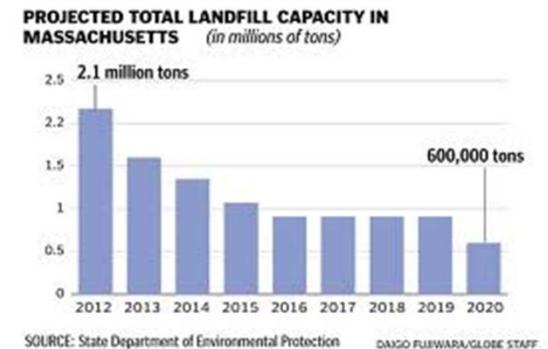


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**KEY DRIVERS – WHY
CONSIDER A
PROGRAM?**

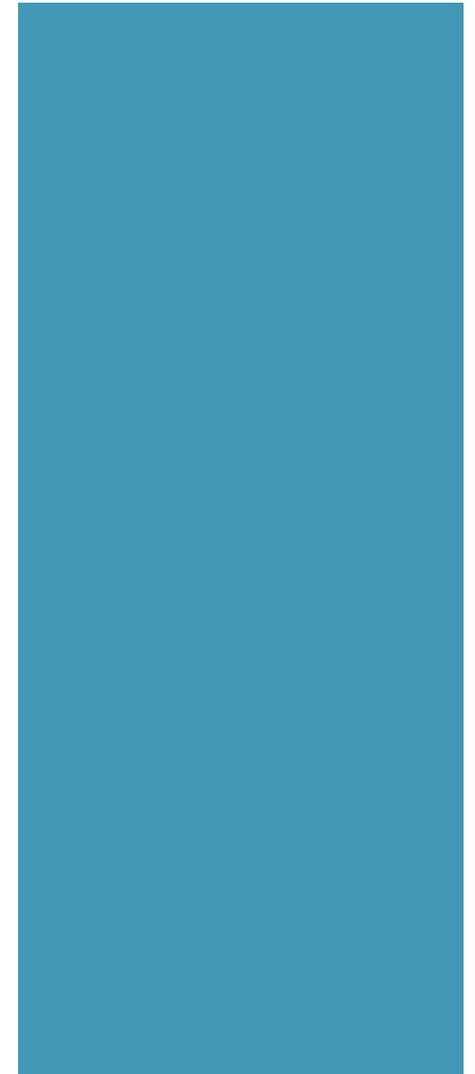
KEY DRIVER – DISPOSAL

- Per capita waste generation rates increasing from 3.66 lbs/capita/day 1980 to 4.43 lbs/capita/day 2010
- 54% of total MSW is currently disposed (2010), 135 million tons per annum
- Depending on the state/region long-term availability of capacity may be an issue (Maine, Massachusetts, New Jersey, Georgia, Florida etc.)
- Improved landfill practices and recycling extend landfill life
- Major service providers own fewer but larger landfills:
 - Waste Management: reported average landfill life of 28 years (2006)
 - Allied Waste Industries: reported average landfill life of 50 years (2006)
 - Republic Services: reported average landfill life of 27 years (2006)
- Cost for landfill disposal around Orange County is low \$28 to \$60/ton
- Around 30 years of NC landfill capacity remains



KEY DRIVER – FOOD WASTE QUANTITY AND QUALITY

- 34 million tons per annum 'available' across US
- Has 3X methane production potential of biosolids
- Some portions more energy rich than others (fats, oils, greases)
- Residential generators: municipalities have ability to gather and direct 'steady' stream of food residuals to processing
- Commercial generators: large scale generators in the food and beverage industry, smaller scale 'local' generators (e.g. breweries)
- Institutional generators: hospitals, educational institutions etc.
- Quality varies depending on WHERE materials generated and HOW materials are diverted/collected
- Quantity varies depending on how EASY the program is to use



KEY DRIVER – ORGANICS BANS / REGULATORY REQUIREMENTS

- States and local jurisdictions are taking an increasing role in regulating/requiring organics diversion
- States/jurisdictions with bans/regulations/ordinances in effect:
 - Massachusetts: ban commercial food waste, large generators (1 ton or more per week) as of July 1, 2014
 - Connecticut: ban commercial food from landfill 2011 (generators of 2 tons or more per week)
 - Vermont: escalating ban, large generators in 2012, all food by 2020
 - Seattle: mandatory food scrap composting – 2009
 - Honolulu: commercial food waste ban - 1997
 - San Francisco
 - Portland
- Jurisdictions in planning stages:
 - New York, New York City



KEY DRIVER – DIVERSION & RECYCLING TARGETS / INCENTIVES

- Diversion/recycling targets:
 - Florida, California: 75% recycling by 2020
 - Massachusetts: 80% waste reduction by 2050
 - NYC: 75% diversion from landfill by 2030

- Orange County: solid waste reduction goal of 61% per capita – currently at 63%

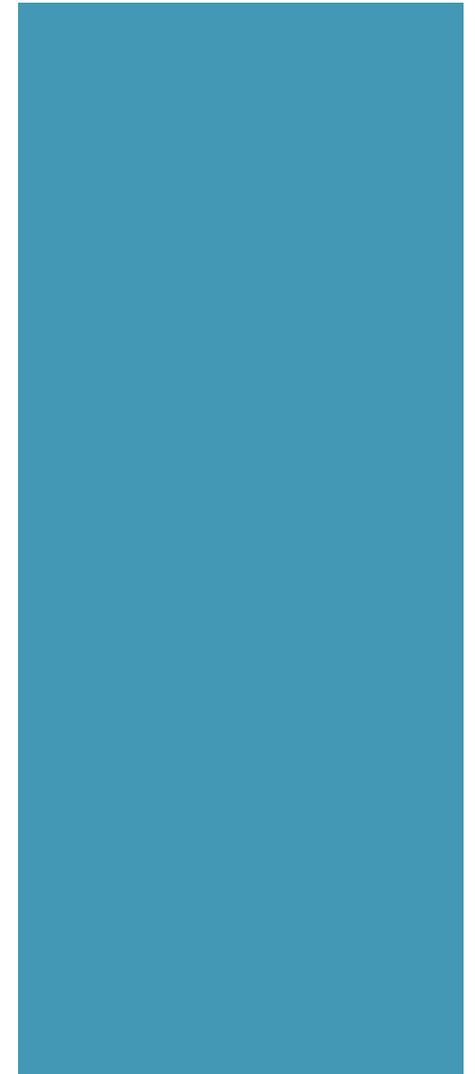
- Incentives:
 - Rural Energy for America Program (REAP) grants of up to ¼ of project cost and loan guarantees of up to \$25 M – intended to increase use of AD to 1,300 farms by 2020



KEY DRIVER – RENEWABLE FUELS

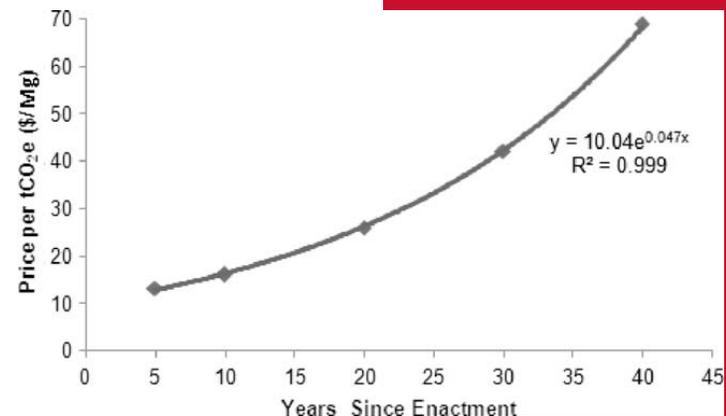
- Clean energy regulations:
 - Renewable fuel standard (RFS2) and Low Carbon Fuel Standard (LCFS)
 - Biogas Investment Tax act, 30% investment tax credit (ITC) for qualifying biogas technologies
 - Production Tax Credit for biogas projects generating electricity
 - If 50% of food waste generated annually went to AD could satisfy electricity needs of 2.5 million homes per annum
 - California: Assembly Bill (AB) 1900 – defines biomethane as a renewable fuel, authorizes California Energy Commission to establish certification process for biogas energy content and purity

- Continued growth in renewable energy consumption is predicted by many authorities



KEY DRIVER – CARBON AND CLIMATE CHANGE

- Clean Development Mechanism in the Kyoto protocols allow emission-reduction projects to earn carbon credits
- Avoided emissions due to composting are accepted
- No system is yet in effect in the U.S. – debate on cap-and-trade versus carbon tax
- US EPA has performed an economic analysis of ACES (American Clean Energy and Security Act) and made predictions regarding future carbon allowances
- Implementation of ACES is estimated to create an incentive for food waste diversion of \$7/Mg initially to over \$11/Mg in ten years



Regression of EPA predictions of carbon allowance prices based on IGEM model



03

RESIDENTIAL ORGANICS PROGRAMS

RESIDENTIAL ORGANICS COLLECTION IN CANADA

- Started on the east coast (Maritimes) in early 1990's, due to bans on disposal of organics in landfill
- Primarily large automated carts, combining yard and food waste
- Diversion progress stagnated at between 45 and 50%, organics capture < 60%
- Began in Ontario in late 1990's, with combined yard and food waste collection
- Started in BC in the 2000's
- Programs have evolved to separate food and yard materials, and some include expanded organics (pet waste, sanitary paper and diapers)
- Majority curbside – rarely have depots



RESIDENTIAL ORGANICS COLLECTION: PROGRAM VARIATIONS

- Type of organics ranges: yard waste, food waste, compostable paper fiber, pet waste, diapers, sanitary products
- Size of curbside container: 12 gallons to 50 gallons
- Type of kitchen container: aerated/non-aerated
- Allow/not allow liners: film plastic or compostable bags
- Year-round weekly collection, sometimes less frequent collection in winter months
- Automated or manual collection
- Co-collection: picking up organics in a split truck with other materials (garbage or recycling)
- Restrict garbage quantities or pick up every other week



ONTARIO ORGANICS PERFORMANCE 2013

Municipality (all over 500,000 pop)	2013 Diversion Rate	Garbage Collection Frequency	Key Elements of Organic Program	Lbs/capita/year organics diverted	Contamination Rate
Durham Region	54%	Every other week	Weekly Green Bin: food, paper fibre Separate yard waste	181 total, 95 food	5%
Halton Region	55%	Every other week	Weekly Green Bin: food, paper fibre Separate yard waste	249 total, 121 food	NA
City of Hamilton	48%	Weekly	Weekly Green Bin: food, paper fibre, yard waste largely collected with Green Bin	203 total, 128 food	4%
City of Ottawa	47%	Every other week	Weekly Green Bin: food, paper fibre, yard waste. Does not allow compostable bags	201 total	2%
Peel Region	44%	Weekly	Weekly Green Bin: food, paper fibre Separate yard waste	137 total, 51 food	1%
City of Toronto	53%	Every other week	Weekly Green Bin: food, diapers, pet waste, paper fibre, Separate yard waste, allows plastic bags	194 total, 108 food+	20 to 25%
York Region	59%	Every other week	Weekly Green Bin: food, diapers, pet waste, paper fibre, Separate yard waste	223 total, 145 food+	17% +

RESIDENTIAL ORGANICS COLLECTION: PERFORMANCE

- Organics capture rates:
 - Up to 95% yard waste
 - Up to 65% food
 - Up to 40% compostable fiber
 - Up to 40% pet waste & diapers
- Highest food capture rates with programs that:
 - collect weekly organics separate from yard waste
 - collect garbage every other week
 - provide curbside cart and in-home container
 - allow compostable bags



RESIDENTIAL ORGANICS COLLECTION - ISSUES

- Participation rates level off at 70%+
- Organics still remain in waste stream
- Difficult to implement in multi-family locations
- To control collection costs: can co-collect materials and/or move to every other week garbage pick-up
- Some communities considering processing of mixed waste to extract organics fraction





04 **ORGANICS
PROCESSING -
TECHNOLOGIES**

FUNDAMENTALS

Organics Processing

- Match technology with type of organic stream
- Match energy and organic products to available markets
- Consider integration with existing system
 - co-processing with agricultural materials
 - co-processing with commercial organics
 - co-processing at waste water treatment plants
- Location – balance between proximity to markets and receptors (odor, traffic)





Dry Fermentation Anaerobic Digestion

Photo courtesy of Zero Waste Energy Corp.



Open Window Composting



Covered Composting

Photo courtesy of Gore

**ORGANICS
PROGRAM DESIGN
DRY PROCESSING
(AEROBIC,
ANAEROBIC)**



Phased solids: Clean World, Sacramento CA



High solids: Urbaser, Madrid, Spain

**ORGANICS
PROGRAM DESIGN
WET AD
PROCESSING**



High Rate: Gills Onions, Oxnard CA

TECHNOLOGY SELECTION

Key Issues

- Feedstock quality/contaminant level
- Potential for odors and odor management
- Area/site size requirements
- Utilities: power, water usage and wastewater
- Potential permitting issues
- Proven operations on similar feedstock
- Ancillary cost: Chemicals, effluent
- Maintenance, staffing, fuel, water, power requirements
- By-product compatibility



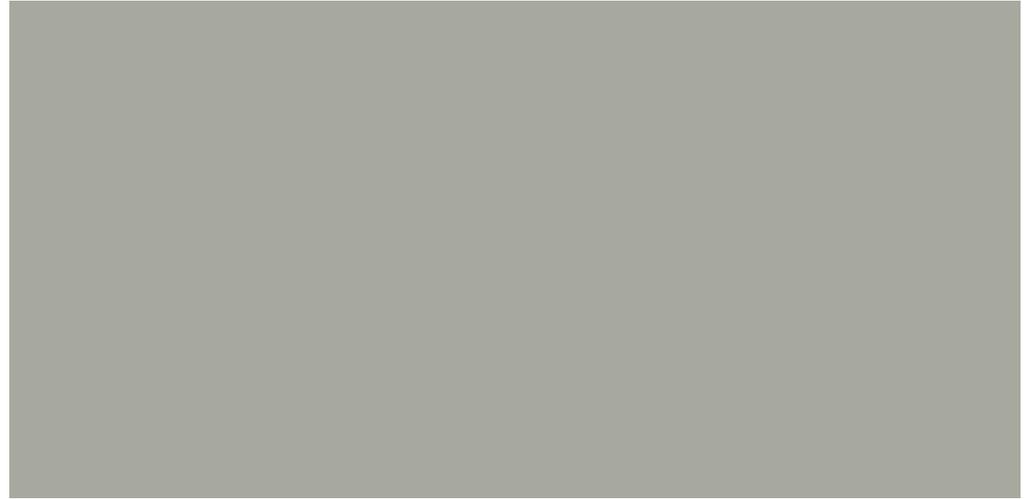
COSTS

- Capital: up to \$600 per annual ton of capacity
- Operating:
 - Aerobic processing: \$60 to \$120 per ton (can be lower depending on local factors)
 - Anaerobic Digestion: \$90 to \$150 per ton
- Range varies due to economies of scale, extent of odor control requirements, preprocessing requirements
- Offsets for carbon credits, low carbon fuel, etc. can reduce cost



REVENUES

- Products and revenues:
 - Compost
 - Fertilizer (liquid, pellets)
 - Composted digestate
- Tipping Fees:
 - Currently range from \$30 to \$50 per ton
 - Consider proximity to generator and potential savings in haul vs landfill when setting fee
- Power Purchase:
 - “buy all / sell all”, “surplus sale”, “net metering”



IMPLEMENTATION

Lessons Learned to date

- Feedstock quality is key
- Siting
- Match technology to attributes of organic stream
- Odors, odors, odors.....
- Take the time to develop an appropriate plan



Dry Fermentation Anaerobic Digestion

Photo courtesy of Zero Waste Energy Corp.



05

**ORGANICS DIVERSION
IN ORANGE COUNTY**

CURRENT PROGRAMS - COLLECTION

- Split jurisdiction for waste services
- County responsible for SS recycling collection (soon to all SF households), 95 gallon carts
- Towns responsible for weekly cart collection of garbage and yard waste collection
- More difficult to get to most efficient system for food waste collection
- Options:
 - Town SF garbage/SSO co-collection
 - County SF recyclable/SSO co-collection (some or all of County)
 - Logistics for drop-off, material transfer



CURRENT PROGRAMS - LANDFILL

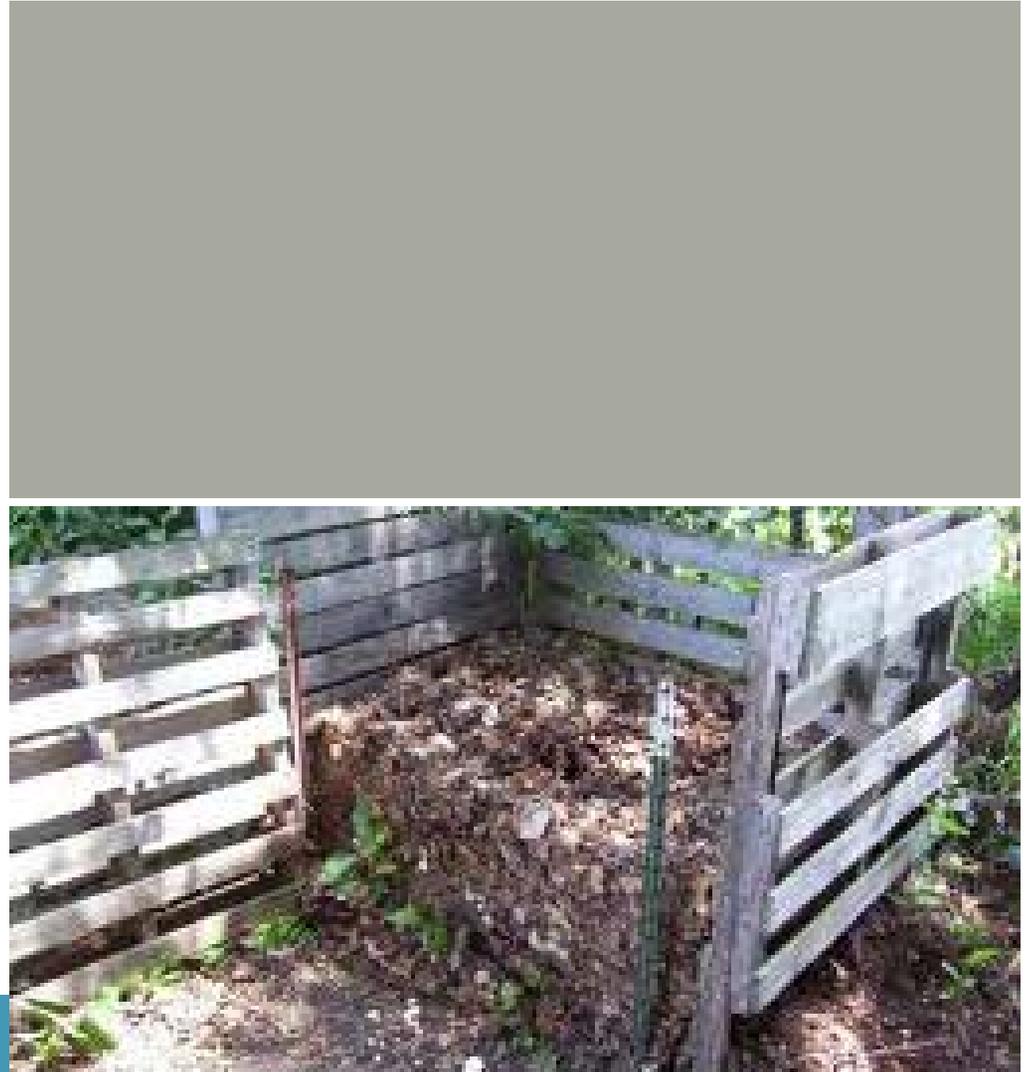
- Disposed (buried) in County (6,317 tpy 14-15), out of County (63,121 tpy 14-15)
- In-County 'landfill' primarily a waste recovery facility, 11,500 tpy recycled 14-15
- MSW disposed: 56% Residential, 44% Non-residential
- Landfill tip fees - \$40 for C&D and \$18 for yard waste Orange County, ranges up to \$60 out of County (avg. \$40/ton)
- Potential organics driver: availability/pricing of future out of County landfill capacity

CURRENT PROGRAMS – DROP OFF PROGRAMS

- 5 staffed solid waste & recycling sites – one with food waste collection
- 5 un-staffed 24 hour drop off locations
- 445,221 visitors per annum, averages just over 10 visits per household per year
- Diversion through drop off (5,219 tons 14-15), diversion through County curbside programs (7,509 tons 14-15)

CURRENT ORGANICS PROGRAMS - COUNTY

- 9,724 tons of yard waste, clean wood, oyster shells diverted at County landfill
- 1,622 tons of commercial food waste collected from 39 collection sites / 45 separate establishments, 3x per week
- Sells backyard compost bins & provides composting support
- Includes food waste collection from schools
- Residential food waste drop-off at Walnut Grove, 5 tons in 2014/2015
- Also provides food waste collection services for public and private special events



CURRENT ORGANICS PROGRAMS - OTHER

- Chapel Hill
 - leaf and yard waste collection
 - grease corral for commercial generators, grease privately collected
- Hillsborough
 - leaf and yard waste collection
- Carrboro
 - leaf and yard waste collection
- Leaf re-use diverted 2,039 tpy 14-15
- Food waste diversion by Chapel Hill Carrboro Public Schools, primary and middle schools, 127 tons 14-15
- UNC yard waste grinding and food waste collection diverted 2,297 tons 14-15

CURRENT ORGANICS PROCESSING

- County mulches yard waste, not permitted to process food waste or large amounts of leaves
- Brooks Contractor composts collected commercial materials at their facility
- Other Type III and IV operating compost facilities in the area:
 - McGill Environmental Systems
 - Novozymes of North America

WASTE COMPOSITION: ORGANIC FRACTION IN MSW

Sector	Food Waste	Yard Waste	Portion of 'Other Paper'	Other Organics
Single Family	21%	2.6%	9.2%	17%
Multi Family	22.5%	3.9%	8.8%	17%
Commercial	25.5%	2.7%	14.5%	9%
Estimated Tons	11,400 tons	1,700 tons	5,100 tons	8,500 tons

- Based on County waste composition study 2010 and 2014-2015 tons reported
 - % of food waste and other organics has increased significantly since 1995
 - Small increase in % of yard waste
 - % of 'other paper' has decreased
 - Waste generation rate is approximately 0.6 tons/urban HHD/year
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CURRENT PROGRAMS - OBSERVATIONS

- Achieve economies of scale with current recycling system – need similar approach for economies of scale with organics
 - Any Town or County changes in collection services should be coordinated to provide greatest benefit/minimize risks
 - Implementing organics collection is compatible with PAYT (should that proceed), offers option to residents to reduce garbage
 - Every other week garbage may be a useful tool in lieu of PAYT – however has implications
 - Can be easier/faster to implement changes in collection with public collection forces (not bound by contract dates)
 - Future consideration of new Transfer Station(s) could allow for transfer of organics out of County
 - Projected population increase anticipated to increase tons of waste disposed over time
 - Current yard waste collection (collection approach, processing) not suitable for inclusion of food waste
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ORGANICS COLLECTION OPTIONS

- Residents used to carts for garbage and recycling
- Rate of use of carts for yard waste unknown, not an easy 'add' on to include food in yard waste
- Need to address collection efficiency and transfer
- Residential Options:
 - Town SF garbage/SSO co-collection
 - County SF recyclable/SSO co-collection (some or all of County)
 - Expand food drop-off locations
- Commercial Options:
 - Continue and expand current voluntary program
 - Expand school food waste diversion
 - Transition to mandatory organics diversion for large food waste generators



PROCESSING OPTIONS

- Current in-County options are limited
 - Could seek permit to co-compost food waste at County landfill
 - A number of out-of-County processing options, may require transfer for efficiency
 - Costs for processing at existing facilities in the area ranges based on published information, nominal fee (low end) of \$24/ton, but ranges higher (\$45 +)
 - Economies of scale for development of new composting or AD facility unlikely
 - Estimate less than 10,000 tpy of additional organics diverted from residential/commercial program allowing all organic materials, likely range from 3,000 to 5,000 tpy
 - Could seek to establish partnership/long term arrangement with private sector or others (UNC) to develop capacity
- 

PROGRAM CONSIDERATIONS AND COSTS

- One-time roll-out costs for carts, kitchen containers, promotion, \$30 or more per household
- Cost to provide collection service reported in other jurisdictions ranging from \$5.40/month/HHD to \$12.90/month/HHD
- However, most of these have 'separate' collection service, costs can be reduced
- Program costs will vary based on:
 - Configuration of collection system (separate versus co-collection)
 - Cost/requirement to transfer materials
 - Processing option
- Could consider pilot program or staged roll-out to investigate options for collection, public response and program performance...



PROGRAM CONSIDERATIONS - PILOT

- When is a pilot reasonable:
 - Need to compare functionally different options, use pilot to collect data
 - Where there are concerns regarding public response to program, use pilot to roll-out organic program to trouble-shoot issues
 - When a full program is not feasible, but phasing in a program is possible
 - When there is a level of commitment/interest in proceeding with a program but potential program performance needs to be assessed against other major constraints like costs

- Is a pilot reasonable in Orange County..... To be discussed



QUESTIONS?

