Systems Analysis of the Impact of Act 148 on Solid Waste Management in Vermont

Testimony

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DSM's Scope of Work

- Contractor to the Vermont Department of Environmental Conservation
  - Project Team included Tellus Institute and Robert Spencer
- Conducted a detailed assessment of the current solid waste management system infrastructure, governance and costs
- Goal was to project additional infrastructure necessary to meet the objectives of Act 148, what it might cost, and what the impacts would be

http://www.anr.state.vt.us/dec/wastediv/solid/documents/FinalReport_Act148_DSM_10_21_2013.pdf

Systems Analysis

- While there is a desire to view each change envisioned by Act 148 in isolation, these changes are inter-related requiring a Systems Analysis
- It is important to know that collection costs remain the largest single cost associated with solid waste and materials management (typically 70 +/- % of total cost)
- For this reason, the key to this analysis was to define the current collection system, and then evaluate how it will change to address Act 148 mandates, including:
  - Parallel collection of recyclables
  - PAYT pricing
  - Mandatory organics diversion
- Processing and disposal costs can then be added to assess total costs

Economic Analysis

- Costs are estimated for the time period 2014 through 2022
- This allows for full implementation of the various phased in bans and changes required under Act 148
  - Although it is our view that actual implementation will take longer than envisioned under Act 148
- All costs are summed (in current dollars) across the 9 year analysis period to provide a single total system cost for comparison across systems

Five Systems Analyzed

- **System 1, Base Case – Existing System**

- **System 2, Act 148 with no bottle bill**
  - Bottle bill material is collected curbside and drop-off (although at lower recovery rates) and processed through the existing MRF infrastructure
- **System 3, Act 148 with existing bottle bill**
- **System 3A, Same as 3 but recycling collection programs remain status quo (don't all change to single stream)**
- **System 4, Act 148, with expansion of bottle bill**
  - Some beverage container material currently going to MRFs is diverted to the container redemption system
- Please note that while the absence or addition of the Bottle Bill defines the different systems, most of the cost and material diverted is not associated with the Bottle Bill
  - This was just the way the Scope was defined by ANR and DSM as a result of the Act 148 requirement for analysis

Use of Vermont Data

(This is a VT report based on VT data)

- 2012 Vermont Waste Composition Study
  - Conducted under separate contract by DSM
- Vermont facility reporting data for materials recycled and disposed
- Vermont MRF loss data and bale quality data
  - Based on DSM sorting at Casella Rutland MRF
- Vermont beverage sales and returns
- Vermont consumer redemption behavior
  - Based on DSM surveys of consumer return behavior at redemption centers around VT
- Hauler survey data
- District cost data

Summary of Findings

- Maintaining the Status Quo (Current System) is estimated to cost between $1.2 and $1.36 billion from 2014 through 2022
  - Average annual cost of about $150 million
  - Range in costs reflects whether system costs include individuals driving to drop-offs and transfer stations
- Implementation of Act 148 is estimated to increase these costs from 5 to up to 12 percent, depending on the system chosen, with a corresponding:
  - Increase of materials diversion (by weight) from 72 – 84%
  - GHG emissions reductions of an additional 34 – 39 percent over the current system
  - Increased monthly costs to households from $3 to $5 per month
  - Increased per ton costs to ICI sector from 2 – 12%

Findings, Table 58 of Report

(Without separate trips included)

SYSTEMS EVALUATION	SYSTEM 1	SYSTEM 2	SYSTEM 3	SYSTEM 3A	SYSTEM 4
Metrics	Base Case, No Act 148	Act 148, Universal Single Stream, No BB	Act 148, USS, BB	Base Case With Act 148,BB	Act 148, USS, EBB
Diversion, in Tons (2022)					
Materials					
Plastic	5,120	5,580	5,870	5,753	7,190
Aluminum	2,300	1,750	2,680	2,626	2,760
Glass	23,880	16,320	24,000	23,520	25,080
Fiber	60,570	87,560	87,560	85,809	87,560
Steel Cans	1,620	1,690	1,690	1,656	1,690
Organics	0	48,098	48,098	48,098	48,098
Total:	93,490	160,998	169,898	167,462	172,378
Percent Increase over Base:	***na***	72%	82%	79%	84%
GHG Emissions Reductions					
Total, in Metric Tons Carbon Equivalent:	(70,019)	(93,568)	(96,597)	(96,000)	(97,293)
Percent Decrease over Base:	***na***	34%	38%	37%	39%
Sum of Annual System Costs (2014 - 2022)					
Operating	$ 1,212,692,940	$ 1,246,034,056	$ 1,305,811,407	$ 1,314,091,818	$ 1,328,703,772
Capital	$ 1,900,000	$ 42,450,455	$ 42,427,062	$ 45,467,476	$ 42,414,492
Total	***$ 1,214,592,940***	***$ 1,288,484,510***	***$ 1,348,238,468***	***$ 1,359,559,294***	***$ 1,371,118,264***
Change in Total System Cost over Base:	***na***	***$ 73,891,570***	***$ 133,645,528***	***$ 144,966,354***	***$ 156,525,324***
Percent Change from Base:	***na***	5%	10%	11%	12%
Unit Costs (2022)					
Average Per HH Monthly Cost	$ 28.33	$ 31.29	$ 33.01	$ 34.38	$ 33.61
Percent Change from Base:	***na***	10%	17%	21%	19%
Average Per Ton Cost, ICI	$ 202	$ 206	$ 221	$ 220	$ 225
Percent Change from Base:	***na***	2%	9%	9%	12%

HOW DID WE GET THERE?

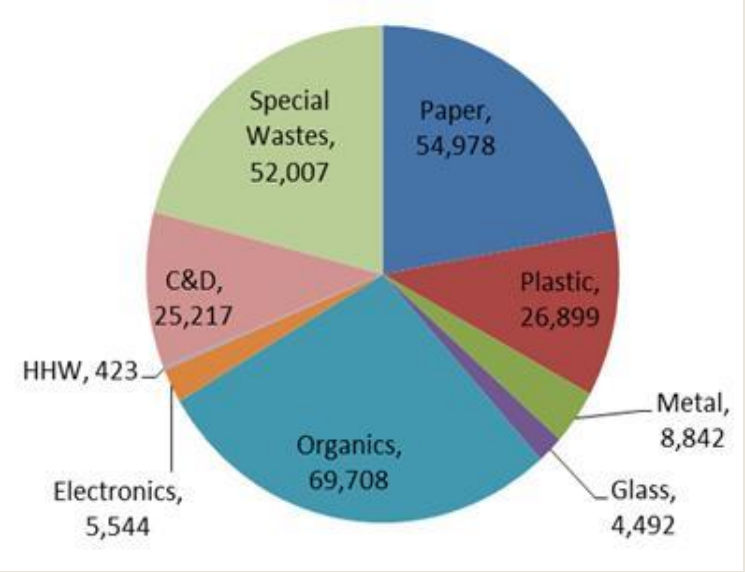
Impact of Act 148 on Solid Waste Management in Vermont

Materials Disposed

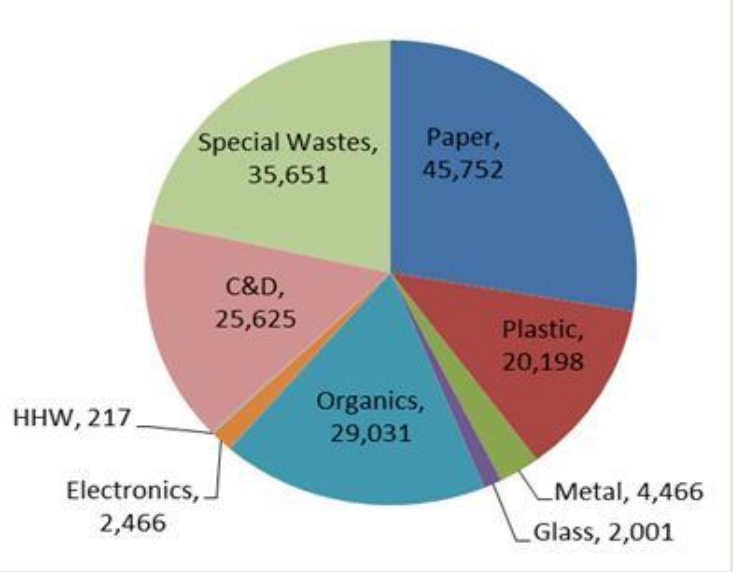
Vermont Waste Composition Study, 2012

(Exclusive of C&D Wastes Disposed Separately)

Residential Waste Disposed, Tons by Material Type



ICI Waste Disposed, Tons By Material Type



Materials Recovered
(Reported 34% ***Recycling Rate***)

- Excludes economic recycling and scrap metal recycling, other than by facilities permitted and reporting to ANR
  - Appliance and white goods are included
- Excludes estimates of reuse and backyard composting.

Material Category	Recycling, CY 2011 (tons)
Fibers and Containers (2)	80,796
Bottle Bill Material (3)	17,800
Appliances and White Goods (4)	6,500
Special Wastes (5)	1,978
Organics (6)	
Certified Compost Facilities	11,620
Exempt Facility Estimate	866
Yard Waste (7)	1,157
Stumps, Brush, Wood (7)	4,151
Total:	**124,868**

Materials Recovery Rates

(a more accurate description of how VT is doing)

- For recyclable paper and packaging, an overall 50 percent materials recovery rate is our best estimate based on Vermont's recent waste composition study and most current recycling data

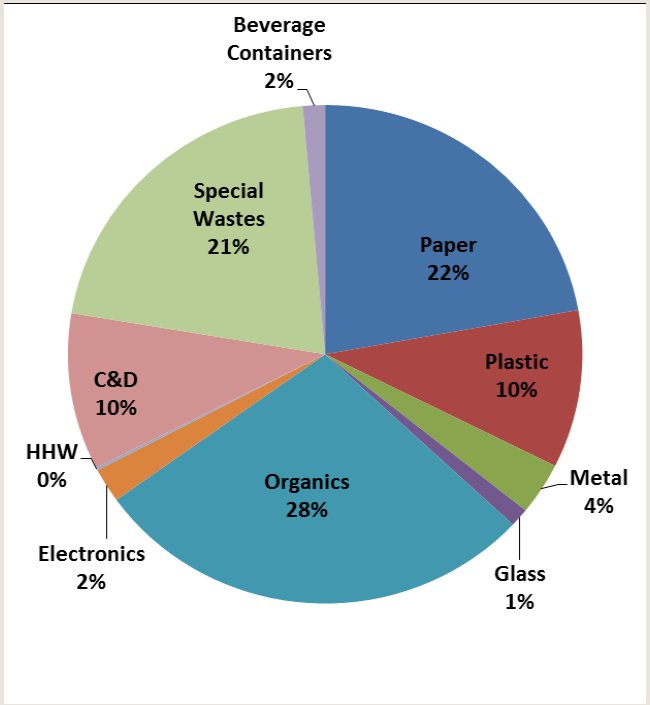
MATERIAL	SYSTEM 1: BASE CASE			
	Disposed (tons)	Recovery (3) (tons)	Generation (tons)	Recovery Rate (%)
Aluminum - UBC (1)	870	2,300	3,170	73%
Glass	5,900	25,300	31,200	81%
PET	3,000	2,600	5,600	46%
HDPE	2,000	1,400	3,400	41%
Other Plastics (2)	7,800	1,500	9,300	16%
Steel Cans	2,900	1,700	4,600	37%
Aluminum - Other	210	20	230	9%
Fibers	73,200	62,100	135,300	46%
Totals:	**95,880**	**96,920**	**192,800**	**50%**

Key Findings

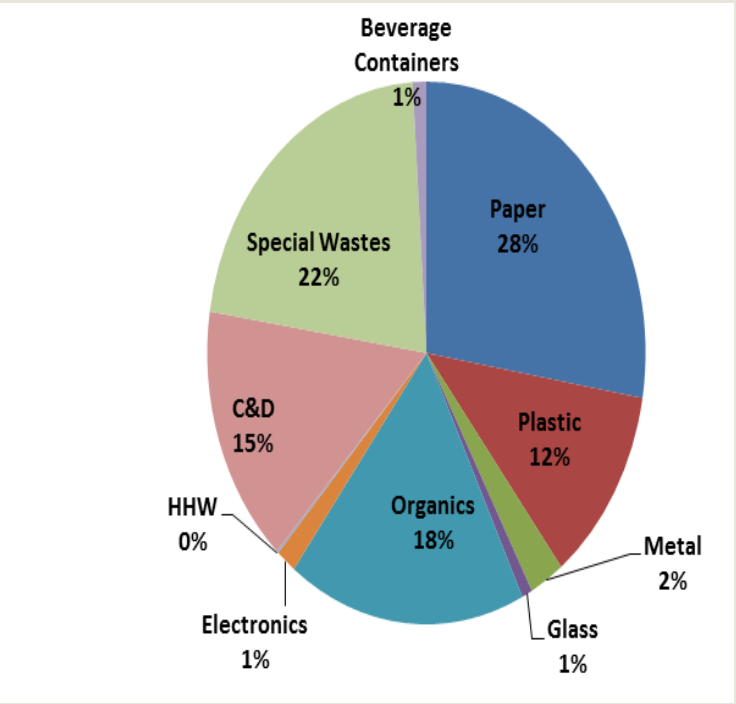
- Vermont is doing a relatively good job of recycling (paper and packaging) materials already
  - Comparison of recycling rates across states is a notoriously poor way to assess programs
  - Too many different ways to calculate and report recycling rates
  - Better to use material recovery rates, by material
- While much of the focus during the public comment period was on Bottle Bill material, paper and organics are the key materials for improving recovery
  - Recovering more beverage containers under an Expanded Bottle Bill would require pulling significant quantities from the existing recycling collection infrastructure (with the exception of PET)

Waste Composition (2012)

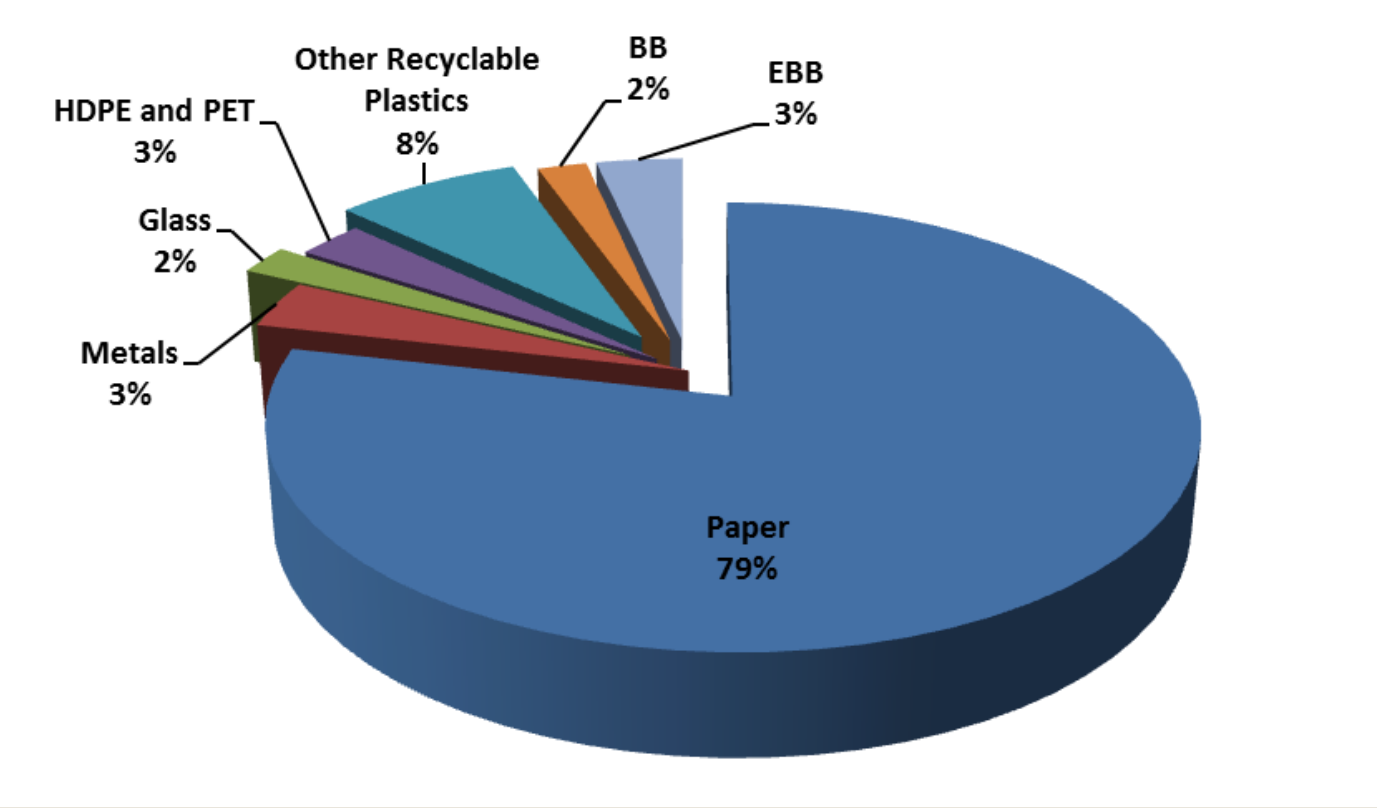
Residential Waste



ICI Waste



But Vermont Can Do Better: *Almost 100,000 tons of potentially recyclable Paper and Packaging Remain in the Waste Stream*



Collection Infrastructure

- Key provisions of Act 148 call for:
  - Parallel collection of recyclables with cost embedded in refuse collection cost
  - Banning of food and yard waste from landfills
    - ICI food waste phased in over next 5 years
    - Yard waste in 2015
    - Residential food waste by 2020
- Changes to the collection infrastructure will be required to achieve these goals
  - While solid waste districts will play an important role, the majority of these materials are collected by the private sector requiring private sector investments

Current Residential Collection System

(Households served by different methods)

	CURRENT SYSTEM	
	Refuse *(households)*	**Recycling** *(households)*
Organized Curbside		
Chittenden County	1,200	17,300
Rest of Vermont	10,700	17,500
Subtotal, Organized:	**11,900**	**34,800**
Subscription Collection		
Chittenden County		
Curbside	38,900	22,800
Containerized	13,400	13,400
Rest of Vermont		
Curbside	70,000	29,900
Exempt Haulers and Fast Trash	14,000	5,950
Containerized	21,500	2,150
Subtotal, Subscription:	**157,800**	**74,200**
Drop-off Collection		
Chittenden County	8,300	8,300
Rest of Vermont	91,900	90,100
Subtotal, Drop-off:	**100,200**	**98,400**
Total:	**269,900**	**207,400**

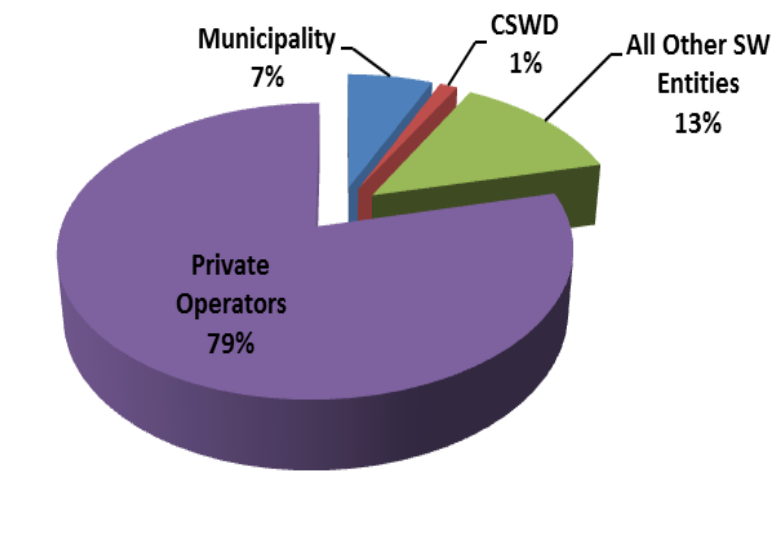
Lack of Parallel Access	**62,500**
Percentage of Vermont Households	***23%***

KEY FINDING:

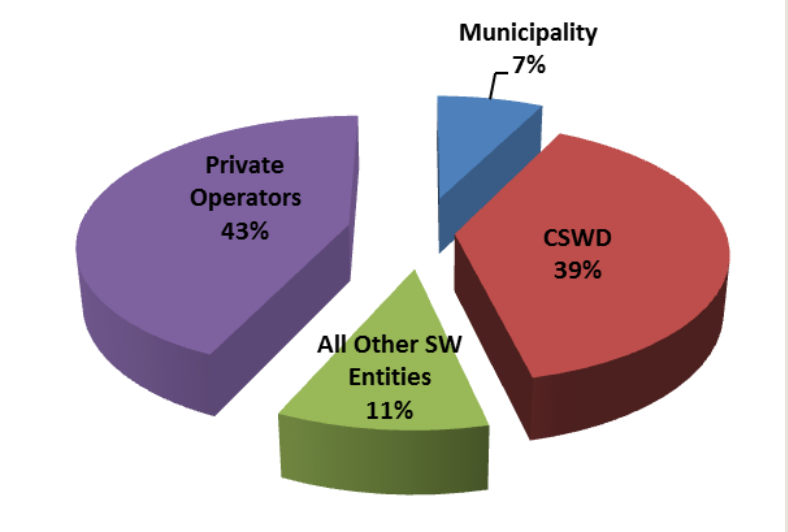
- Heavy reliance on unorganized subscription collection throughout VT
- Many of the remaining households and businesses drive to drop-offs

Current Residential Collection System
(Tons collected by different parties)

Refuse Collection



Recycling Collection



Key Findings

- An estimated 62,500 households do not currently have parallel access to recycling collection but will be required to by 2015
- 37% of households drive their refuse to a drop-off/transfer station
- But 63% of households receive curbside collection of refuse
- All households will need to be provided with organics collection by 2020
  - We cannot assume that households with curbside collection will drive their organics to local farms or composting facilities separate from refuse
  - We would not expect higher participation for non-parallel collection of organics than for materials recycling
    - No more than 10 to 15%

Industrial, Commercial and Institutional (ICI) Refuse and Recycling Collection

- Rough estimates based on tonnage, collection infrastructure and how ICI sector is typically serviced

TYPE OF COLLECTION	Refuse *(tons)*	Refuse *(%)*	Recycling *(tons)*	Recycling *(%)*
Drop-off	6,600	4%	1,600	4%
Curbside	16,500	10%	15,400	38%
Containerized	112,900	68%	23,100	58%
Roll-offs	29,400	18%		
Total:	**165,400**	**100%**	**40,100**	**100%**

Vermont's Bottle Bill

- Sales and Returns Data – Hard to account for out of state purchases but spent inordinate amount of time trying to adjust for this
- Separate Trips and Use of Personal Vehicles
  - ***All*** separate trips, whether to redeem deposit containers, or to deliver refuse or recycling (and in the future, organics) to drop-offs/transfer stations are accounted for in DSM's system analysis
- Costs
  - Handling costs of 3.5 – 4 cents make up the main component of the cost of the bottle bill

Bottle Bill Findings

- The lack of transparent data on bottle bill sales, returns and costs is a significant problem
  - We do not know the actual return rate, but would expect it to be similar to States that have mandatory reporting requirements – yielding a return rate of roughly 75%
- The most important issue to understand about the bottle bill is that it is a separate system with costs that must be added to the refuse and recycling system
- The largest single cost in Vermont is the cost to all parties to collect/accept, count, transport and process deposit containers:
  - Elimination of the handling fee would significantly reduce costs but it would essentially drive existing independent redemption centers out of business, and would negatively impact retailers unless they were exempt from the requirement to accept containers

Material Losses

- One of the clear differences between a bottle bill and single stream collection systems is that material loss rates for single stream collection and processing can be significantly higher than for bottle bill material
- ANR directed that VT-specific data on loss rates be collected and used in the report
- DSM conducted loss rate sampling at the Casella Single Stream facility in Rutland
  - The Rutland MRF, with the exception of aluminum, has relatively low losses to residue of recyclable material
  - Audited bale data also show relatively low materials contamination for all materials when compared to reports in the literature

Organics

- One of the challenges of this analysis was attempting to estimate the impact of the phased -in ban on organics to landfill
  - Especially because while haulers are required to offer collection, they do not need to embed the cost in refuse collection
  - How consumers and businesses will behave in response to this mandate is unclear, especially if they have to pay more for collection services

Estimated Organics Diversion by 2022, *Showing Cumulative % Change from 2014 to 2022*

Organics	2014 Tons	2022 Tons	% Change Over 2014
ICI Organics			
Food Residuals Disposed	18,592	6,095	***67%***
Reduced		1,608	
Food Rescue		1,592	
New Diversion		10,889	
Yard Waste Disposed	4,818	2,409	***50%***
On-site Disposal		964	
Diverted		1,445	
Compostable Paper Disposed	6,345	3,173	***50%***
Diverted		3,173	
Total ICI Disposed	***29,755***	***11,677***	***61%***
Residential Organics			
Food Residuals Disposed	41,486	18,007	***57%***
On-Site Composting		5,471	
Diverted		18,007	
Yard Waste Disposed	7,913	2,216	***72%***
On-Site Disposal		2,374	
Diverted		3,323	
Compostable Paper Disposed	15,506	7,753	***50%***
Diverted		7,753	
Total Residential Disposed	***64,905***	***27,976***	***57%***
Total Disposed, ICI & Residential	***94,660***	***39,653***	***58%***

Organics Processing

- The largest single investment necessary to implement Act 148 will be in new organics collection and processing capacity
  - Because ANR and many individuals involved in organics management hope to divert as much organics as possible to small, farm-based systems, the analysis assumed 30 percent of new diversion would go to small, farm based systems
- However it is important to note that 58 percent of all waste collected in Vermont is collected by private haulers
  - Setting up a separate system to deliver organics to farms is likely to result in very low participation rates if the history of materials drop-offs is any guide
  - Further, it is not clear that most farms will welcome food residuals, especially if there is any potential for contamination
- As such we have assumed that centralized organics processing facilities will be necessary for roughly 70% of the food residuals diverted

Organics Processing (continued)

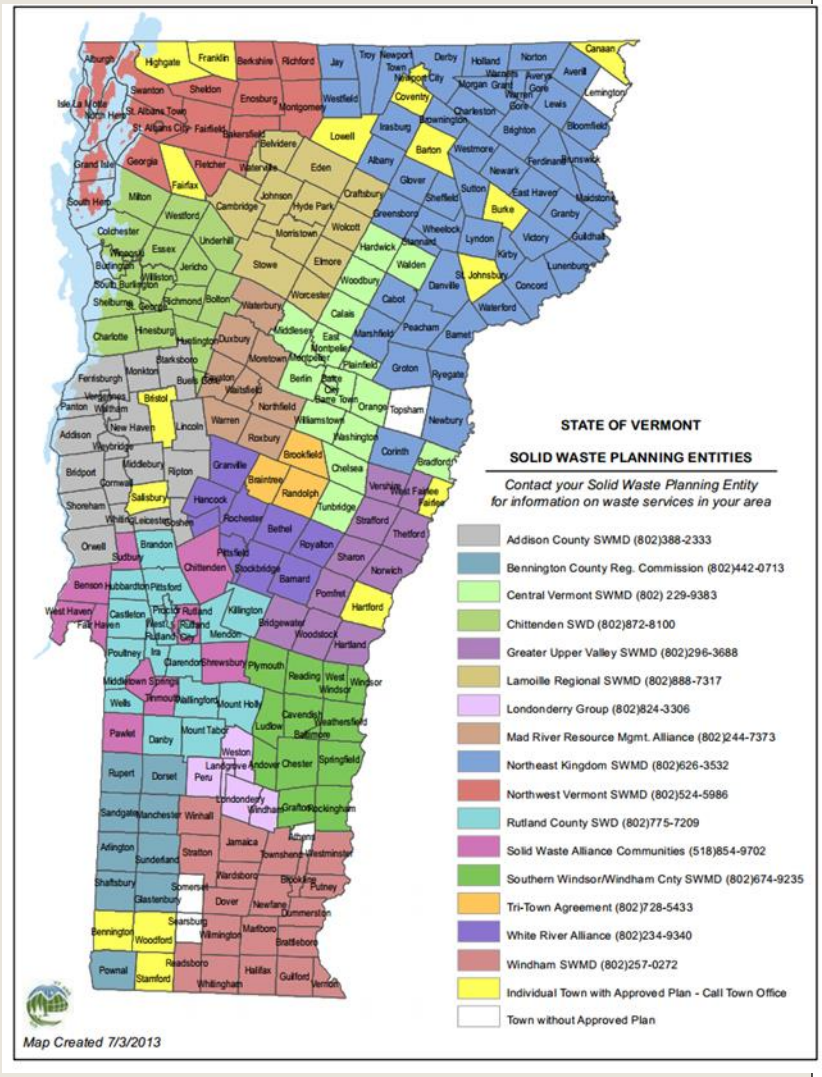
- One key to organics processing will be how much of the material is processed using aerobic composting
- If the majority is aerobically composted, carbon will be a significant additional cost and potential constraint
- The demand for carbon will encourage collection of waste paper with food residuals and yard waste
  - Waste paper will increase front-end and back-end screening requirements to produce a clean enough material for sale
- Anaerobic Digestion has the potential to play a key role – especially if the system can be organized to utilize existing on farm digesters.
  - We believe that this will require centralized processing facilities to clean and grind organics with trucking of ground organics to farms

Organics Findings

- This analysis assumes an overall 58% diversion rate for organics by 2022
- While theoretically organics are banned from disposal by 2020, if history is our guide, achieving a 58% diversion rate in the next 9 years is an optimistic assumption
- It will require both a funding source for development of new processing capacity, and a strengthened organizational structure in a number of areas of the state
  - And it will require some important changes in how collection of refuse, recycling and organics is performed and priced

Governance

- Roughly 88% of the population of Vermont reside in a community that participates in joint management of materials through a "solid waste planning entity"
  - 10 districts and 6 "alliances"
- However, not all districts or alliances are created equally
  - Some are very aggressive about managing solid waste and recyclables, and some have almost no appreciable role, relying almost exclusively on the private sector



District Costs

- We attempted to gather budgets from all of the districts and alliances
- Ultimately we were successful in receiving data from the majority of them
- This, combined with data compiled by the Chittenden District, was used to construct a picture of total costs for local governance of solid waste management in Vermont
  - $20.4 million in total expenditures by districts and other municipal entities
  - Of which $7.8 million was raised in surcharges and member town assessments
  - The remainder assumed to be funded through fees for services

Table 35

(Source: Systems Analysis Draft Report)

Major Cost Areas	Expenses ($)	Revenues ($)	Difference ($)
Administration	$2,733,000	$209,000	($2,524,000)
Education and Outreach	$1,008,000	$10,000	($998,000)
HHW and Universal Waste	$1,557,000	$365,000	($1,192,000)
Operations	$12,044,000	$10,845,000	($1,199,000)
Special Wastes (excluding HHW and Universal Wastes)	$1,039,000	$366,000	($673,000)
Misc	$869,000	$181,000	($688,000)
Total:	$19,250,000	$11,976,000	($7,274,000)

Governance Findings

- There does not appear to be uniform or realistic metrics that are updated annually to track performance toward SWIP and State MMP goals.
  - Private sector controls much of the waste and recycling stream and these data are not tracked by most entities
  - Tracking district progress toward meeting the goals of Act 148 is going to require even more sophistication
  - Consolidation of some responsibilities of the solid waste planning entities is likely to save money.
  - Consolidating administrative, education, and some areas of operations, could free up funds to expand services (operations)
  - Universal, state-wide messaging will be important to the success of Act 148

Implementation Issues – Refuse and Recycling

- Enforcement of mandated separate collection of recyclables will be challenging
  - But the infrastructure exists to process the increased materials
- Parallel access to collection of recycling and refuse needs to be better defined
  - True parallel access will be a challenge for many small haulers
- Implementing unit based pricing in subscription collection systems requires changes in hauler licensing, municipal ordinances and enforcement activity to ensure an equal playing field
- Public space recycling by municipalities requires technical assistance and education programs, as well as funding
- Source separation of organics will require a major enforcement effort combined with relatively large investments in collection and processing infrastructure

Funding for Organics Infrastructure

- New organics processing facilities will require an investment of at least $20 million. Raising this will be difficult:
  - Increasing the Franchise Fee from $6 to $12 per ton could raise roughly $2.5 million annually at current disposal rates – about ½ of what will be needed
  - However the amount raised declines as additional recyclables (and later organics) are diverted.
  - Disposal fees in surrounding states have fallen since 2008. With spot market rates at roughly $50 to $60 per ton, and District surcharges added, Vermont's disposal fees could be double those in neighboring states providing a significant incentive for leakage from Vermont.

Implementation Issues - General

- Equalized programs and enforcement across Vermont requires changes by ANR and at the State level:
  - Large variations in how Act 78 has been implemented across Vermont remain, ranging from active involvement in materials diversion programs (and high recovery rates) to limited or no involvement (and with low recovery rates). This is unlikely to change unless ANR decides to equally enforce Act 148.
  - ANR may need to change how it enforces SWIPs, or actively enforce standards for programs across all municipalities and districts.
  - Without this, it is unlikely that Vermont will meet the materials and organics diversion levels of Act 148.
- An argument can be made for a single implementation entity, or at most two entities:
  - With roughly 70 percent of recyclables currently going to two single stream MRFs, and Act 148 requirements uniform across the State, consolidating some administration and recycling education efforts across the state could reduce costs, level the playing field, and provide consistent messaging.
  - States of similar size such as Delaware and Rhode Island have a single implementation entity responsible for managing programs (and materials). An analysis of these states could provide insights into the feasibility of consolidating solid waste administrative functions and other activities in Vermont.

Implementation Issues, cont.

- Data collection and analysis need to be strengthened at the State level under Act 148:
  - There is no standardized approach to tracking progress toward State goals or SWIP goals, although there is much data collection and reporting
  - Act 148 cannot be managed if it can't be measured. Standardized performance data for MSW, recyclables, organics, etc. is critical.
- A broad based funding source that covers the full range of packaging and food residuals generated in Vermont, and which could be used to invest in the management and capital necessary to move Vermont to a sustainable materials management system is necessary:
  - While there has been huge interest in the bottle bill, which represents roughly 1 to 2 percent of Vermont material, there has been little discussion of other packaging materials (roughly 100,000 tons in 2012 and growing) including many materials which are not recyclable.
  - The cost of a food residuals ban will be borne entirely by VT households and businesses who already face high solid waste management costs relative to other, more densely populated areas of the U.S.
  - It is highly unlikely that sustainable materials management can be funded entirely on the backs of municipal property taxes, landfill surcharges and unit based prices.
  - The failure to include the large producers of packaging and food products not impacted by the bottle bill leaves out an essential component of any attempt to internalize sustainable materials management in Vermont.

Questions