

VERMONT'S  
MUNICIPAL SOLID WASTE  
DIVERSION RATE  
2001

RESULTS OF  
RECYCLING AND REUSE SURVEY  
FINAL REPORT

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## Executive Summary

The Vermont Department of Environmental Conservation, Solid Waste Program (DEC) contracted with DSM Environmental Services, Inc. (DSM) through a competitive bid process to develop an estimate of the State of Vermont's Municipal Solid Waste (MSW) Diversion Rate for calendar year 2001. Vermont's MSW Diversion Rate is calculated by estimating the percentage of total materials recycled, reused and composted that would otherwise be disposed as municipal solid waste. This calculation is performed using the following formula:

$$\frac{\text{Recycling} + \text{Reuse} + \text{Composting}}{\text{Recycling} + \text{Reuse} + \text{Composting} + \text{Disposal}} = \text{Vermont's MSW Diversion Rate}$$

To calculate the MSW Diversion Rate, DSM researched or surveyed six types of recycling, reuse and waste reduction activities occurring in Vermont, and estimated the tons diverted from disposal by each activity in calendar year 2001. The six activities researched or surveyed by DSM were:

- Materials recycled that were collected or processed by *Vermont Certified Recycling and Solid Waste Transfer Facilities* (71,800 tons rounded)<sup>1</sup>
- *Materials that were reused* through activities sponsored by the Vermont Business Materials Exchange, Vermont Solid Waste Districts and related reuse organizations (estimated at 2,500 tons rounded)
- *Organic materials composted* through estimates of backyard composting activity and quantities reported by centralized composting facilities and businesses and institutions with on-site composting operations (29,700 tons rounded)
- *Deposit Return Container Recycling* (13,600 tons rounded)
- Metals recycling through *Scrap Metal Processors* (34,800 tons rounded)
- *Economic Recycling* defined as recycling performed by businesses for economic reasons and not using Vermont Certified Recycling Facilities (33,900 tons rounded)

The survey results by broad material category are outlined in Table ES-1 and show that a total of **182,600 tons** (rounded) were estimated to have been diverted from disposal in Vermont in 2001. Fibers represented nearly half of the material diverted with scrap metal, containers and organics composting representing between 15 and 20 percent each of materials diverted.

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<sup>1</sup> This total includes 3737 tons of glass, plastic and aluminum deposit return containers that were collected through redemption centers and retailers by distributors but processed through certified recycling centers. This tonnage is also shown in the deposit return recycling survey (Table ES-1) total of 13,646 tons and then subtracted out of the Recycling Facilities total in Table ES-1.

**TABLE ES-1**  
**ESTIMATED DIVERSION BY MATERIAL TYPE**  
**AND DIVERSION ACTIVITY, 2001**  
**SUMMARY OF SURVEYS CONDUCTED**

<b>MATERIAL</b>	<b>Recycling Facilities (tons)</b>	<b>Reuse Facilities/Programs (tons)</b>	<b>Organics Composting (tons)</b>	<b>Soft Drink and Beer Distributors (tons)</b>	<b>Scrap Metal Facilities (tons)</b>	<b>Economic Recycling (tons)</b>	<b>TOTAL (tons)</b>	<b>% OF TOTAL (%)</b>
PAPER	51,730	137	41	386	0	33,495	85,788	47%
CONTAINERS	15,501	19	0	13,260	0	117	28,897	16%
SCRAP METAL	0	159	0	0	34,830	251	35,240	19%
ORGANICS	0	0	29,626	0	0	0	29,626	16%
MISC.	830	2,167	0	0	0	14	3,011	2%
<b>TOTAL:</b>	<b>68,061</b>	<b>2,482</b>	<b>29,667</b>	<b>13,646</b>	<b>34,830</b>	<b>33,877</b>	<b>182,562</b>	
<b>% of TOTAL:</b>	<b>37%</b>	<b>1%</b>	<b>16%</b>	<b>7%</b>	<b>19%</b>	<b>19%</b>		

(1) "Containers" diverted by "Soft Drink and Beer Distributors" include 3737 tons processed by "Recycling Facilities" but not included in their total for this summary table.

(2) Numbers may not add due to rounding.

The biggest factors contributing to measured diversion were the Vermont certified collection and processing facilities (37 percent), economic recycling (19 percent) and the scrap metal processors (19 percent). However if the assumptions made for estimating backyard composting are relatively accurate, organics composting also plays an important role in materials diversion (estimated to total 16 percent).

Disposal of Municipal Solid Waste (MSW) generated in Vermont in 2001 was calculated by the DEC to be 415,249 tons. Adding together the materials diverted and dividing by MSW diverted and disposed using the formula shown above yields a diversion rate of 31 percent in 2001.

There are limitations to the use of diversion data and rate calculations to measure success in waste diversion, including the fact that economic factors typically have a significant impact on waste diversion efforts. Nonetheless, waste diversion remains an important goal in Vermont, and evaluation and measurement are critical steps to determine the progress made as well as to identify methods to increase diversion activity. The measurement approaches taken in 2001 and in previous years are fairly consistent enabling useful comparison between years.

## I. Introduction

The Vermont Department of Environmental Conservation, Solid Waste Program (DEC) contracted with DSM Environmental Services, Inc. (DSM) through a competitive bid process to develop an estimate of the State of Vermont's Municipal Solid Waste (MSW) Diversion Rate. The Diversion Rate is calculated by estimating the percentage of total materials recycled, reused and composted that would otherwise be disposed. This calculation is made by using the formula:

$$\frac{\text{Recycling} + \text{Reuse} + \text{Composting}}{\text{Recycling} + \text{Reuse} + \text{Composting} + \text{Disposal}} = \text{Vermont's MSW Diversion Rate}$$

Materials included in the definition of recycling, reuse, and composting and disposal are covered in Section II of this report. Construction and demolition waste is not included in this calculation.<sup>2</sup>

While the State estimates the MSW diversion rate annually, they requested that an outside consultant conduct a more comprehensive study to determine the rate for 2001 and make recommendations for methodologies to follow for rate calculations in future years.

Prior to 1997, the calculation of recycling or diversion rates among states resulted in reporting of rates representing widely diverging numbers. In September 1997, EPA released the guide "Measuring Recycling--A Guide for State and Local Governments" which represented the work of many state and local governments to develop a voluntary methodology to accurately measure recycling rates. EPA created the guide in hopes of standardizing recycling rates reported by different states. However, states have not universally adopted EPA's methodology, with the result that it continues to be very difficult to compare recycling rates across states.

Vermont's MSW diversion rate was first estimated for 1987 when the 1989 State of Vermont Solid Waste Management Plan was adopted. At that time, an estimated 42,000 tons were diverted from disposal to recycling and composting, or approximately 12 percent of solid waste generation. In 1994, DSM, under contract to the DEC, surveyed recycling processors, scrap metal processors, composting facility operators, major businesses engaged in economic recycling, solid waste districts and reuse/salvage business owners/operators and estimated that 164,800 tons of materials (not including C&D waste) were diverted from disposal through reuse, recycling and composting.<sup>3</sup> The DEC estimated this to be 35 percent of total solid waste generation.<sup>4</sup>

Finally in 1998, 1999, and 2000 the DEC estimated approximately 196,000 tons, 199,000 and 189,500 respectively were diverted from disposal based on facility reporting and the use of data from the 1994 DSM surveys<sup>5</sup>. Using data collected on total tons

<sup>2</sup> Some C&D waste is included in the MSW total because mixed MSW and C&D loads may be counted as MSW.

<sup>3</sup> *Results of Recycling, Composting, and Reuse Survey Conducted for the Vermont Department of Environmental Conservation, Environmental Assistance Division, December 31, 1995.* DSM Environmental Services, Inc.

<sup>4</sup> *Vermont Solid Waste Diversion in 1994. 40% By the Year 2000, Where Are We?* August 1996. State of Vermont, Agency of Natural Resources.

<sup>5</sup> Vermont Solid Waste Diversion and Disposal, Vermont DEC, February 1, 2002

disposed (in state and out of state) yielded diversion rates of 34 percent, 35 percent and 33 percent (rounded) for 1998, 1999 and 2000 respectively.

## II. Overview of 2001 Survey

### Major Differences from EPA Methodology

For 2001, DSM evaluated the EPA's guidance document to determine the limitations of what to include or exclude from calculating Vermont's MSW Diversion Rate. The major differences between Vermont's Diversion Rate calculation and the EPA methodology are:

- **Scope of Materials covered-** DSM did not include the recycling of Oil Filters, Lead Acid Batteries and Tires in the Diversion Rate calculation because it would be impractical to collect accurate data for these materials (the majority of these materials are collected for recycling through private businesses throughout the state). DSM only included fluorescent tubes recycled through solid waste district programs. The EPA guidelines include these materials.
- **Inclusion of some manufacturing waste** – The EPA guidelines exclude all process manufacturing waste from MSW, however some of Vermont's process manufacturing waste is by necessity included in the denominator in Vermont's Diversion Rate calculation as it is disposed with other MSW in Vermont's landfills and in out of state solid waste disposal facilities.<sup>6</sup> Therefore DSM also included recycling of commercial printers' overruns in the numerator of the diversion rate calculation. However DSM did not include ice cream wastes, wood waste and sawdust from the wood products industry in either the numerator or denominator.
- **Inclusion of Backyard Composting** – Backyard (on-site) composting of food scraps and leaf and yard waste is not included in the EPA Recycling Rate guidelines, but the Vermont DEC decided to include this activity in the 1994 rate and DSM has estimated this activity as part of the 2001 diversion rate calculation.
- **Inclusion of Reuse Activity** – Reuse of apparel, furniture, appliances, electronics, pallets and other materials are not included in EPA's methodology but the Vermont DEC decided to include reuse and DSM has attempted to quantify this activity as much as feasible and include it in the 2001 diversion rate calculation.
- **Scrap Metal Recycling** - While ferrous and nonferrous metals from C&D debris, industrial applications, and transportation equipment are not included in EPA's definition of MSW, Vermont's Diversion Rate calculation includes all metals recycling by scrap metal processors except for metals from automobiles. This may result in some C&D debris metals being reported.

Appendix A shows the materials included and excluded from EPA's methodology.

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<sup>6</sup> This does not include any food processing manufacturers' wastes, dairy wastes or sludges which would not be landfilled.

## ***Types of Recycling and Reuse Activities Surveyed***

As part of the Diversion Rate Study, DSM researched or surveyed the following types of recycling, reuse and waste reduction activities occurring in Vermont:

- Recycling through Certified Recycling and Solid Waste Transfer Facilities;
- Reuse Activity through Vermont Business Materials Exchange, Vermont Solid Waste Districts and related activities;
- Organics Composting (backyard, on-site facilities and centralized composting facilities);
- Deposit Return Container Recycling;
- Metals Recycling through Scrap Metal Processors; and,
- Economic Recycling (defined as recycling performed by businesses for economic reasons and not using Vermont certified recycling facilities).

## ***Material Categories***

Listed below are the material categories used for quantifying materials recovered in Vermont in 2001 in this report.

<b>MATERIAL</b>	<b>CATEGORY DESCRIPTION</b>
<b>FIBERS</b>	
<i>Corrugated</i>	Corrugated cardboard, including clean corrugated pizza boxes, and Kraft bags/paper
<i>Newspaper</i>	All newspaper and shoppers inserted in newspapers
<i>Mixed paper</i>	White, office, colored and other paper, junk mail
<i>Magazines</i>	Magazines, catalogues and all coated stock paper
<i>White office paper</i>	White office and computer paper
<i>Books</i>	All books including telephone books
<i>Boxboard</i>	Cereal boxes, chipboard and other paper food package boxes including clean pizza boxes made from chipboard
<i>Commingled fibers</i>	All fibers above, mixed
<i>Miscellaneous other paper</i>	Polycoated paper, other mixed paper
<b>CONTAINERS</b>	
<i>Glass</i>	Mixed clear, green and amber glass bottles and jars
<i>Aluminum cans</i>	Beverage containers and any other aluminum cans
<i>Bi-metal cans</i>	Steel and bi-metal food cans
<i>Aseptic containers</i>	Milk, juice and other aseptic drink containers
<i>Commingled containers</i>	Mixed glass, aluminum, bi-metal and plastics containers
<i>Plastics</i>	
<i>HDPE bottles</i>	HDPE #2 resin bottles
<i>PET bottles</i>	PET #1 resin bottles
<i>Other plastic containers</i>	Mixed resin 1-7 bottles and containers
<i>Film</i>	Redemption bags
<i>Other plastics</i>	All other plastics

## ***Material Categories (continued)***

### **SCRAP METAL**

<i>Appliances</i>	Scrap metal, brown and white goods
<i>Ferrous metals</i>	Scrap metals containing iron excluding metals found in auto bodies and from industrial applications and C&D debris (as feasible)
<i>Non-ferrous metals</i>	Exclude metals from industrial applications and C&D debris as feasible

### **ORGANIC WASTES**

<i>Leaf and yard waste</i>	Leaves, grass, small branches, brush
<i>Food waste</i>	Food waste primarily from commercial sector except for backyard composting estimates
<i>All other organic</i>	Grass, brush, clean wood

### **MISCELLANEOUS**

<i>Wood</i>	Consumer wood products such as pallets, crates, wooden furniture, barrels, etc.
<i>Textiles</i>	Clothing, towels, blankets as reported by municipal recycling programs and limited reuse facilities
<i>Electronics</i>	Computers, televisions, VCRs, CD players/stereos, radios, printers as reported by municipal recycling programs and reuse facilities
<i>Waste Oil</i>	Waste oil collected by districts and municipal programs
<i>Household Hazardous Waste</i>	Hazardous waste collected by districts and municipal programs.
<i>Other</i>	Miscellaneous household items

## ***Limitations of Survey***

DSM made every effort to obtain accurate data while using existing data supplied by the many certified solid waste, recycling and organics composting facilities located in the State. However several factors limit the accuracy of the data reported in this study and must be taken into consideration when applying these data for other purposes.

First, DSM quantified the majority of recycling activity at the point of processing in order to ensure double counting of materials did not occur. DSM relied mainly on information supplied by recycling facilities in the DEC quarterly facility reports to determine the quantity of material processed by the facility and to identify material that did flow through the major processing facilities in the State.

However some smaller facilities without scales (e.g. Springfield, Weathersfield, Shaftsbury) may be estimating volumes and be performing their own conversions from cubic yards to tons or may be relying on totals from brokers or end users (who may be providing estimates because truckload deliveries of loose material may be from more than one facility). The conversions may vary widely with material condition and can result in reported tonnages higher or lower than actual amounts.

Also, the information supplied in the quarterly reports on material flow was incomplete or in some cases appeared inaccurate. In these cases, DSM made follow up telephone calls to clarify information and if the information could not be clarified, the totals were not included in the report.

For example, a number of recycling drop-off facilities in southern Vermont send glass to the Windham MRF for processing. Some of these drop-offs report this tonnage as delivered to the Windham MRF while others do not define where it is delivered. To the extent that we had knowledge that a drop-off facility sent glass to the Windham MRF, we excluded it at the drop-off level, but accounted for it at the Windham MRF level. However, in other cases, we had no knowledge of whether the drop-off delivered to the MRF or not. Similarly, some of these same drop-offs deliver paper to manufacturers such as Putney Paper or to out-of-state processors, but do not report where the material is delivered. Putney Paper is not required to report to the DEC the origin of waste paper feedstock, nor are out-of-state recycling facilities or brokers. In the case of Putney Paper, DSM obtained a confidential estimate directly from them on how much feedstock came from Vermont solid waste transfer stations and recycling facilities and included this in the total, excluding the totals reported by Vermont facilities believed to deliver material to Putney Paper.

Second, there was a lack of complete record keeping from many of the facilities surveyed (e.g. reuse facilities, scrap metal facilities, businesses surveyed for economic recycling activity) as to the quantity or source of the material recycled. In some cases, such as reuse and economic recycling activity, the facility had no reason to maintain records on materials quantities (by volume or weight) sold or recycled. In some of these cases, estimates either were not provided or were provided but not based on any records or weigh data. In the cases where estimates were provided on a per unit basis, DSM used EPA or State conversion factors for specific materials to convert units to weight.

Finally, recycling materials flow in Vermont is ever changing based on fluctuations in the economy, recycled materials markets, and the cost effectiveness of recovering materials to the particular generator. It is complicated by the fact, as stated above, that only some of the processors (those located in Vermont) are required to report tonnages, while those located out-of-state, or those not subject to certification requirements to report, have no incentive to provide this type of business data, which many consider proprietary, to the DEC or to DSM. DSM made contact with all major out of state recycling facilities and obtained estimates over the telephone from them but has no way of verifying that these estimates are accurate or based on weight data.

Despite these challenges DSM made every effort to collect valid data on material quantities for 2001. We believe these data provide reasonable estimates of recycling activity from which to benchmark future year's activity assuming the same data collection and analysis methods are applied. Furthermore recognizing the data collection and reporting errors inherent in this type of study, the actual quantities of materials recycling are most likely within plus or minus ten percent of the numbers presented in this study. (This does not include the quantities of materials reuse in which DSM performed a limited survey of reuse organizations.)

### **III. Survey Method and Results by Survey Type**

#### **Survey/Review of Data from Certified and Other Recycling Facilities**

Under Vermont Solid Waste Management Rules, facilities that collect, consolidate and/or process MSW materials for recycling must be certified or receive a categorical certification by the DEC. All facilities must report either quarterly or annually on the types and quantities of material they collect or process at the facility. The quarterly reporting form provided by the DEC also asks for the destination of the material collected or processed for recycling. One of the reasons this data is collected is to evaluate the progress of recycling activity and to assist in market development.

#### ***Method***

The DEC compiled data from quarterly and annual reports submitted by certified and categorically certified recycling facilities. DSM used the DEC data as a basis to determine the amount of recycling activity occurring through state regulated facilities.

DSM reviewed the data from major processing facilities and specific collection facilities known to send material out of state for processing. DSM conducted follow up telephone calls to out of state processing facilities and to operators of specific Vermont collection facilities (known or suspected to send material out of state) to verify quantities received from Vermont (or sent out of state) and to ensure double counting of material collected in Vermont did not occur.

#### ***Results***

Reporting Vermont recycling facilities collectively were responsible for an estimated 71,800 (rounded) tons of recyclable material in 2001 (Note this total does not include appliances and scrap metal).

The source of this material is shown in Table 1. As shown in Table 1, over 70 percent of this material is paper with cardboard and newspaper collectively representing about 55 percent of the total material by weight. The majority of this material was processed in Chittenden County (over 60 percent) although some of this was collected in counties to the north, east and south of Chittenden County and brought to the County for processing. The material totaled in the "Other Recycling Facilities" column includes materials from transfer stations/recycling facilities that sent material to the out-of-state non-reporting recycling processors and/or end users in 2001 including:

- Recycling Services of Claremont, NH;
- Pine Tree Waste (now out of business);
- Bennington Boxboard;
- Putney Paper;
- Canusa of St. Albans;
- Northeast Resource Recovery Association;
- American Retroworks;
- North Adams, MA Transfer Station; and,
- Miscellaneous textile recyclers and brokers.

**TABLE 1**  
**Material Recycled from Certified Vermont Recycling Facilities in 2001**

	Chittenden SWD MRF (Williston)	Casella MRF (Burlington)	Rutland SWD MRF (Rutland)	Windham SWMD MRF (Brattleboro)	Gauthier Trucking Facility (Essex)	Northeast Waste Services - Casella (Hartford)	Northeast Kingdom WMD Facility	Other Recycling Facilities (3)	TOTAL MATERIAL
<b>MATERIAL</b>									
<b>PAPER</b>									
Corrugated	3,266	7,696	5,138	844	2,679	1,220	923	1,191	22,958
Newspaper	12,595	862	2,058	55	521	262	199	553	17,106
Mixed paper		575	401	23	579	857	107	366	2,908
Magazines		402	263		1,268	197	199	204	2,533
White Office Paper	501	187	98			42		14	841
Books	57	75					7	5	143
Boxboard	563	88	213			15	1	41	921
Commingled fibers				1,921				2,154	4,075
Miscellaneous other paper			168					77	245
<b>Subtotal, Paper:</b>	<b>16,982</b>	<b>9,884</b>	<b>8,339</b>	<b>2,843</b>	<b>5,048</b>	<b>2,592</b>	<b>1,437</b>	<b>4,604</b>	<b>51,730</b>
<b>CONTAINERS</b>									
Glass	2,983	5,908	747	1,488		137	97	2,612	13,971
Aluminum Cans		51	16			5		11	84
Bi-metal Cans	918	234	317	17	129	41	36	13	1,705
Asceptic		14						0	14
Commingled containers				1,172				440	1,612
<b>Plastics</b>									
HDPE bottles	739	79	155	4		43	45	36	1,100
PET bottles	377	86	113	2		32	14	18	641
Other plastic containers		15						8	23
Film		89						0	89
<i>Plastics, subtotal:</i>	<i>1,116</i>	<i>269</i>	<i>268</i>	<i>6</i>	<i>0</i>	<i>74</i>	<i>58</i>	<i>61</i>	<i>1,853</i>
<b>Subtotal, Containers:</b>	<b>5,017</b>	<b>6,476</b>	<b>1,348</b>	<b>2,683</b>	<b>129</b>	<b>257</b>	<b>191</b>	<b>3,137</b>	<b>19,238</b>
<b>MISCELLANEOUS</b>									
Electronics (1)								170	170
Waste Oil (2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	201
HHW (2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	459
<b>Subtotal, Miscellaneous:</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>170</b>	<b>830</b>
<b>TOTAL MATERIAL:</b>	<b>21,999</b>	<b>16,361</b>	<b>9,687</b>	<b>5,527</b>	<b>5,176</b>	<b>2,849</b>	<b>1,627</b>	<b>7,912</b>	<b>71,798</b>

(1) Total reflects all materials processed by American Retroworks that were collected for recycling at solid waste district collections.

(2) Total Material shown is tons reported from all reporting facilities combined.

(3) Total includes material from collection facilities that send material directly to out of state processing facilities or end-users.

(4) Numbers may not add due to rounding.

## Conclusions and Recommendations

Certified municipal, district and private recycling facilities continue to provide collection and processing infrastructure that accounted for an estimated 39 percent of recycling activity in the State in 2001. However when comparing these quantities to 1994 data, there appears to be an increase of only about 10 percent since 1994. Table 2 makes this comparison.

**TABLE 2**  
**Comparison of Reporting Recycling Facilities (1994 vs. 2001)**

		1994	2001
		(tons)	(tons)
<b>Paper</b>	Corrugated	20,041	22,958
	Newspaper	16,642	17,106
	Mixed paper	2,670	2,908
	Magazines	3,208	2,533
	White Office Paper	2,318	841
	Books	NA	143
	Boxboard	NA	921
	Commingled fibers	NA	4,075
	Miscellaneous other paper	380	245
		Subtotal:	<b>45,259</b>
<b>Containers</b>	Glass	10,973	11,045
	Aluminum Cans	546	84
	Bi-metal Cans	1,987	1,705
	Commingled containers	321	991
	HDPE bottles	919	1,100
	PET bottles	472	466
	Film (2)	2	89
	Other Plastic Containers	153	23
	Subtotal:	<b>15,373</b>	<b>15,501</b>
	Total:	<b>60,632</b>	<b>67,231</b>

(1) Does not include deposit return containers in the "Containers" totals.

(2) Mostly redemption bags.

One of the reasons why the difference between the 1994 data and the 2001 data is not greater may be due to overreporting of materials recycled in 1994, or poor conversion of volume to weight by small facilities without scales in 1994.

The accuracy and level of reporting of materials recycling through these facilities has improved greatly since 1994 as evidenced by the quarterly reports filed to the DEC. However the flow of materials from collection point to processing facilities has made it equally difficult to use these reports to compare recycling activity from one year to the next. This is because material that is collected at a certified transfer station facility and processed at a certified recycling facility in Vermont is recorded on two reports and entered twice into the DEC recycling database. A line on the form asks for the location where the material is transferred to (destination of material) but is listed as an optional entry.

As a result, of the roughly 115,000 tons of materials reported by certified recycling facilities in 2001 only 23 percent of this material reported included a destination for the material collected or processed. Because of this, informed assumptions about material flow must be made by the DEC. In reporting the rate after 1994, the DEC has primarily relied on data from Vermont *processing* facilities to represent the quantity of materials from all Vermont recycling facilities.

One way to solve this problem would be to reduce some of the reporting requirements for certified facilities by making the following changes to the existing requirements.

- First, reduce the quarterly reporting requirements for small recycling facilities (such as those that report collecting < 500 tons per year) by allowing them to instead report annually on recycling quantities.
- Second, require that all certified recycling facilities that don't process material (that is they ship loose material to a processor) to list the destination to which they send the material for processing. This would include listing any out of state facilities if they do not send material to a Vermont processing facility.
- Finally, ask facilities who use a Vermont "certified recycling facility" for processing (the form would need to list these facilities) to verify that they sent all their material in the reporting year to a certified facility but not require that they report on the quantity shipped. Instead require that they maintain totals internally for tracking purposes, including the regular updating of their Solid Waste Implementation Plans.

The downside of loosening the requirements for small facilities is that the quality of local recordkeeping will decline. Also in some cases towns who use brokers do not know the end destination of material. However, these reporting exemptions may encourage them to better track the flow of the materials they collect.

Obviously with increased access to the internet by municipalities these reporting forms could be made available online for data entry, submittal and review which may also lessen paperwork burdens on both ends.

### **Survey of Materials Reuse**

Materials are also diverted from disposal through reuse. There are hundreds if not thousands of reuse, resale and repair businesses (e.g. thrift shops, consignment shops, sporting goods stores) located in Vermont. In the late 1990's the Association of Vermont Recyclers compiled a database of 900 reuse organizations in the State. These organizations are supplemented by auctions, yard and barn sales, fundraising events, ski and skate sales, material exchanges and hundreds of other activities all contributing to reuse of materials that may otherwise be disposed. Used clothing alone was one of America's major exports to Africa, with over \$61 million in sales.

However, while recycling has received much of the attention and considerable subsidies from solid waste districts, reuse receives significantly less subsidy and requires less in the way of processing and transporting costs.

It would be impractical if not impossible to attempt to quantify all of this reuse activity for two main reasons. One, the changing nature of reuse and repair businesses and off the books reuse activity would make surveying difficult and unreliable. Two, even if we were able to survey a portion of these activities, the records kept by the majority of these organizations would not be weight or volume based.<sup>7</sup>

As a result, DSM limited its survey of reuse activity to organizations and activities that *may* have come about as a result of Act 78.

### **Method**

DSM compiled **limited** information on reuse activity occurring in the state of Vermont from three sources:

- Not for profit organizations dedicated to reuse;
- Solid waste district activities dedicated to reuse; and,
- For profit businesses that reuse materials.

The survey was further limited to reuse of materials that would be designated as MSW if disposed. This excludes many construction and building supplies that may be recovered through deconstruction, renovations and new construction and be destined for reuse.

DSM referred to existing data files on reuse activity occurring in the State (and the region) from a Fall 2000 reuse business feasibility study performed for the Lamoille Solid Waste District. DSM supplemented these data with telephone calls to Vermont's solid waste districts and to several reuse organizations. The brief telephone survey's goal was to:

- Identify reuse activities (retail sales, swap shops, special events) and the types of materials exchanged;
- Quantify the volume or weight of material reuse by material type, where possible; and
- Determine the flow of material for reuse to avoid double counting.

### **Results**

There can be frequent changes amongst reuse organizations and reuse activity is difficult to quantify. Since DSM conducted research on reuse activity in the Central Vermont region in Fall 2000, two of these businesses have closed, and one organization has expanded into the sale of used building materials. Furthermore, Vermont solid waste districts wholeheartedly support the concept of reuse, and many have organized reuse programs, but quantifying material diverted through specific reuse activities has been impractical if not impossible for even the solid waste districts who are dedicated to waste diversion.

DSM did document reuse activity from nine organizations in Vermont as well as contacted the Vermont solid waste districts to gain insight into their reuse efforts. Table 3 illustrates these results.

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<sup>7</sup> Computer programs do exist that are designed to account for materials donated by businesses. This program converts numbers of materials into average weight and used value. For information, call (415) 671-4931 or the San Francisco Recycling Department at (415) 554-3418.

**TABLE 3**  
**Estimated Quantities of Material Reuse through Select Organizations in 2001**

REUSE ORGANIZATION	Clothing/textiles	Furniture	Computers/Electronics	Large Appliances/Metals	Books	Small Appliances	Misc. (1)	TOTAL
	(tons)	(tons)	(tons)	(tons)	(tons)	(tons)	(tons)	
Good Buy Store	96	60				✓	✓	156
American Retroworks	75	✓	30	✓		✓	✓	105
Vermont Retroworks - Community Action	317	✓	3		✓	✓	10	330
Recycle North		155	28	70		14	21	289
ReStore	✓				✓		✓	0
Computer Barn			✓					0
Salvation Army (Chittenden County mostly)	1,254	✓			✓	✓	✓	1,254
Vermont Business Materials Exchange	23	9	40	89	18		11	190
Vermont Republic Industries							✓	0
Vermont Solid Waste Districts and Municipalities	21	✓	✓		✓	✓	137	158
<b>Total:</b>	<b>1,786</b>	<b>225</b>	<b>100</b>	<b>159</b>	<b>18</b>	<b>14</b>	<b>179</b>	<b>2,482</b>

(1) Includes glass reuse on-site, newspaper bedding, and miscellaneous household items.

(2) ✓ indicates reuse activity occurs but no unit or weight data available.

As shown in Table 3, the estimate provided by the Salvation Army represents the largest amount of reuse activity (by weight) documented. This estimate represents textiles shipped out of state primarily for export to textile reuse markets overseas.

### **Conclusions and Recommendations**

DSM's survey results show that the Salvation Army, which has been operating for over a century, is the largest contributor to textile reuse/recycling in Vermont with six retail outlets in the State. (Only textiles shipped for reuse/recycling are included in the estimate provided.) However clearly furniture and appliance reuse within Vermont also diverts material from disposal.

Quantifying reuse activity however continues to be challenging. Even the Vermont Business Materials Exchange whose objective is to measure reuse activity that results from the service has a difficult time reporting all exchanges.<sup>8</sup>

<sup>8</sup> Note that some VBMx exchanges occurring in 2001 are not included because they were either C&D waste or not quantifiable.

While DSM does not recommend that the DEC spend time quantifying reuse, we acknowledge that it provides an important contribution to materials diversion in Vermont that is often overlooked when compared to recycling. The numbers reported by DSM represent only a very small percentage of total materials reuse in the state.

## Survey of Organics Composting Activity

### Method

Organics composting activity was estimated from three sources:

- Certified and Categorically Certificated Composting Facilities
- Exempt On-site Composting Facilities; and
- Backyard Composting Activity.

Certified and categorically certified composting facilities are required to report to the DEC on the quantities of materials handled either quarterly or annually. Exempt facilities (small scale generators with on-site composting operations) are not required to report.

DSM relied mainly on information provided by the DEC to estimate the tons of organic material diverted by composting operations. The DEC compiled information from the quarterly and annual reports on quantities composted and supplemented this data with telephone calls to exempt composting operations. DSM organized this data and supplemented some data by telephone calls to the DEC or to facility operators.

DSM also estimated the quantity of material composted on-site by residents. To do this, DSM first researched what methods other states have used to estimate backyard composting quantities. DSM found the results to be similar to the approach taken by DSM in the 1994 survey. In summary, DSM found:

- In **Massachusetts**, the MA Department of Environmental Protection (DEP) performed a telephone survey in October 1999 to determine the level of participation in on-site diversion of organic waste. They found that 85 percent of residents divert at least some of their yard waste and half of these compost their yard waste. They also found that 25 percent of residents compost some of their food waste and 4 percent compost paper waste.<sup>9</sup>
- In **Seattle**, Seattle Public Utilities<sup>10</sup> used the number of composting bins delivered to households and conducted a follow up survey on usage. They then applied a yard waste generation coefficient (630 pounds of *compostable* leaf and yard waste per household based on a waste composition study) and multiplied this by an assumed efficiency rate of 80 – 90 percent. This yields between 504 and 567 pounds of leaf and yard waste composted annually per household using the bin.
- In Vermont, the **Chittenden Solid Waste District** conducted a telephone survey (October 2000) of households in the District and asked if they composted yard waste and/or food waste. The survey results found that 38.9 percent of

<sup>9</sup> Residential Organic Waste Management Survey, MA DEP, 2000. ([www.state.ma.us/dep/recycle/compost.htm](http://www.state.ma.us/dep/recycle/compost.htm))

<sup>10</sup> Bagby, Jennifer. *Backyard Composting Measurement*. Seattle Public Utilities, for the National Recycling Coalition. May 1998

households surveyed compost yard waste and 25.9 percent of households surveyed compost food waste

Working with the DEC DSM compiled totals of composting bin sales to estimate household backyard composting. Since 1994, 8842 compost bins have been documented as sold through the solid waste districts and statewide sales. DSM felt this number severely underestimated the number of households participating in backyard composting. Therefore, DSM believes that the CSWD estimate (of the percent of Chittenden County, Vermont households composting food and yard waste in their backyards) was the best estimate to apply to Vermont given that a statewide survey was not feasible.

### ***Estimating the Quantity of Material Composted Backyard Per Household***

Recent research from the University of Arizona shows the average household creates "474 pounds of food debris each year"<sup>11</sup>. Curbside set-out data from Fairfield and Greenwich, Connecticut indicates that households set out for collection an average of 710 pounds per household per year of compostable material.<sup>12</sup> A 1995 nationwide survey indicates households in municipalities with active backyard composting programs divert 646 pounds of compostable material per year.<sup>13</sup> Finally, a Seattle Public Utilities researcher estimated that households composted between 504 and 567 pounds of leaf and yard waste per year in backyard compost bins.<sup>14</sup>

Yard waste generation varies widely in the United States depending on housing density, climate and landscaping practices. We have assumed that the reports of diversion of 646 to 710 pounds of compostable material include food, leaf and yard waste and compostable paper (which are not likely to be composted in back yards in most cases).

Using all of these references as a guide, DSM conservatively estimated that the average back yard composting household diverted 350 pounds of food waste and 250 pounds of yard waste to backyard composting, as illustrated in Table 4.

### ***Results***

First, based on the CSWD survey and the literature (described above), DSM estimated that 26 percent (rounded) of Vermont households composted 350 pounds of food waste each and 39 percent (rounded) of households composted 250 pounds of yard waste in 2001. Table 4 shows the quantity of organics material estimated to be diverted to backyard composting in 2001 assuming there were 240,634 occupied households in Vermont (US Census 2000).

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<sup>11</sup> Johnson, Jim. "Households generate 474 pounds of food waste per year, researchers say". *Waste News*, August 16, 2002.

<sup>12</sup> Wet Bag Composting Demonstration Project, National Audubon, Spring 1993.

<sup>13</sup> Sherman, Steve. *Analyzing the Costs and Benefits of Home Composting Programs*. Resource Recycling, June 1996.

<sup>14</sup> Bagby, Jennifer, PhD, Seattle Public Utilities. *Backyard Composting Measurement*. National Recycling Coalition.

**TABLE 4**  
**Estimated Quantity of Organic Material Diverted to Backyard Composting in 2001**

<b>MATERIAL</b>	<b>Number of Households Composting (households)</b>	<b>Annual Quantity per household (pounds)</b>	<b>Total Material (tons)</b>
Yard Waste (1)	93,607	250	11,701
Food Waste (2)	62,324	350	10,907
<b>Total:</b>			<b>22,608</b>

- (1) DSM assumed 38.9% of Vermont's 240,634 occupied households (US Census 2000) were composting yard waste in their backyards.  
 (2) DSM assumed 25.9% of Vermont's 240,634 occupied households (US Census 2000) were composting food waste in their backyards.

Table 5 shows the total estimates of organics composting activity in 2001 including the backyard composting estimate shown in Table 4. As shown in Table 5, backyard composting represents 77 percent of the total material.

**TABLE 5**  
**Estimated Total Quantity of Organic Material Diverted to Composting in 2001**

	<b>COMPOST FACILITIES</b>				<b>TOTAL (tons)</b>
	<b>Certified (tons)</b>	<b>Categorical Certified (tons)</b>	<b>Exempt (tons)</b>	<b>Backyard Composting Estimates (tons)</b>	
<b>Paper</b>					
Corrugated					0
Newspaper				38	38
Mixed paper	3				3
<b>Subtotal, Paper:</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>38</b>	<b>41</b>
<b>Organic Wastes</b>					
Leaf and yard waste	2,652	62	93	11,701	14,508
Grass	1	0	0		1
Clean wood	298	0	0		298
Food waste	1,796	1,111	581	10,907	14,394
Ice cream waste (2)	NA	NA	NA	NA	NA
Mixed organics	49	376	0	0	425
<b>Subtotal, Organic:</b>	<b>4,796</b>	<b>1,548</b>	<b>674</b>	<b>22,608</b>	<b>29,626</b>
<b>Total Material:</b>	<b>4,799</b>	<b>1,548</b>	<b>674</b>	<b>22,646</b>	<b>29,667</b>
<b>% of Total</b>	<b>16%</b>	<b>5%</b>	<b>2%</b>	<b>76%</b>	<b>100%</b>

(1) Excludes manure and sawdust.

(2) Ice cream waste reported to be composted in Vermont was 6,364 tons, but was not included in the totals because it is not classified as MSW.

### ***Conclusions and Recommendations***

As shown in Table 5, centralized composting facilities diverted less than 25 percent of the total estimated organics material composted in 2001. In contrast, backyard composting activity may be diverting large quantities of material from disposal.

Measuring backyard composting activity is extremely difficult, if not impossible, instead necessitating the use of estimating techniques such as the method applied by DSM. With additional resources, the DEC could conduct an annual telephone survey of Vermont residents' backyard composting behavior. In the meantime, the DEC could use the 2001 estimate made by DSM and adjust for changes in population.

### **Survey Of Deposit Return Container Recycling**

Under Vermont Statute, Title 10, Chapter 53, beverage containers must be accepted for recycling at the place of purchase and distributors must offer a system for collecting the redeemed containers. "Beverage" means beer or other malt beverages and mineral waters, mixed wine drinks, soda water, carbonated soft drinks, and as of January 1, 1990, liquor.

DSM surveyed the quantity of material recycled through deposit return container collection programs set up as a result of Vermont bottle bill legislation. This material is recovered through collection points at redemption centers, grocery stores, convenience stores, liquor stores and other beverage retail stores. Distributors must pay retailers and redemption centers 3 cents per container collected for consolidating the material. Distributors are required by law to pick up the material from these collection points. Distributors then either sort and process the material themselves, sending the glass, plastic and aluminum directly to market, or, use an existing recycling processor to manage and market their material.

### ***Survey Methodology and Limitations***

DSM made estimates on the tons of glass, PET and aluminum cans recovered through the deposit return container system by undertaking the following steps.

First, DSM contacted representatives for the Vermont Soft Drink Association and the malt beverage distributors regarding annual surveys of their members.

Second, DSM collected data directly from several soft drink distributors and with the help of Sherman, Kimbell & Ellis, who represents the malt beverage distributors, collected data through the distributor's representative. Data were collected on the quantity (by weight) of glass, plastic and aluminum cans originating in Vermont that were recycled through the distributor. DSM also queried the distributors on the flow of each material to ensure that material processed through a Vermont certified recycling facility was not double counted.

Third, for the malt beverage distributors, DSM estimated material quantities based on market share and estimated quantities provided by the largest distributors.

Fourth, DSM contacted the State Liquor Control Agency to obtain estimates of liquor bottles returned. Estimates were available but not separated by glass or plastic.

Finally, DSM compared the Vermont 2001 estimates to other estimates and data available. This includes the Vermont 1994 estimates<sup>15</sup>, the Vermont 1996 estimates (made by Northbridge Environmental)<sup>16</sup> and Massachusetts 2001 estimates.<sup>17</sup> Massachusetts estimates were reviewed because they are relatively accurate (they are computed based on Massachusetts Department of Revenue bottle return data) and therefore could be compared on a per capita basis to Vermont. However, DSM also recognizes that Massachusetts residents purchase many non-deposit beverages over the border in New Hampshire and Rhode Island.

Vermont 2001 estimates presented below should be viewed with the following limitations in mind.

- DSM did not review written records of materials recycled from any of the distributors.
- Most distributors handle material from more than one state and the quantities of material recycled by source (i.e. Vermont, NY or MA) are difficult to disaggregate. In these cases, distributors estimated the percentage of the recycled material collected in Vermont.
- Estimates of malt beverage container recycling were based on the market share and package mix (glass, plastic or aluminum) of the largest distributor in Vermont. The brands sold by other distributors may have a slightly different package mix than this one distributor but, for lack of better data, were used as the basis for the estimate.
- Some of the smallest distributors as well as grocery store chains did not provide estimates of material recycled.

## **Results**

Table 6 shows the results of the survey of deposit return beverage container recycling in Vermont. It breaks out the material recovered by source (beer, soft drink or liquor distributors) and by material type. Only one distributor reported the quantities of fiber recovered. Table 1 also shows the percentage and tons of material that is brokered directly from the distributor's consolidation point to an out of state processor or end user (73 percent of total material). This leaves 3737 tons or 27 percent of deposit return container materials processed through certified recycling facilities in Vermont in 2001.

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<sup>15</sup> See *Results of Recycling, Composting, and Reuse Survey Conducted for the Vermont Department of Environmental Conservation*. December 31, 1995. DSM Environmental Services, Inc.

<sup>16</sup> Northbridge Environment (Westborough, MA) for the Vermont Soft Drink Association, 1996.

<sup>17</sup> Provided by John Fischer, MA DEP, E-mail correspondence, April 19, 2002.

**TABLE 6**  
**Quantities of Material Recovered Through Deposit Beverage Container Recycling**

MATERIAL	Type of Distributor			Total (tons)	Broker Direct (tons)	% broker direct (2)
	Beer	Soft Drink	Liquor (1)			
<b>PAPER</b>						
Corrugated	250		127	377	377	100%
Mixed paper	9			9	9	100%
<b>Subtotal, Paper:</b>	259	0	127	386	386	100%
<b>CONTAINERS</b>						
Glass	7,985	154		8,139	5,212	64%
Aluminum Cans	1,335	1,056		2,392	1,756	73%
Commingled containers			1,267	1,267	1,267	100%
<b>Plastics</b>						
PET bottles	175	1,288		1,463	1,288	88%
Film						
<b>Subtotal, Containers:</b>	9,495	2,498	1,267	13,260	9,524	72%
<b>TOTAL MATERIAL:</b>	<b>9,754</b>	<b>2,498</b>	<b>1,394</b>	<b>13,646</b>	<b>9,909</b>	<b>73%</b>
<b>% of material (by weight)</b>	<b>71%</b>	<b>18%</b>	<b>10%</b>			

(1) Breakdown of glass vs. plastic is not available.

(2) Broker direct material is material that does not pass through Vermont certified recycling processing facilities.

It should be noted here that the high percentage of recycling tonnages attributed to beer is the result of the amount of beer packaged in glass bottles (estimated at 50 percent), as opposed to soda, where the vast majority is packaged in light-weight plastic and aluminum. This information does not indicate that beer returns are greater than soda returns.

The decrease in the weight of materials recovered since 1996 (the last time a survey was conducted) is likely due to a shift in soft drink packaging from glass to plastic. In addition, sales of beer have been flat or slightly declining this past year.

**Conclusions and Recommendations**

Documenting annual deposit return material recycling in Vermont is time consuming because there is no uniform reporting system and it requires an understanding of Vermont distributors' recycling activities. In future years, estimates could be performed using one of the following three methods:

- Work with distributors to obtain summary information from the reports made by distributors on the handling fee paid to retailers in VT. (The handling fee represents the number of units recovered.) These summary reports would then need to be adjusted for the package mix (the percentage of glass, plastic and aluminum containers);

- Survey distributors annually on the tons of plastic, glass and aluminum collected in Vermont and the destination of such material (while making it clear container sales need not be disclosed); or,
- Use estimates from this 2001 study and adjust annually for population increases and increases (or decreases) in beverage consumption (based on informational interviews with industry representatives).

The last option, using the estimates from the 2001 study and making adjustments would be the best method for the DEC to apply in the next few years when resources are limited.

## **Survey of Scrap Metal Processors**

### ***Method***

Scrap yards/metal processors play an important role in diverting large quantities of material from disposal facilities; however these facilities have traditionally been a very difficult sector from which to obtain accurate data. This observation is confirmed by the President of the Institute of Scrap Recycling Industries, the national trade organization for scrap metal recyclers, who claims that they have never compiled national data on quantities recovered by members because of the challenges of obtaining accurate data from these businesses.

DSM was unsuccessful at contacting regional trade representatives to collect data on metals recycling in Vermont. Therefore, DSM conducted limited telephone surveys to Vermont's major metals processors to develop an estimate of quantities of metals recovered in Vermont. This was supplemented by data available from DEC from the certified solid waste and recycling facilities database.

### ***Results***

DSM obtained data directly or indirectly from 22 metals processors on the quantity of metals processed that were collected from Vermont.<sup>18</sup> These processors were located in the four-state region and estimated they processed a total of **34,830** tons of ferrous and non-ferrous metals. This includes appliances and other white goods collected from transfer stations and recycling drop-offs throughout Vermont, and potentially metals removed from construction sites.

### ***Conclusions and Recommendations***

The 2001 survey figures are down from the 1994 survey figures DSM collected. Metal processors mention that falling metals prices, economic slowdown and a reduction in manufacturing activity in Vermont all have played a factor in the decrease. Nationwide, steel recovery rates were down from 1994 where 68.3 percent was recovered as opposed to 64.1 percent in 2000 (the most recent year available).

After two rounds of surveying metals processors, DSM would not recommend this approach in the future. This is because DSM believes that it is impossible to accurately

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<sup>18</sup> This was up from 18 who provided data for the 1994 survey.

disaggregate construction and demolition metals from other metals. A future approach would be to include only the metals reported on the quarterly reports.

An alternative approach would be to use the most recent estimates for appliance and steel packaging recycling available from the Steel Recycling Institute or EPA (2000) and divide by the US population (to convert to a per capita metals recovered) and then multiply by Vermont's population. To avoid double counting, recycling of bi-metal cans through Vermont's certified recycling facilities must be subtracted from this total.

Both of these approaches however would yield a total less than the estimate reported in this report because it does not include metals recovered from the commercial and industrial sector.

### ***Economic Recycling Survey (Direct To Market)***

For economic reasons, materials recovery occurs between Vermont businesses and brokers who seek to sell the material to end users or it occurs directly between the business and end user. Since these materials bypass Vermont material processing facilities, the types and quantities are not reported to the DEC. This type of recycling has been going on as long as there has been economic activity in the State, and is not directly impacted by state and district recycling programs, except to the extent that a recycling collection infrastructure continues to grow in Vermont and public sector processing facilities are now used more often by commercial and industrial generators in Vermont than they were in 1994.

### ***Method***

DSM surveyed by telephone some of the largest employers and manufacturing facilities to try to estimate the level of "economic" recycling activity that occurred in the State in 2001 and make some comparisons to 1994, the last year an economic recycling survey was conducted.

DSM attempted to survey a total of 64 businesses and completed a total of 49 surveys. This included a survey of 20 of the State's top 50 employers in 2001. Companies surveyed represented over 40,000 employees (at least 20 percent of the employment base). DSM also attempted to reach brokers and suspected end users to discuss economic recycling activity occurring in Vermont directly with them.

### ***Results***

Table 7 illustrates the results of the economic recycling telephone survey. Complete results are shown in Appendix B. The most major change seen since 1994 is that Vermont seems to be handling more recyclable material (mainly cardboard and paper) locally through processing infrastructure that exists in state. Of the 49 completed surveys performed by DSM, at least 50 percent of those respondents reported recycling through a local hauler or processor.

As shown in Table 7, the majority of recycling reported to DSM was in the printing and publishing businesses where print overruns, trim paper and scrap paper provide valuable recycled fiber to end users. While the EPA methodology would not consider

this in a recycling rate calculation, Vermont does because if this material were not recovered, it would be landfilled or otherwise disposed with other MSW from Vermont.

Grocery stores also continue to backhaul large quantities of cardboard from stores to central processing facilities. While DSM was not able to survey all grocery store chains in Vermont, estimates from reporting stores can be applied to employment in this sector to provide an estimate of total cardboard recycling through Vermont grocers. DSM estimates that the amount of OCC reported for this study represents 40 percent of the total OCC being backhauled by Vermont grocers. Adding the other 60 percent or 7,046 tons yields a total of 33,900 tons (rounded) of material recovered in Vermont through "economic" recycling activity. This calculation is shown in Table 8.

**TABLE 7  
Summary of Economic Recycling (Direct to Market)  
Survey Results (2001)**

Surveys Completed	SECTOR	Recycling Mgmt	TOTAL PAPER (tons)	TOTAL OTHER (tons)	TOTAL MATERIAL (tons)
1	BUSINESS SERVICES	Local Processor	0	0	0
3	COLLEGES & UNIVERSITIES	Local Processor	0	9	9
1	COMMUNICATIONS	Local Processor	0	0	0
1	FINANCE, INSURANCE & REAL ESTATE	Local Processor	0	0	0
1	PRODUCE- RETAIL	Local Processor	0	0	0
5	GROCERY STORE CHAINS	Backhaul	4,813	96	4,909
7	SUPERSTORES/CHAIN STORES	Local Processor/ Backhaul	2,680	0	2,680
2	HOSPITALS	Local Processor	0	0	0
2	HOTELS & INNS	Local Processor	0	0	0
5	MANUFACTURING (20-33)	Local Processor/Broker	300	264	564
8	PRINTING & PUBLISHING	Broker	13,707	0	13,707
6	ALL OTHER MANUFACTURING (28 - 39)	Local Processor/Broker	234	12	246
1	ELECTRIC & GAS UTILITIES	Local Processor	0	0	0
1	WHOLESALE - NON DURABLE	Broker	396	0	396
3	FEDERAL GOVERNMENT - Post Office	Local Processor/End user	600	0	600
2	MISC	Brokers	3,720	0	3,720
49		<b>Totals <sup>(1)</sup></b>	<b>26,449</b>	<b>381</b>	<b>26,831</b>

<sup>(1)</sup> Numbers may not add due to rounding.

**Percentage of Total:** 99% 1%

**TABLE 8**  
**Total Estimated Economic Recycling (Direct to Market)**  
**Activity in 2001**

<b>ECONOMIC RECYCLING SURVEY</b>	<b>(tons)</b>
All Business Sectors (Table7)	<b>26,831</b>
<b>ESTIMATE OF ADDITIONAL ECONOMIC RECYCLING</b>	
<b>(OCC from Grocery Stores)</b>	
Surveyed OCC Recycling (40%)	4,697
<i>Other Grocery Stores Recycling (60%)</i>	7,046
Total For Groceries	11,743
<b>Net:</b>	<b>7,046</b>
<b>Total Estimated Economic Recycling</b>	<b>33,877</b>

Finally 99 percent of the material reported as recycled was fibers. Only 101 tons of plastic film was reported as recycled and 16 tons of other plastics. The rest of the other material was metals (251 tons), textiles (5 tons) and computers (9 tons).

***Conclusions and Recommendations***

The “economic” recycling (direct to market) of cardboard may not be increasing in Vermont due to waste reduction factors such as use of shrink wrapped pallet loads. One major grocer estimated that as much as 40 percent of goods arrive at the store in shrink wrap as compared to 10 percent or less in the early 1990s. This makes less cardboard available for recycling.

Conversely the superstores or box stores may be bringing more cardboard into Vermont in packaged electronics and other appliances. However instead of removing the packaging at the point of sale, the cardboard package is brought home by the consumer. This observation was not confirmed by data but several superstores surveyed did not report backhauling any cardboard in 2001.

However, even with the increase in use of shrink wrap and other plastic packaging, plastic film recycling has not taken off. This may be because it remains uneconomical to recover film/shrink wrap for recycling.

Overall the quantity of material recovered through “economic” recycling activity has not increased since 1994. The main factors DSM identifies as contributing to this are:

- An increase in cardboard going to local materials recovery facilities (such as those in Chittenden County);
- A decrease in cardboard use in grocery stores and other businesses replaced by shrink wrap and other reusable packaging;
- A decrease in waste paper from printing as a result of increased efficiency in printing and a decrease in printing activity; and
- A decrease in manufacturing activity in the state.

DSM acknowledges that our estimate under reports this type of recycling activity simply because, due to the scale of this research project, DSM was not able to contact all

businesses engaged in economic recycling. However DSM does believe that our survey captured the majority of economic recycling activity that did occur in the State in 2001.

DSM does not recommend that the DEC undertake an annual survey of economic recycling because of the time required to collect this data, and the fact that some businesses surveyed wish their data to remain confidential. The best method for improving the accuracy of data collected would be to perform some percentage of on-site surveys; however this would increase survey costs.

DEC instead may want to use the estimate provided in this report for rate calculations in the next few years. In the future, the DEC may want to contract again with an outside consultant to update this data as “economic” recycling will continue to be a valuable contributor to diversion activity in Vermont.

## IV. Conclusions

The comprehensive results of the 2001 Municipal Solid Waste Diversion Study are outlined in the tables shown in Appendix B. Table 9 summarizes the survey data collected. As shown in Table 9, a total of **182,562 tons** of estimated materials were diverted from disposal in Vermont in 2001.

Fibers represented nearly half of the materials diverted with scrap metal, containers and organics representing between 15 and 20 percent each of materials diverted that were measured by the surveys.

The biggest factors contributing to measured diversion were the Vermont certified collection and processing facilities (37 percent), economic recycling (19 percent) and the scrap metal processors (19 percent). However if the assumptions made for estimating backyard composting are relatively accurate, organics composting also plays an important role in materials diversion (16 percent).

**TABLE 9**  
**Summary of Materials Diverted by Survey Type (2001)**

<b>SUMMARY OF SURVEYS CONDUCTED</b>								
<b>MATERIAL</b>	VT Certified Recycling Facilities (tons)	Reuse Facilities/Programs (tons)	Organics Composting (tons)	Soft Drink and Beer Distributors (tons)	Scrap Metal Facilities (tons)	Economic Recycling (tons)	<b>TOTAL (tons)</b>	<b>% OF TOTAL (%)</b>
PAPER	51,730	137	41	386	0	33,495	85,788	47%
CONTAINERS	15,501	19	0	13,260	0	117	28,897	16%
SCRAP METAL	0	159	0	0	34,830	251	35,240	19%
ORGANICS	0	0	29,626	0	0	0	29,626	16%
MISC.	830	2,167	0	0	0	14	3,011	2%
<b>TOTAL:</b>	<b>68,061</b>	<b>2,482</b>	<b>29,667</b>	<b>13,646</b>	<b>34,830</b>	<b>33,877</b>	<b>182,562</b>	
<b>% of TOTAL:</b>	<b>37%</b>	<b>1%</b>	<b>16%</b>	<b>7%</b>	<b>19%</b>	<b>19%</b>		

(1) Containers diverted by soft drink and beer distributors include 3737 tons that are processed by Recycling Facilities but not included in their total for this summary table.

(2) Numbers may not add due to rounding.

The DEC provided DSM with the quantity of MSW disposed in 2001 by Vermonters. This totaled **415,250 tons** in 2001. Therefore the MSW diversion rate in 2001 can be calculated as:

$$\frac{\text{Materials Reused, Composted and Recycled}}{\text{Materials Reused, Composted, Recycled and Disposed}^{19}} = \frac{182,562 \text{ tons}}{182,562 + 415,250 \text{ tons}} = 31\%$$

A comparison of the 2001 data to the diversion rate calculated by the DEC in 1994 and again in 1998, 1999 and 2000 is shown below in Table 10 and shows that the rate has declined since 1994. However Table 10 also shows that the MSW tons disposed have

<sup>19</sup> Does not include MSW illegally burned or disposed.

increased. When adjusted for population, the quantity of MSW disposed annually has also increased since 1994. However, data reporting and management have improved since 1994 leading to more accurate estimates of tons disposed.

**TABLE 10**  
**Annual Diversion Rate Calculations since 1987 and Annual Disposal Rate**  
**(Lbs. disposed per capita)**

Year	MSW Diversion (tons)	MSW Disposal (1) (tons)	Diversion Rate (%)	Population (2)(3)	Lbs Disposed Per capita
1987	42,000	308,000	12%	542,395	1,136
1994	164,830	309,970	35%	580,209	1,068
1998	195,930	374,820	34%	590,883	1,269
1999	199,301	364,263	35%	593,740	1,227
2000	189,401	387,396	33%	608,827	1,273
2001	182,562	415,250	31%	613,090	1,355

(1) Does not include MSW illegally burned or disposed.

(2) US Census Bureau for 2000 and 2001.

(3) Vermont Department of Health Projections for 1987, 1994, 1998, and 1999.

Another option for measuring diversion is to measure the disposal rate. However a disposal rate calculation, such as the one shown in Table 10, which is not adjusted for economic factors, may also misrepresent progress made at a local or regional level. In California where a disposal rate is used as a means to measure each County's progress in waste diversion, a research team determined that population, employment and taxable sales were the three most statistically significant factors that affect waste generation. Iowa also uses a disposal rate and offers counties who want to adjust the rate based on economic factors to use a formula that accounts for changes in employment and taxable sales (adjusted for inflation) at the county level. Vermont may want to make adjustments for these economic factors if a disposal rate is calculated.

Nonetheless, Vermont has a 50 percent diversion rate goal by 2005. Measuring progress toward that goal is an important part of determining where improvement might be achieved. The DEC should continue to measure the areas in which relatively reliable data can be obtained, such as the certified recycling facilities and organics composting facilities. In addition, the DEC should continue to look for opportunities to evaluate progress in specific areas where complimentary data can be obtained. The Vermont Waste Composition Study (2001) provides valuable data on what materials remain in the residential waste stream that might be diverted. The commercial data, while less accurate, also begins to provide information on where progress might be made, however, more data is necessary to draw conclusions about which materials should be targeted for recycling from specific commercial, institutional and industrial sectors.

## **Appendix A**

### **EPA Methodology—Definitions**

**TABLE A. SCOPE OF MATERIALS INCLUDED IN THE STANDARD MSW RECYCLING RATE**

<b>MATERIAL<sup>1</sup></b>	<b>WHAT IS MSW</b>	<b>WHAT IS NOT MSW<sup>2</sup></b>
Food Scraps	Uneaten food and food preparation wastes from residences and commercial establishments (restaurants, supermarkets, and produce stands), institutional sources (school cafeterias), and industrial sources (employee lunchrooms).	Food processing waste from agricultural and industrial operations.
Glass Containers	Containers; packaging; and glass found in appliances, furniture, and consumer electronics.	Glass from transportation equipment (automobiles) and construction and demolition (C&D) debris (windows).
Lead-Acid Batteries	Batteries from automobiles, trucks, and motorcycles.	Batteries from aircraft, military vehicles, boats, and heavy-duty trucks and tractors.
Tin/Steel Cans and Other Ferrous Metals	Tin-coated steel cans; strapping; and ferrous metals from appliances (refrigerators), consumer electronics, and furniture.	Ferrous metals from C&D debris and transportation equipment.
Aluminum Cans and Other Nonferrous Metals	Aluminum cans; nonferrous metals from appliances, furniture, and consumer electronics; and other aluminum items (foil and lids from bimetal cans).	Nonferrous metals from industrial applications and C&D debris (aluminum siding, wiring, and piping).
Paper	Old corrugated containers; old magazines; old newspapers; office papers; telephone directories; and other paper products including books, third-class mail, commercial printing, paper towels, and paper plates and cups.	Paper manufacturing waste (mill broke) and converting scrap not recovered for recycling.
Plastic	Containers; packaging; bags and wraps; and plastics found in appliances, furniture, and sporting and recreational equipment.	Plastics from transportation equipment.
Textiles	Fiber from apparel, furniture, linens (sheets and towels), carpets <sup>3</sup> and rugs, and footwear.	Textile waste generated during manufacturing processes (mill scrap) and C&D projects.
Tires	Tires from automobiles and trucks.	Tires from motorcycles <sup>4</sup> , buses, and heavy farm and construction equipment.
Wood	Pallets; crates; barrels; and wood found in furniture and consumer electronics.	Wood from C&D debris (lumber and tree stumps <sup>5</sup> ) and industrial process waste (shavings and sawdust).
Yard Trimmings	Grass, leaves, brush and branches, and tree stumps. <sup>5</sup>	Yard trimmings from C&D debris.
Other	Household hazardous waste (HHW) <sup>6</sup> , oil filters, fluorescent tubes <sup>7</sup> , mattresses, and consumer electronics.	Abatement debris, agricultural waste, combustion ash, C&D debris, industrial process waste, medical waste, mining waste, municipal sewage and industrial sludges, natural disaster debris <sup>8</sup> , used motor oil, oil and gas waste, and preconsumer waste.

## TABLE A. NOTES

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- <sup>1</sup> Composite materials are categorized according to their main constituent; however, they can be designated as a separate category under Other MSW if they cannot be otherwise categorized.
- <sup>2</sup> These wastes are not considered MSW due to one or more of the following reasons: (1) they are not defined as MSW in EPA's *Characterization of Municipal Solid Waste in the United States*, (2) they have not been historically handled and disposed of as MSW, (3) they are regulated as hazardous waste, and/or (4) they were generated by a preconsumer source. These non-MSW wastes are referred to as Other Solid Waste in this guide and on the survey forms and worksheets.
- <sup>3</sup> Carpets are categorized as Textiles when discarded in MSW and are included in the rate calculation. When carpets are discarded in C&D debris, they are not considered MSW and are excluded from the rate calculation.
- <sup>4</sup> Tires from motorcycles are not defined as MSW because they historically have not been characterized as MSW in EPA's *Characterization of Municipal Solid Waste in the United States*.
- <sup>5</sup> Tree stumps are categorized as Yard Trimmings when discarded in MSW and are included in the rate calculation. When tree stumps are discarded in C&D debris, they are not considered MSW and are excluded from the rate calculation.
- <sup>6</sup> HHW includes paints, stains, varnishes, solvents, pesticides, and other materials or products containing volatile chemicals that catch fire, react, explode under certain circumstances, or that are corrosive or toxic. Specific examples include oil-based paint, antifreeze, household cleansers, and bug sprays. Used motor oil is excluded.
- <sup>7</sup> Fluorescent tubes are categorized as Other MSW when found in MSW and are included in the rate calculation. When fluorescent tubes are discarded in C&D debris, they are not considered MSW and are excluded from the rate calculation.
- <sup>8</sup> Natural disasters include earthquakes, floods, hurricanes, and tornados. Heavy storms are not considered natural disasters.

**TABLE B. SCOPE OF ACTIVITIES INCLUDED IN THE STANDARD MSW RECYCLING RATE**

<b>RECYCLABLE MATERIAL</b>	<b>WHAT COUNTS AS RECYCLING</b>	<b>WHAT DOES NOT COUNT AS RECYCLING<sup>1</sup></b>
Food Scraps	Composting of food scraps from grocery stores, restaurants, cafeterias, lunchrooms, and private residences, and the use of food scraps to feed farm animals.	Backyard (onsite) composting of food scraps, and the use of food items for human consumption (food banks).
Glass	Recycling of container and packaging glass (beverage and food containers), and recycling of glass found in furniture, appliances, and consumer electronics into new glass products such as containers, packaging, construction materials (aggregate), or fiberglass (insulation).	Recycling of glass found in transportation equipment and construction and demolition (C&D) debris, recycling of preconsumer glass or glass from industrial processes, and reuse of refillable glass bottles.
Lead-Acid Batteries	Recycling of lead-acid batteries found in cars, trucks, or motorcycles into new plastic and lead products.	Recycling of lead-acid batteries used in large equipment, aircraft, military vehicles, boats, heavy-duty trucks and tractors, and industrial applications.
Metals	Recycling of aluminum and tin/steel cans, and recycling of metals found in appliances and packaging into new metal products.	Reuse of metal containers, packaging, furniture, or consumer electronics, and recycling of metals found in transportation equipment (autobodies) and C&D debris.
Paper	Recycling of paper products (old newspapers and office papers) into new paper products (tissue, paperboard, hydromulch, animal bedding, or insulation materials).	Reuse of paper products, recycling of preconsumer or manufacturing waste (trimmings, mill broke, print overruns, and overissue publications), and combustion of paper for energy recovery.
Plastic	Recycling of plastic products (containers, bags, and wraps), and recycling of plastic from furniture and consumer electronics into new plastic products (fiber fill and plastic lumber).	Reuse of plastic products (storage containers and sporting equipment), recycling of preconsumer plastic waste or industrial process waste, and combustion of plastics for energy recovery.
Textiles	Recycling of textiles into riper rags, and recycling of apparel and carpet fiber <sup>2</sup> into new products such as linen paper or carpet padding.	Reuse of apparel.
Tires	Recycling of automobile and truck tires into new products containing rubber (trash cans, storage containers, and rubberized asphalt), and use of whole tires for playground and reef construction.	Recycling of tires from motorcycles, buses, and heavy farm and construction equipment, retreading of tires, and combustion of tire chips for energy recovery.
Wood	Recycling of wood products (pallets and crates) into mulch, compost, or similar uses.	Repair and reuse of pallets, combustion of wood for energy recovery, recycling of industrial process waste (wood shavings or sawdust), and recycling of wood from C&D debris.
Yard Trimmings	Offsite recycling of grass, leaves, brush or branches <sup>3</sup> , and tree stumps <sup>4</sup> into compost, mulch, or similar uses; and landspreading of leaves <sup>5</sup> .	Mulching of tree stumps <sup>4</sup> from C&D debris, backyard (onsite) composting, grasscycling, landspreading of leaves <sup>5</sup> , and combustion of yard trimmings for energy recovery.
Other	Household hazardous waste (HHW) <sup>6</sup> , oil filters, fluorescent tubes <sup>7</sup> , mattresses, circuit boards, and consumer electronics <sup>8</sup> .	Recycling of used oil, C&D debris (asphalt, concrete, and natural disaster debris), transportation equipment (autobodies), municipal sewage sludge, and agricultural, industrial, mining, and food processing waste.

## TABLE B. NOTES

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- <sup>1</sup> These activities are not considered recycling due to one or more of the following reasons: (1) they are not defined as recycling in EPA's *Characterization of Municipal Solid Waste in the United States*, (2) they involve the recycling of materials that are not part of MSW, (3) they involve reuse or source reduction, and/or (4) they involve the recycling of preconsumer waste.
- <sup>2</sup> Carpeting is categorized as Textiles when discarded in MSW and is included in the rate calculation. When carpets are discarded in C&D debris, they are excluded from the rate calculation.
- <sup>3</sup> Includes woody material such as branches, brush, and whole trees such as Christmas trees.
- <sup>4</sup> Tree stumps are categorized as Yard Trimmings when discarded in MSW and are included in the rate calculation. When tree stumps are discarded in C&D debris, they are excluded from the rate calculation.
- <sup>5</sup> Landspreading of leaves counts as recycling if the manner of the application allows timely biodegradation of the organic plant material. Landspreading of leaves does not count as recycling if the manner of the application precludes the timely biodegradation of the organic plant material.
- <sup>6</sup> HHW includes paints, stains, varnishes, solvents, pesticides, antifreeze products, and other materials or products containing volatile chemicals that catch fire, react, explode under certain circumstances, or that are corrosive or toxic. Specific examples include oil-based paint, antifreeze, household cleansers, and bug sprays. Used motor oil is excluded.
- <sup>7</sup> Fluorescent tubes are categorized as Other MSW when discarded in MSW and are included in the rate calculation. When fluorescent tubes are discarded in C&D debris, they are excluded from the rate calculation.
- <sup>8</sup> Composite materials are categorized according to their main constituent; however, they can be designated as a separate category under Other if they cannot be otherwise categorized.

## **Appendix B**

### **Data Tables**

MATERIAL	DESCRIPTION OF CATEGORY	SOURCE OF MATERIAL						TOTAL	% of Total
		Recycling Facilities	Soft Drink and Beer Distributors (1 Broker Direct)	Economic Recycling (Direct to Market)	Scrap Metal Facilities	Organics Composting	Reuse Facilities/Programs		
<b>PAPER</b>									
Corrugated	Corrugated cardboard, including clean corrugated pizza boxes, and kraft bags/paper	22,958	377	15,391			6	38,731	
Newspaper	All newspaper and shoppers inserted in newspapers	17,106		220		38	113	17,477	
Mixed paper	White, office, colored and other paper, junk mail	2,908	9	17,584				20,501	
Magazines	Magazines, catalogues and all coated stock paper.	2,533						2,533	
White Office Paper	White office and computer paper	841		300				1,141	
Books	All books including telephone books	143					18	161	
Boxboard	Cereal boxes, chipboard and other paper food package boxes including clean pizza boxes made from chipboard	921						921	
Commingled fibers	All fibers above, mixed	4,075						4,075	
Miscellaneous other paper	Polycoated paper, other mixed paper	245						247	
<b>Subtotal, Paper:</b>		<b>51,730</b>	<b>386</b>	<b>33,495</b>	<b>0</b>	<b>41</b>	<b>137</b>	<b>85,788</b>	<b>47%</b>
<b>CONTAINERS</b>									
Glass	Mixed clear, green and amber glass bottles and jars	13,971	5,212	0			19	19,202	
Aluminum Cans	Beverage containers and any other aluminum cans	84	1,756	0				1,840	
Bi-metal Cans	Steel and bi-metal food cans	1,705		0				1,705	
Aseptic Containers	Milk, juice and other aseptic drink containers	14		0				14	
Commingled containers	Mixed glass, al, bi-metal and plastics containers.	1,612	1,267	0				2,879	
Plastics									
HDPE bottles	HDPE #2 resin bottles	1,100		0				1,100	
PET bottles	PET #1 resin bottles	641	1,288	0				1,930	
Other Plastic Containers	Mixed resin 1-7 bottles and containers	23		0				23	
Film	Redemption bags	89		101				190	
Other Plastics	All other plastics			16				16	
Plastics, subtotal:		1,853	1,288	117	0	0	0	3,258	
<b>Subtotal, Containers:</b>		<b>19,238</b>	<b>9,524</b>	<b>117</b>	<b>0</b>	<b>0</b>	<b>19</b>	<b>28,897</b>	<b>16%</b>

**SCRAP METAL**

Appliances				(2)	^	159	159
	Scrap metal, brown and white goods						
	Scrap metals containing iron excluding metals found in automobiles and from industrial applications and C&D debris (as feasible).			(2)	^	251	251
Ferrous Metals				(2)	^	(2)	(2)
	Exclude metals from industrial applications and C&D debris as feasible.			(2)	^	34,830	159
Non-ferrous metals				(2)		0	0
<b>Subtotal, Metals:</b>							<b>35,240</b>
							<b>19%</b>

**ORGANIC WASTES**

Leaf and yard waste						14,508	14,508
	Leaves, grass, small branches, brush						
Food waste						14,394	14,394
	Food waste primarily from commercial sector except for backyard composting estimates						
All other organic						724	724
	Grass, brush, clean wood, mixed organics						
<b>Subtotal, Organic:</b>				0	0	29,626	0
							<b>16%</b>

**MISCELLANEOUS**

Wood						225	225
	Consumer wood products such as pallets, crates, wooden furniture, barrels, etc.						
Textiles						1,786	1,791
	Clothing, towels, blankets as reported by municipal recycling programs and limited reuse facilities						
Electronics						100	279
	Computers, televisions, VCRs, CD players/stereos, radios, printers as reported by municipal recycling programs and reuse facilities						
Waste Oil						201	201
	Waste oil collected by districts and municipal programs						
Household Hazardous Waste						459	459
	Hazardous waste collected by districts and municipal programs.						
Other						56	56
	Miscellaneous household items						
<b>Subtotal, Miscellaneous:</b>				830	0	2,167	3,011
							<b>2%</b>
	<b>TOTAL MATERIAL:</b>			71,798	9,909	34,830	182,562
	<b>Percentage of total:</b>			39%	5%	19%	100%
						16%	

(1) Total shows distributors totals without deposit return containers processed by recycling facilities.

(2) Included in "Scrap Metal Facilities" totals.

(3) ^ denotes included in the total figure.

(4) Totals may not add due to rounding.

**MSW DISPOSED (tons):**

**RECYCLING RATE:**

415,249

31%

## **Appendix C**

### **Presentation Slides**

# Vermont's 2001 MSW Diversion Rate

DSM Environmental Services  
for the  
*VT Dept of Environmental Conservation*

## Why Measure?

- Compare one year to the next
- See which materials are contributing most to diversion
- Understand where majority of diversion activity is occurring
- Understand shifts in recovery

## What's Counted?

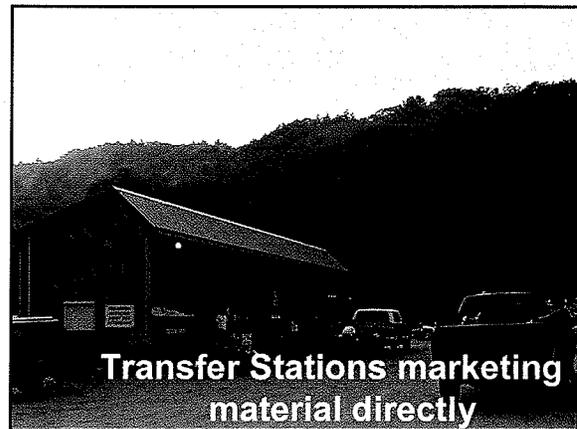
- Materials included in MSW
- No Construction and Demolition Waste
- Only materials from manufacturing that would be disposed
- Backyard composting activity estimates
- Reuse estimates

## Diversion Activity Surveyed

- Recycling Collection and Processing Facilities
- Deposit Return Container Recovery
- Reuse Activity
- Organics Composting
- Scrap Metals
- Economic Recycling

## Recycling Facilities Surveyed

- Vermont drop-offs and transfer stations
- District and Private MRFs
- Out of state processing facilities accepting material from Vermont
- End users (Putney Paper, Bennington Boxboard)



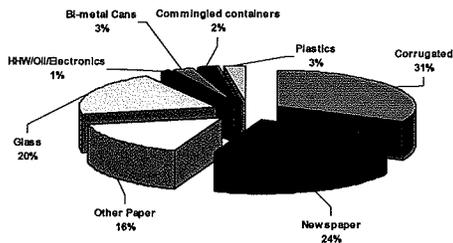
## Method: Recycling Facilities

- Quarterly reports from DEC database
- Telephone calls to verify data
- Surveys of out of state processors/end users

## Results

- Over 70,000 tons of material
- Over 70% fibers
- OCC and ONP represent 55%
- Over 60% processed in Chittenden County (CSWD, Casella, Gauthiers)

## Results – Composition (by weight)



## Compare 1994 to 2002

Paper		(tons)	(tons)
Corrugated		20,041	22,958
Newspaper		16,642	17,106
Mixed paper		2,670	2,908
Magazines		3,208	2,533
White Office Paper		2,318	841
Books	NA		143
Boxboard	NA		921
Commingled fibers	NA		4,075
Miscellaneous other pap		380	245
	Subtotal:	45,259	51,730

Containers			
Glass (1)	10,973		11,045
Aluminum Cans	546		84
Bi-metal Cans	1,987		1,705
Commingled containers	321		991
HDPE bottles	919		1,100
PET bottles	472		446
Film (2)	2		89
Other Plastic Containers	153		23
	Subtotal:	15,373	15,501
	Total:	60,632	67,231

(1) Does not include deposit return glass containers.

(2) Mostly redemption bags.

## Deposit Return Container Recycling

- Contact Trade Representatives: Vermont Soft Drink Association, Representative for Malt Beverage Distributors
- Survey distributors on quantities and processors used

## Results

- 13,260 tons of material recovered
- 73% broker direct
- 27% through Vermont MRFs
- Very little glass reuse

## 2001 Comparison to 1994 Survey

	2001	1994
<b>Material</b>	(tons)	(tons)
Glass (1)	8,139	12,251
Aluminum cans	2,392	2,889
Commingled containers	1,267	NR
PET bottles	1,463	714
	<b>13,260</b>	<b>15,854</b>

## Economic Recycling

- Occurs for economic reasons directly between a commercial or industrial generator and a broker, processor or end user
- Survey generators, brokers, and end users

## Results

- Completed 49 telephone surveys including 20 of Vermont's top 50 employers (over 40,000 employees)
- Companies surveyed represent over 100 facilities
- 18 businesses engaged in economic recycling
- Totaled @ 27,000 tons (99% fibers)

## Comparison to 1994 Survey

Material	2001	1994
	(tons)	(tons)
Print overruns	13,584	14,034
Corrugated	15,391	11,493
White Office Paper	300	1,620
Mixed paper	4,000	2,242
Newspaper	220	587
<i>subtotal, paper:</i>	<b>33,495</b>	<b>29,976</b>
Metals	251	1,450
Plastics	117	457
Other Material	14	174
<b>Total Material:</b>	<b>33,877</b>	<b>32,057</b>

## Changes Since 1994 Include:

- Businesses using instate processing infrastructure
- Manufacturing activity reduced – metal turning
- Increased efficiency – shrink wrap vs. OCC use by grocers

## Scrap Metal Recycling

- Contacted Trade Associations – Vermont Data?
- Surveyed Vermont metal processors and those in surrounding region
- Totaled over 34,000 tons for 2001
- Down from nearly 43,000 in 1994

## Scrap Metal Recycling Conclusions

- Fall in prices
- Fall in manufacturing in Vermont
- Numbers may not compare – cannot segregate out C&D metals

## Reuse Activity

- Limited survey of not for profit organizations, solid waste district activities, for profit businesses that reuse materials.
- C&D, salvage not included
- Looked for reuse activity that came about as result of Act 78

## Results

- Most facilities can't quantify reuse
- Counted nearly 2500 tons
- Over 70% textiles
- Salvation Army textile recycling largest contributor
- VBMx contributed about 200 tons

## Organics Composting

- Certified and Categorically Certificated Composting Facilities
- Exempt On-site Composting Facilities
- Estimated Backyard Composting Activity

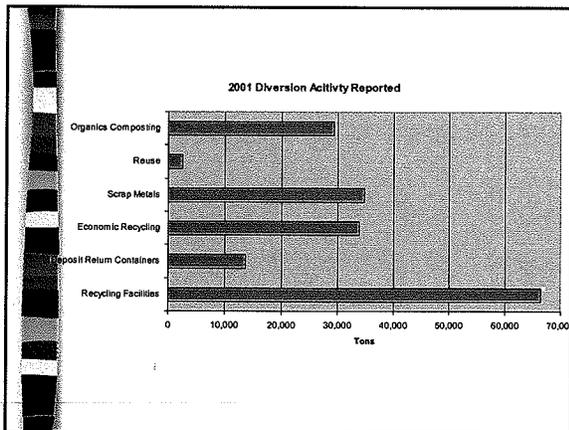
## Estimating Backyard Composting

- Nearly 9000 compost bins sold since 1994 – doesn't represent activity
- CSWD survey estimates 38.9% district households compost L&Y waste and 25.9% compost food waste
- Assuming 600 pounds per household (350 lbs of food), yields 22,600 tons

	COMPOST FACILITIES				TOTAL (tons)
	Certified (tons)	Categorical Certified (tons)	Exempt (tons)	Backyard Composting Estimates (tons)	
<b>Paper</b>					
Corrugated					0
Newspaper				38	38
Mixed paper	3				3
<b>Subtotal, Paper:</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>38</b>	<b>41</b>
<b>Organic Wastes</b>					
Leaf and yard waste	2,652	62	93	11,701	14,508
Grass	1	0	0		1
Clean wood	298	0	0		298
Food waste	1,796	1,111	581	10,907	14,395
Ice cream waste (2)	NA	NA	NA	NA	NA
Mixed organics	49	376	0	0	425
<b>Subtotal, Organic:</b>	<b>4,796</b>	<b>1,548</b>	<b>674</b>	<b>22,608</b>	<b>29,626</b>
<b>Total Material:</b>	<b>4,799</b>	<b>1,548</b>	<b>674</b>	<b>22,646</b>	<b>29,667</b>
<b>% of Total:</b>	<b>16%</b>	<b>5%</b>	<b>2%</b>	<b>77%</b>	<b>100%</b>

### 2001 Diversion Rate Calculation

- Reuse + Composting + Recycling = Diversion Activity
- Diversion Activity = 18,600 tons
- MSW disposal = 415,250
- Diversion Rate = 31%



### Conclusions - Reporting

- Quarterly reporting changes could simplify reporting
- Distributors reporting necessary for reporting deposit container recycling
- Reuse and backyard composting will continue to be challenging to estimate
- Economic recycling requires intensive effort

### Conclusions

- Fibers nearly 50% of total
- Backyard composting cannot be measured but likely plays important contribution