ecomaine

Organics Recycling Feasibility Study

6-13-13 Presentation to the ecomaine Board

Goals of this Presentation

- Provide a summary of the key findings from the organics recycling feasibility study to date
- Discuss the organics collections and processing options reviewed at the May 21st workshop with ecomaine staff
- Provide an opportunity for questions related to the study and the final options that will be further developed

TASK 1 – Waste Composition
Estimates of Achievable Residential Diversion Rate

- Based on the seasonal nature of the accumulation of yard trimmings (leaves, grass clippings, etc.) and due to the successful programs already in place for collections, new residential organics collection programs in ecomaine service area will likely not include yard trimmings

Reported Residential Organics Recovery Rates from Curbside Collection Programs in the U.S.

Community	Reported Organics Recovery (#/HH/week)
Hamilton, MA	10.5
Garbage to Garden	10-11
Brattleboro, VT	10-12
National Range	7-12

- Applying 10 pounds per household per week to the entire number of households in ecomaine member communities (at a theoretical 100% participating and setout rate) yields approximately **26,000 tons of targeted residential organics** → confirmation that the results of the U Maine study may not be an overestimation of targeted organics in Maine's residential solid waste stream.

TASK 1 – Organics Diversion in Transfer Station Communities

- The Maine DEP has been encouraging transfer station drop-off programs, such as the one developed by Yarmouth
- Drop-off programs clearly represent an opportunity to increase organics diversion in transfer station communities, and need to be developed in concert with aggressive public education and outreach
- It is more difficult to predict rates for collection of residential organics through transfer station Drop-off programs than it is for curbside collection
- Backyard composting will always be an option for transfer station communities, but, due to pest concerns and space limitations, backyard composting is limited in the type of materials that can be composted and participation rates

TASK 1 –Existing Organics Programs in ecomaine Service Area

- **Commercial Organics** → ***approximately 4400 tons per year already diverted and composted***
  - Resurgam (primarily restaurants and supermarkets) → 1800 tons per year
  - Benson Farm LLC (primarily seafood waste, but includes some supermarkets) → 1475 tons
  - Dubois Livestock & Excavating → 1125 tons
  - Hannaford stores in the ecomaine service area are diverting approximately 900 tons per year, some of which is accounted in Resurgam and Benson Farm tonnages and some of which is going out of the ecomaine service area
- **Residential Organics** → ***approximately 240 tons per year*** (and growing) collected by Garbage to Garden and going to Benson Farm LLC for composting
- **Yard Trimmings and Brush** → ***15,000 tons per year already removed from ecomaine solid waste stream***

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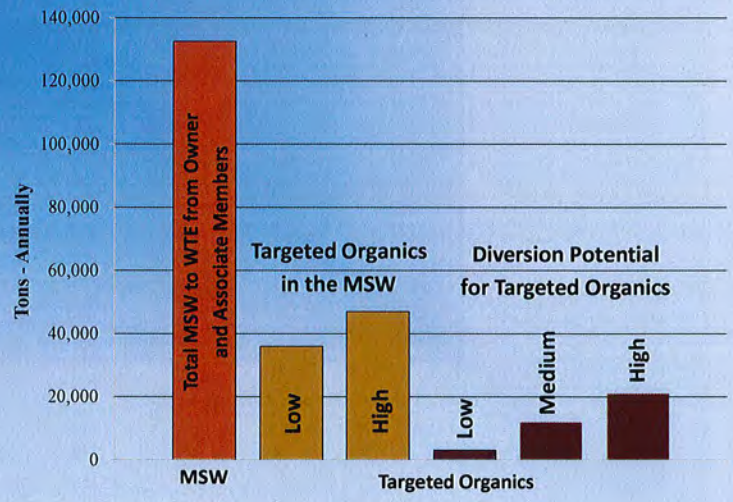
TASK 1 – Estimates of Achievable Diversion Rates



- Scenarios of achievable organics diversion rates
  - Low → 3100 tons residential SSO
  - Medium → 6800 tons residential and 5100 tons commercial → 11,900 tons SSO
  - High → 13,900 tons residential and 7100 tons commercial → 21,000 tons SSO

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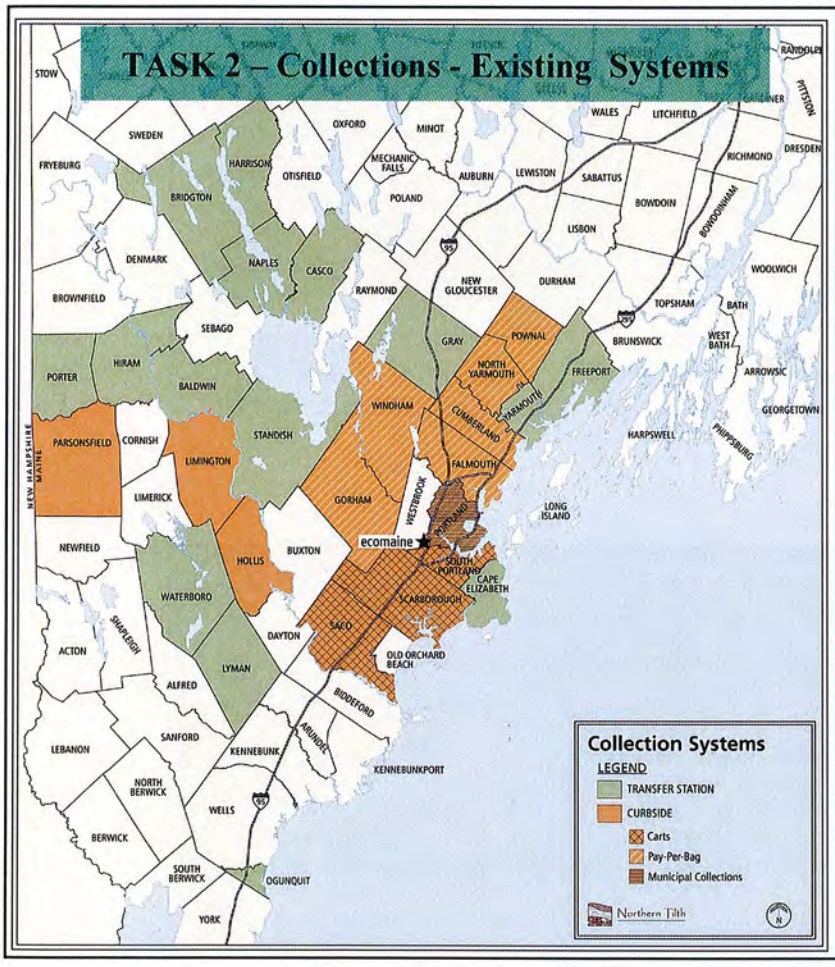
TASK 1 – Waste Composition - Key Findings

- Approximately 36,000 – 47,000 tons of the non-spot market tonnage delivered to the WTE plant in 2012 consisted of targeted organics
- Existing source separated organics (SSO) programs in the ecomaine service area capture and process approximately 4,400 tons per year of targeted organics, such as seafood processing waste, pre-consumer vegetative wastes from supermarkets and food scraps
- For curbside organics collection programs in the U.S. in which yard trimmings are not included, recovery rates are consistently between 7 to 12 pounds per household per week
- Organics recovery rates for transfer station Drop-off programs are more difficult to predict and high recovery rates will require aggressive public outreach and education
- Mandatory recycling programs, especially when combined with other incentives (Pay Per Bag, roll out carts, etc.) to reduce rubbish tonnage, are much more effective in diverting targeted organics than are voluntary programs
- Estimated low, medium and high-end scenario for organics diversion are as follows:
  - 3,100 tons per year
  - 11,900 tons per year
  - 21,000 tons per year



Owner and Associate Member Communities

- 13 Communities, representing 72% of the population, have curbside collection
  - 7 with Pay Per Bag arrangement
  - 3 with dedicated carts
  - Portland uses a municipal fleet for collections
- 15 Communities, with the remaining 28% of the population, rely on transfer station drop-off or residences contracting privately for curbside collection

TASK 2 – Potential Organics Collection Configurations

Dedicated Collection

- Dedicated Route for organics only
- Predominantly used in conjunction with dedicated organics carts
- Flexibility in types of trucks used
  - Rear loading packer
  - Side loader
  - Rendering truck
- Costs the same as adding an additional rubbish route until reduced volumes in rubbish allow for greater number of stops per rubbish route → expensive option, especially in a voluntary program

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TASK 2 – Potential Organics Collection Configurations

Co-Collection with Rubbish (A type of commingling)

- Based on the Blue Bag Organics model currently in place in Minnesota
- Requires no change in current collection configurations; the organics are separated by residents and placed in a heavy duty, compostable bag and placed curbside to be co-collected with the rubbish
- Additional costs are in
  - the bag itself, which cost approximately $1.00 per bag in Minnesota program, but could be closer to $0.50 for smaller bags needed for Maine curbside collection
  - Separation of the Blue Bags, which in the Blue Bag model is currently completed manually at the MRF to which all rubbish, recyclables and organics are delivered.
- Within ecomaine's current configuration, this program would likely require an addition to the WTE tipping floor and additional sorting equipment

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TASK 2 – Potential Organics Collection Configurations

Co-Collection with Every-Other-Week Rubbish/Recycling

- Involves other every week collection of rubbish and recyclables and every week collection of organics
- Same number of routes, but new distribution of the wastes → no increase in collection costs
  - Some communities, including Hamilton, MA, report an overall decrease in costs due to decrease in tipping fees
- Generally seen only in mandatory organics and recycling programs
- Results in large increases in recycling rates
- Could work in either Portland's current model or with the split bodies used in the remainder of the curbside collection communities
- Represents a huge paradigm shift in disposal/recycling behavior
- There can be unintended consequences from this type of shift in service → Portland, OR diaper issue

TASK 2 – Options for Transfer Station Communities

Drop-Off Programs

- The Yarmouth Transfer Station model could work in other ecomaine transfer station communities, however in order to increase recovery, extensive and consistent public outreach and education is needed

Backyard Composting

- Can increase organics diversion in transfer station communities and should be encouraged
- However, participation and recovery amounts are limited by the types of materials that can be included in backyard composting and the lack of space or the "ick" factor for some residents

TASK 2 – Collections - Key Findings

- Residential organics collection systems that have applicability to the ecomaine service area include
  - Dedicated Collection
  - Commingling with Rubbish (Blue Bag-Type collection)
  - Co-Collection with Every-Other-Week rubbish and recyclables collection
  - Transfer Station Drop-Off
- Relative to costs, commingled collection is generally less expensive than dedicated collection, and a new program being demonstrated in suburban Minnesota ("Blue Bag Organics") offers an intriguing model of commingled collection of organics and rubbish that has the potential to work in the ecomaine service area.
- Co-collection of organics with Every-Other-Week rubbish and recyclables collection has the potential to actually decrease overall solid waste costs, but the significant culture shift necessary to accommodate this type of program make this type of program challenging. It has been successfully implemented in several Canadian communities, and more recently in Portland, OR

TASK 3 - Technology Alternatives
Evaluation Matrix Results for ecomaine-developed Facility

Technology Alternative	Total Weighted Score
Digestion	
Dry Fermentation	330
Liquid Digesters	182
Composting	
Enclosed Aerated Static Pile (ASP)	373
Containerized ASP	342
Covered ASP	334
Turned Windrow	*278*

Heavily Weighted Factors Included

- Minimal risk of nuisance odors
- Proven technology in climate similar to ecomaine's
- Minimal risk of surface and groundwater contamination
- Costs

TASK 3 - Technology Alternatives Evaluation
Composting – Enclosed Aerated Static Pile

Source: Chittenden Solid Waste District ASP composting operation - Williston, VT

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TASK 3 - Technology Alternatives Evaluation
Anaerobic Digestion – Dry Fermentation

Source: Dry Fermentation Anaerobic Digestion – University of Wisconsin – Osh Kosh

- Handling solid materials in a batch process
- Digestate removed from the bays requires composting prior to use as a soil amendment
- Two stand-alone SSO digesters operating in the U.S. with 10 – 15 more coming on line by the end of 2015

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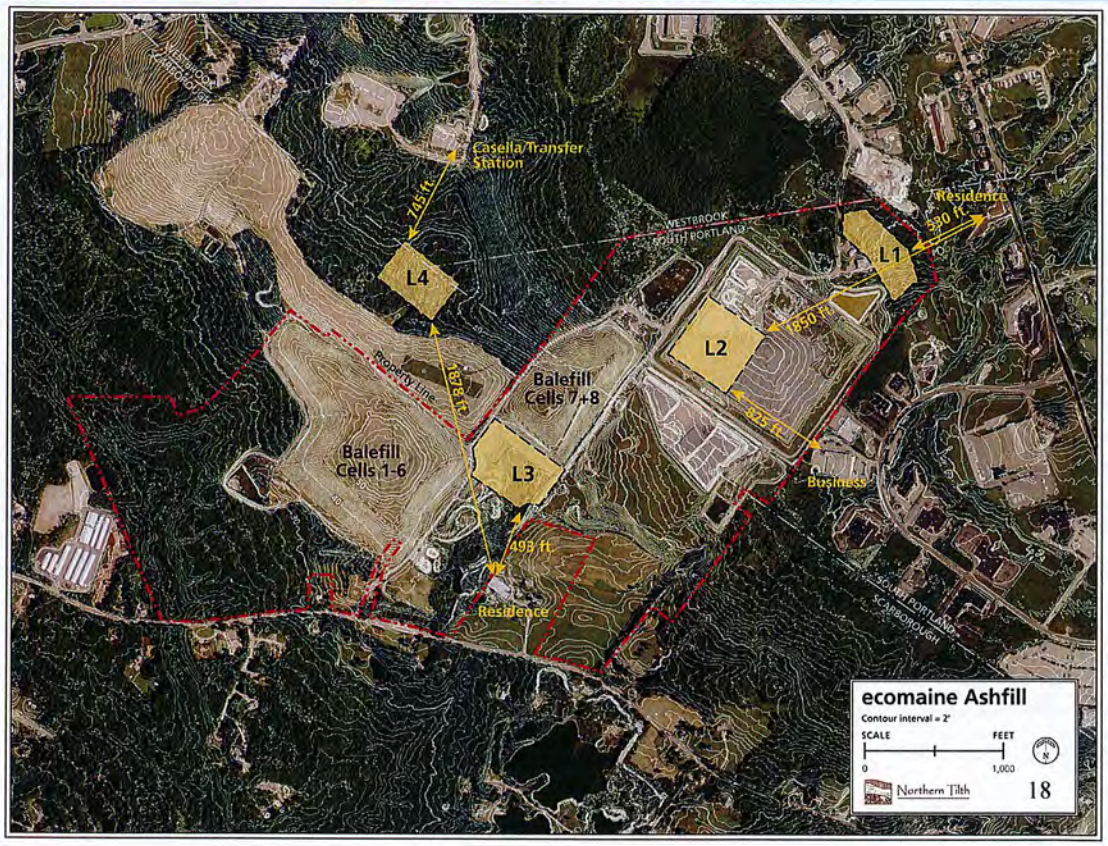
TASK 4 – Site Evaluations – Considerations

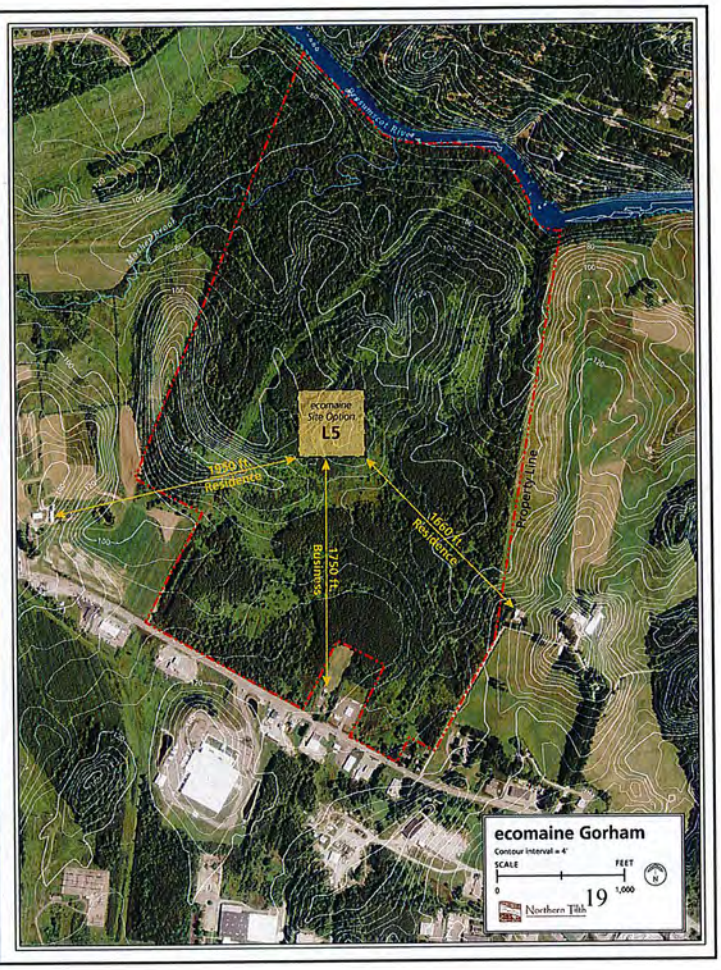
- **There are scores of examples of failed/closed composting operations around the country, including several in Maine.** Reasons for failure include
  - Water quality impacts
    - Winterwood Farm
  - Unresolvable nuisance odors
    - Glowood Farm
    - South Portland biosolids composting facility
  - Vectors
    - Bangor biosolids composting facility near the airport
- ecomaine has expressed the desire to facilitate organics recycling programs that avoid some of the problems that have been associated with organics processing operations in the past
- For composting, ecomaine's risk minimization goals will require the right mix of technological controls and setbacks that reduce the potential for nuisance odors and water management strategies that minimize and effectively treat leachate and surface water run-off

TASK 4 – Site Evaluations - ecomaine-owned sites - ashfill



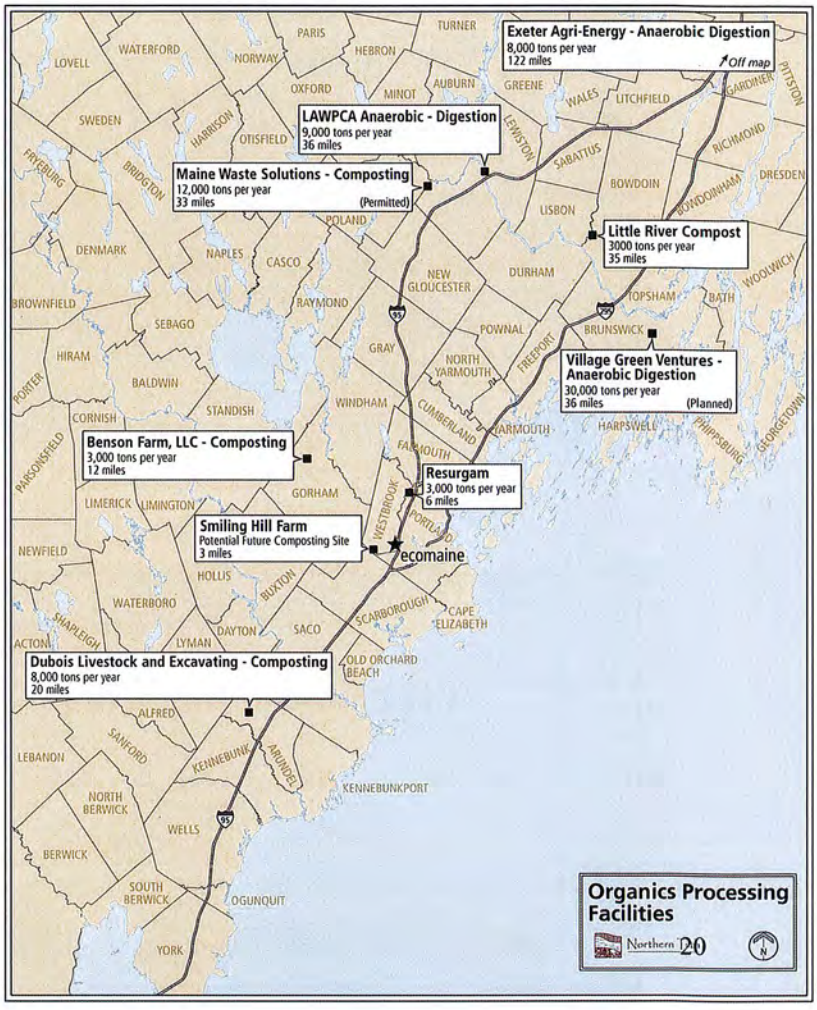
TASK 4 – Site Evaluations - ecomaine-owned sites – Gorham property

- The two areas identified as having the best suitability for developing an ecomaine-owned processing facility are
  - An upland area near the center of the Gorham parcel
  - A wooded area, not currently owned by ecomaine, northwest of balefills 7&8 adjacent to the ashfill property
- The area adjacent to the ashfill would be closer to the WTE and could take advantage of some of the exising infrastructure (roads, water, etc.) at the ashfill
- The area at the Gorham property provides greater setbacks from neighbors and is already owned by ecomaine



TASK 4 – Site Evaluations – Partnering Options

- In proximity to the ecomaine service area, including operating and permitted facilities, there is enough capacity for approximately 46,000 tons of SSO, most of which has been permitted in the past two years
  - 29,000 composting
  - 17,000 anaerobic digestion
  - A digestion operation with another 30,000 tons of capacity at the old Brunswick Naval Air Station is in the planning stages
- Price range for accepting organics at compost facilities in proximity to the ecomaine service area is generally $30 - $40 per ton
- Price range at anaerobic digesters is still to be determined, with the exception of Exeter Agri-Energy, which has lower tip fees but would required greater trucking costs
- Not all of the existing sites would meet ecomaine's risk minimization goals



TASK 4 – Key Findings

- In developing an organics recycling program, ecomaine must determine the most cost-effective manner to ensure sufficient capacity for processing SSO collected from the ecomaine service area while meeting ecomaine's risk minimization goals.
- Of the locations evaluated on ecomaine-owned land (or land that may be available to ecomaine), one location on property adjacent to the ashfill and one location at the Gorham parcel hold the most promise for siting a processing facility
- There is sufficient capacity at existing or planned organics processing facilities in or close proximity to the ecomaine service area to manage the organics that would be generated by an ecomaine-based organics diversion program. However, practical considerations may limit the ability of these operations to manage the type of SSO that would be generated in a residential curbside organics program, and not all facilities would meet ecomaine's risk minimization goals.
- Because organics programs within the ecomaine service area will likely build slowly over the first few years, it may be to ecomaine's advantage to partner with existing facilities as the program grows. This could provide an opportunity to determine if building ecomaine-owned organics processing capacity is necessary over the long-term.

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TASK 5 – WTE Impact Analysis

WTE Changes Related to Organics Diversion

Organics Diversion Scenario	Organics diverted from WTE (tons/yr)	Adjusted heat capacity of solid waste (kcal/kg)	Increase in heat value of solid waste
current	NA	3070	NA
Low-end	3,100	3094	0.8%
Medium	11,900	3163	3%
High-end	21,000	3233	5%

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TASK 5 – Key Findings

- Diverting targeted organics (food scraps and compostable paper) from the waste stream feeding the WTE will increase the energy content of the waste stream, by up to 5% in the high-end diversion scenario
- Because ecomaine WTE operations are currently steam-limited, theoretically, there may be a need to limit waste input in order to stay within operational limits of the plant
- However, experience from other WTE plants serving communities in which organics diversion programs have been developed indicate that tonnages received by the WTE will not likely need to be reduced
  - Metro Vancouver → developed widespread curbside organics programs → no change in tonnage to WTE
  - European experience → more aggressive organics collection → 10% increase in energy content of waste to the WTEs →changes in operations → no change in tonnage
- Prince Edward Island, which seems to be an outlier, developed an aggressive, very inclusive organics program "overnight" and found that they needed to reduce tonnage to their WTE due to increased energy content of the waste; the plant could not absorb the extra energy

TASK 6 – Markets for Compost

Price Range and Quantity Estimates for Existing Composts in ecomaine Service Area

Compost Type	Price Range (per cubic yard – bulk sales)	Estimated Quantities (cubic yards per year)
Commercial Organics (including seafood processing wastes) and Manure-based Composts	$25 - $45	16,000
Biosolids Composts	$0 - $18	15,000
Yard Trimmings Composts	$0 - $20	10,000

Market Estimates for ecomaine-produced Compost

- An ecomaine ASP compost facility handling 12,000 of residential and commercial SSO would generate approximately 18,200 cubic yards of compost
- The primary markets for the compost would be residential and commercial landscaping and topsoil blending
- The compost would have a quality similar to the existing commercial organics/manure-based composts in the service area, possibly with a higher level of contamination (plastics, etc.)
- A conservative market value of $15/cubic yard (bulk/wholesale) would provide revenue of $270,000 per year
- The compost market is not saturated in the ecomaine service area; the market could absorb the additional quantity from ecomaine

TASK 6 - Markets for Energy from Biogas

Assumptions: Dry Fermentation Anaerobic Digestion Processing 12,000 tons per year of SSO

- Electricity
  - 1,600,000 kWh/year
  - $0.10/KWh through Maine PUC's Community-Based Renewable Energy Production Incentive
  - $160,000 per year in revenue
- Recycled Natural Gas for pipeline distribution
  - 21,000 MCF/year
  - $6.80 per MCF "citygate" price
  - $143,000 per year in revenue
- Compressed Natural Gas
  - 161,000 diesel gallon equivalents (DGE)
  - Anticipated future price of $1.12/DGE
  - **$180,000 per year in revenue → used in macro-economic analysis**

TASK 7 – Macroeconomic Analysis of Options

Assumptions: 12,000 tons per year collection of combined residential and commercial SSO

Collections

- ***Dedicated Organics Collection***
  - Range for curbside collection costs of rubbish and recycling in ecomaine service area (private contracts) is approximately $10 - $13 per household per month
  - National average costs for curbside organics collection costs is $7.70 per household per month
  - Using $8.00 per household per month for 45% of the approximately 69,000 HH of owner and associate member communities with curbside → **approximately $3,000,000 per year in collection costs**
    - Lower costs for municipal collection
    - Competition and demand may drive prices down
- ***Blue Bag-type system***
  - **No additional costs on actual collections**
  - Costs of bags→ **$635,000 per year in associated collection costs**
  - Need to further refine sorting technology, labor and infrastructure costs
- ***Every-other-week Collection of Rubbish and Recycling with Weekly Collection of Organics***
  - No additional collection costs
  - Could present some challenges related to every other week collection of rubbish

TASK 7 – Macroeconomic Analysis of Options

Assumptions: 12,000 tons per year collection of combined residential and commercial SSO

Processing

- ecomaine-owned composting facility
  - **$30 – 35 per ton** (taking into account capital costs, operating costs and revenue from compost sales
  - Costs are very sensitive to compost sales
- ecomaine-owned anaerobic digestion facility
  - **$35 - 40 per ton**
  - This costs is on top of composting costs; the digestate from the dry fermentation process will need to be composted before distribution for sales
  - Costs are very sensitive to the sales of CNG
- Aggregated costs for transporting diverted ecomaine organics to existing composting and digestion facilities
  - **$45 – 50 per ton**
    - This includes a combination of composting and anaerobic digestion
    - Because the development of organics collection systems will take several years, this approach may make the most sense for the short term
- Do-nothing approach
  - Continued loss of organics from within the ecomaine service area
  - **$190,000 per year of lost revenue based on difference between member and spot market tip fee price to the WTE**

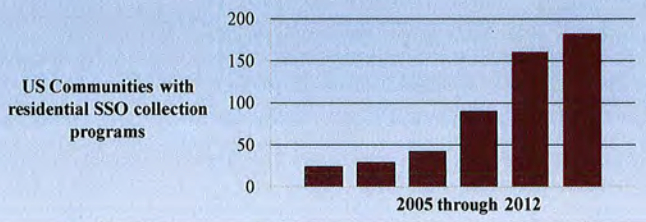
Options for Further Consideration

Based on workshop with ecomaine staff on May 21st, the Northern Tilth project team is refining the economic analysis and plan for

- A Blue Bag-type collection system
- Facility and equipment improvements and purchases needed to allow for sorting at the WTE
- Distributing sorted organics to existing composting and digestion facilities in Maine
- Results from the final economic analysis will be included in the final report for the feasibility study

Organics Recycling for ecomaine – The Long View

- Organics recycling in the US is currently in a similar phase of growth to that of traditional recycling twenty to thirty years ago
- Developing programs, such as Resurgam and Garbage to Garden, in the ecomaine service area indicate a high level of interest among residents and businesses
- Organics diversion programs (primarily the collections portion) can be expensive to develop, but as a leader in solid waste resource recovery the time is right for ecomaine to facilitate the shift to greater recovery of organics
- Feasibility studies, similar to the ecomaine study are being completed in communities throughout the US



Source: Rhodes Yespen, BioCycle, March 2013