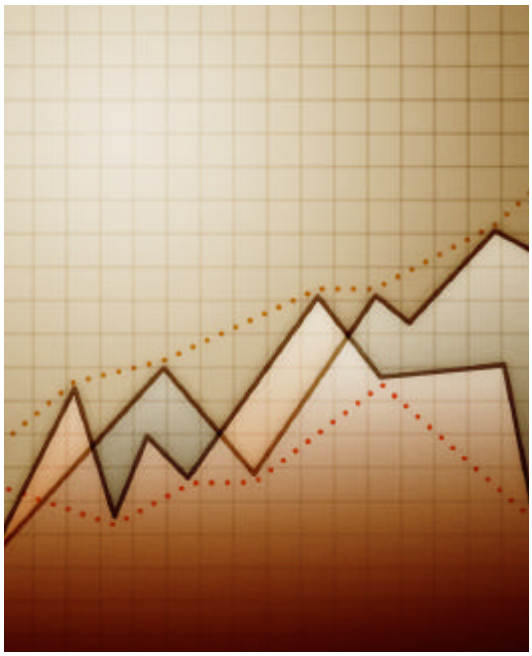
Final Report

Recycling Economic Information Study

Prepared for the Northeast Recycling Council
by R. W. Beck, Inc.



NORTHEAST RECYCLING COUNCIL NERC

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EXECUTIVE SUMMARY

OVERVIEW

This report presents the results of the Recycling Economic Information (REI) Study commissioned by the Northeast Recycling Council (NERC). NERC retained R. W. Beck, Inc. to implement and refine the methodology developed by NERC[1] for gathering economic data on the recycling and reuse industries in the ten Northeastern states that comprise the NERC region.[2]

The three primary goals of the study were to:

1. Document the size of the recycling and reuse industries in the Northeast;
2. Refine the original REI methodology developed by NERC; and
3. Provide information and data to support the extension of the study to the rest of the nation.

To achieve the three goals, the project approach included the following steps:

- A review of existing sources of recycling and reuse data;
- A review of NERC's original proposed methodology and discussions with the Advisory Committee[3] regarding changes;
- Creation of a database of recycling and reuse businesses and surveying them to gather primary data for categories where little or no existing information was otherwise found;
- Deriving estimates using limited existing information for categories with insufficient existing data or incomplete/unavailable lists of establishments;
- Conducting limited surveys to gather supplemental intermediate input data for economic modeling; and
- Conducting economic modeling to estimate the total economic values.[4]

A follow-on national study commissioned by the National Recycling Coalition (NRC) will replicate this study for the remainder of the U.S. It will incorporate the results of this study to present results for the nation of the whole.

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[1] The Northeast Recycling Council, with sponshorship from the Environmental Protection Agency, performed the original research necessary to develop a methodology for gathering economic information on the recycling and reuse industries. NERC presented its recommended methodology to the EPA in its *Recycling Economic Information Project Final Report,* April 10, 1998.

[2] The ten states of the NERC region are Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

[3] Please refer to the Acknowledgements section for a complete list of Advisory Committee members.

[4] Economic values refer to numerical economic information (employment, wages, receipts, and value added) attributable to the categories of recycling and reuse establishments included in this study.

SUMMARY OF DIRECT RESULTS

Twenty-six recycling and reuse industry categories are used in this study and can be grouped into the following two sectors based on the general types of activities undertaken:

- Recycling; and
- Reuse and Remanufacturing.

Direct industry size data was determined for each category by one of three methods:

- Utilizing existing data from a variety of sources including the U.S. Census Bureau, publications of trade associations, and periodicals;
- Surveying establishments and performing a statistical analysis of results; or
- Deriving estimates using limited existing information.

Table ES-1 presents the estimates of direct economic activity, by category and sector, for each funding state[5] and the NERC region as a whole. As shown in the table, the NERC region hosts more than 13,000 recycling and reuse establishments employing approximately 206,000 people generating an annual payroll of $6.8 billion and $44 billion in annual revenues.

Over half of the economic activity for the recycling and reuse industries is accounted for by the following four categories:

- Recyclable material wholesalers;
- Paper, paperboard, and deinked market pulp mills;
- Plastics converters; and
- Steel mills.

These four categories alone account for approximately 55 percent of all employees, 63 percent of total payroll, and 72 percent of total receipts. The average payroll of $37,700 per employee for these four categories is 14 percent higher than the average of $33,000 for all categories. At 37, the average number of employees per establishment for the top four categories is also higher than the average number of employees for all categories of 16.

A noticeable distinction exists between the recycling and reuse sectors regarding the size of establishments and average annual payroll. The recycling establishments have an average of 22 employees each, with an average annual payroll per employee of $35,000. Comparatively, the reuse sector is made up of smaller establishments (an average of 5 employees per establishment) with an average annual payroll of $19,000 per employee. Although the reuse and remanufacturing sector comprises 37 percent

[5] The states of Delaware, Massachusetts, New Jersey, New York, Pennsylvania, and Vermont provided funding for state-specific direct economic activity research and analysis.

of total establishments, it makes up only 13 percent of total employees, 8 percent of payroll, and 6 percent of receipts.

These figures are thought to represent the minimum amount of reuse and remanufacturing captured by the methodology, however, because remanufacturing activities are often included with traditional manufacturing industries that were not included in this study. Several years ago Professor Robert T. Lund of Boston University estimated remanufacturing activities on a national level,[6] although state or regional estimates were not attempted. Extrapolating figures from his study down to the NERC region indicated that reuse and remanufacturing categories may be as much as 20 to 30 percent of total jobs, wages, and receipts for all categories.

Another interesting observation can be made by comparing recycling categories that are primarily local establishments performing collection, sorting, and densification activities to those that source material from large distances for downstream processing, conversion, or manufacturing operations. Local collection and processing (baling, grading, densifying, etc.) includes:

- Government staffed residential curbside collection;
- Privately-staffed residential curbside collection;
- Compost and miscellaneous organics products producers;
- Materials recovery facilities; and
- Recyclable material wholesalers.

Establishments in the remaining recycling categories are considered to be downstream processors of recycled materials and tend to utilize recycled materials in manufacturing. When the two groups are compared, "local" collection and processing make up about 21 percent of total recycling employment and receipts whereas non-local downstream processing makes up the remaining 79 percent of employment and receipts. This indicates that public and private investment in local recyclables collection and processing infrastructure pays great dividends in downstream private recycling economic activity. Public policy in the form of state or local laws and regulations that require collection of recyclables or that discourage disposal (e.g. disposal taxes, material specific bans, etc.), directly affects these local public and private sector establishments and indirectly the larger recycling and reuse industry as a whole.

[6] Professor Robert T. Lund, *The Remanufacturing Industry: Hidden Giant,* 1996.

Table ES-1
Summary of Direct Estimates of Economic Activity

Annual Payroll and Estimated Receipts are in $1,000. Throughput is in thousands of tons.
Throughput estimates are not summed due to the potential for triple counting at the collecting, processing, and manufacturing stages.
(D) - Data not disclosed due to a limited number of establishments in this business category and the need to avoid revealing data that could identify a single business. Data for multiple disclosure categories are included in totals.

Business Category	Data Type	Estimates of Total Recycling and Reuse-Related Economic Activity						
		DE	MA	NJ	NY	PA	VT	NERC Region
Recycling Industry Economic Activity								
1. Government Staffed Residential Curbside Collection	Establishments	3	53	173	500	299	27	1,162
	Employment	12	450	640	1,200	810	10	3,540
	Annual Payroll	382	16,401	22,573	36,386	22,213	260	114,045
	Estimated Receipts	1,684	18,488	26,020	47,135	24,737	322	136,246
	Estimated Throughput	23	311	978	974	271	50	3,004
2. Private Staffed Residential Curbside Collection	Establishments	1	103	337	972	580	53	2,255
	Employment	6	860	1,240	2,340	1,580	20	6,870
	Annual Payroll	191	31,344	43,735	70,954	43,330	519	221,167
	Estimated Receipts	1,012	35,889	50,508	91,497	48,019	625	264,478
	Estimated Throughput	185	2,016	9,126	11,566	1,576	220	25,869
3. Compost and Miscellaneous Organics Producers	Establishments	7	129	156	111	30	10	584
	Employment	19	444	1,019	382	424	57	3,340
	Annual Payroll	258	9,279	33,619	8,254	10,422	1,343	78,441
	Estimated Receipts	995	46,643	134,109	20,210	39,854	5,280	308,333
	Estimated Throughput	3	670	1,945	901	318	13	4,182
4. Materials Recovery Facilities (MRF's)	Establishments	1	22	25	23	48	4	148
	Employment	39	369	921	611	529	29	2,988
	Annual Payroll	911	7,241	23,047	15,138	10,390	543	70,058
	Estimated Receipts	2,303	23,581	43,771	23,115	50,366	3,225	180,573
	Estimated Throughput	18	163	623	1,317	322	90	3,118
5. Recyclable Material Wholesalers	Establishments	33	236	397	683	557	20	2,194
	Employment	290	2,421	5,378	8,144	6,652	85	26,160
	Annual Payroll	6,024	71,655	169,520	217,471	197,844	2,212	759,502
	Estimated Receipts	70,090	799,993	1,821,548	2,385,730	2,150,790	28,268	8,291,248
	Estimated Throughput	187	1,493	7,535	10,323	1,207	167	21,573
6. Glass Container Manufacturing Plants	Establishments	0	1	3	3	4	0	12
	Employment	0	(D)	617	483	800	0	2,472
	Annual Payroll	0	(D)	24,250	21,375	30,000	0	96,996
	Estimated Receipts	0	(D)	134,167	133,750	150,000	0	536,664
	Estimated Throughput	0	(D)	70	55	91	0	282
7. Glass Product Producers (other recycled uses)	Establishments	2	4	3	1	1	1	13
	Employment	21	13	20	(D)	(D)	(D)	89
	Annual Payroll	404	160	416	(D)	(D)	(D)	1,804
	Estimated Receipts	523	288	1,201	(D)	(D)	(D)	5,203
	Estimated Throughput	14	8	13	(D)	(D)	(D)	58
8. Nonferrous secondary smelting and refining mills	Establishments	1	6	7	17	25	0	67
	Employment	2	341	295	1,162	1,521	0	3,632
	Annual Payroll	69	12,824	15,665	42,698	57,217	0	138,539
	Estimated Receipts	1,001	188,201	237,741	638,584	837,652	0	2,047,257
	Estimated Throughput	0.3	60	52	205	268	0	640
9. Nonferrous product producers	Establishments	0	4	7	9	13	0	42
	Employment	0	204	857	1,545	2,951	0	6,412
	Annual Payroll	0	6,989	30,798	65,154	112,270	0	252,549
	Estimated Receipts	0	74,318	279,801	616,578	1,053,745	0	2,422,396
	Estimated Throughput	0	15	62	112	215	0	466
10. Nonferrous foundries	Establishments	0	43	42	78	102	1	346
	Employment	0	980	1,325	2,615	4,693	2	11,034
	Annual Payroll	0	27,900	35,600	84,249	136,310	50	325,121
	Estimated Receipts	0	98,529	126,853	307,982	486,680	174	1,166,719
	Estimated Throughput	0	7	9	19	34	0	79

(continued)

Business Category	Data Type	Estimates of Total Recycling and Reuse-Related Economic Activity						
		DE	MA	NJ	NY	PA	VT	NERC Region
11. Paper and Paperboard Mills/Deinked Market Pulp Producers	Establishments	1	20	15	39	26	6	139
	Employment	61	2,331	1,439	4,983	5,143	936	24,251
	Annual Payroll	2,909	96,497	60,915	212,939	227,254	35,644	1,081,944
	Estimated Receipts	17,956	673,766	407,362	1,392,214	1,414,391	263,904	6,858,680
	Estimated Throughput	18	539	907	1,505	1,227	57	5,633
12. Paper-based Product Manufacturers	Establishments	0	6	3	8	11	0	35
	Employment	0	124	62	166	228	0	725
	Annual Payroll	0	2,432	1,216	3,242	4,458	0	14,185
	Estimated Receipts	0	16,913	8,457	22,551	31,008	0	98,660
	Estimated Throughput	0	25	12	33	46	0	145
13. Pavement Mix Producers (asphalt and aggregate)	Establishments	4	2	1	0	6	7	29
	Employment	11	45	(D)	0	48	8	300
	Annual Payroll	380	2,625	(D)	0	2,748	215	20,833
	Estimated Receipts	1,425	8,125	(D)	0	8,133	3,363	135,464
	Estimated Throughput	35	356	(D)	0	N/A	138	N/A
14. Plastics Reclaimers	Establishments	5	28	21	35	36	1	152
	Employment	72	542	474	775	1,042	(D)	3,533
	Annual Payroll	2,097	15,783	13,803	22,568	30,343	(D)	102,881
	Estimated Receipts	6,065	45,658	39,930	65,286	87,778	(D)	297,620
	Estimated Throughput	11	85	74	121	163	(D)	551
15. Plastics Converters	Establishments	10	90	134	135	138	5	602
	Employment	461	4,676	5,851	6,933	7,993	334	31,304
	Annual Payroll	12,899	138,207	172,759	184,276	218,828	9,444	879,343
	Estimated Receipts	172,759	978,967	1,439,657	1,266,898	1,428,140	59,429	6,162,078
	Estimated Throughput	9	53	77	68	77	3	331
16. Rubber Product Manufacturers	Establishments	0	5	3	11	15	0	35
	Employment	0	103	62	105	701	0	723
	Annual Payroll	0	1,982	1,189	4,618	8,621	0	13,872
	Estimated Receipts	0	9,543	5,726	8,824	67,688	0	66,800
	Estimated Throughput	0	3	2	3	18	0	18
17. Steel mills	Establishments	1	3	8	13	58	0	90
	Employment	356	9	991	2,651	27,063	0	31,337
	Annual Payroll	17,725	426	55,486	121,361	1,336,788	0	1,545,067
	Estimated Receipts	115,355	2,768	414,636	906,322	8,837,206	0	10,388,376
	Estimated Throughput	117	3	327	874	8,919	0	10,328
18. Iron and Steel foundries	Establishments	0	25	16	26	106	2	196
	Employment	0	850	1,904	1,033	9,354	59	16,162
	Annual Payroll	0	30,581	63,633	33,096	297,081	1,823	519,931
	Estimated Receipts	0	91,633	216,565	101,263	998,313	5,565	1,705,041
	Estimated Throughput	0	77	173	94	851	5	1,471
19. Other Recycling Processors/Manufacturers	Establishments	6	34	13	21	28	1	113
	Employment	91	1,240	373	237	2,570	(D)	4,120
	Annual Payroll	2,031	17,883	13,228	3,855	25,223	(D)	59,436
	Estimated Receipts	25,175	125,175	93,600	32,940	110,250	(D)	416,024
	Estimated Throughput	18	242	73	46	501	(D)	803
Recycling Subtotals	**Establishments**	75	814	1,363	2,685	2,083	138	8,213
	Employment	1,441	16,001	23,467	35,365	74,101	1,587	178,992
	Annual Payroll	46,280	490,208	781,450	1,147,634	2,771,339	53,235	6,295,712
	Estimated Receipts	416,343	3,238,479	5,481,651	8,060,879	17,824,749	376,245	41,487,860

(continued)

Business Category	Data Type	Estimates of Total Recycling and Reuse-Related Economic Activity						
		DE	MA	NJ	NY	PA	VT	NERC Region
Reuse and Remanufacturing Industry Economic Activity								
20. Computer and Electronic Appliance Demanufacturers	Establishments	0	16	9	8	7	1	58
	Employment	0	270	31	135	118	(D)	980
	Annual Payroll	0	7,604	1,139	3,802	3,327	(D)	27,566
	Estimated Receipts	0	30,523	13,469	15,261	13,354	(D)	110,645
	Estimated Throughput	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21. Motor Vehicle Parts (used)	Establishments	29	175	217	424	372	16	1,410
	Employment	183	1,215	1,334	3,470	1,957	88	9,492
	Annual Payroll	3,843	30,528	34,174	76,771	38,692	1,775	216,518
	Estimated Receipts	19,129	151,039	171,303	381,130	194,415	9,293	1,079,777
	Estimated Throughput	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22. Retail Used Merchandise Sales	Establishments	60	389	329	1,045	697	81	3,202
	Employment	306	1,484	1,346	4,067	4,309	223	13,915
	Annual Payroll	3,470	23,352	19,973	86,251	53,831	2,119	220,250
	Estimated Receipts	17,006	121,843	98,920	445,506	253,454	11,893	1,109,841
	Estimated Throughput	N/A	N/A	N/A	N/A	N/A	N/A	N/A
23. Tire retreaders	Establishments	3	12	50	73	68	3	222
	Employment	64	53	290	247	566	17	1,355
	Annual Payroll	1,407	932	7,654	5,564	13,618	374	31,921
	Estimated Receipts	7,280	5,376	39,565	29,761	70,341	1,934	166,555
	Estimated Throughput	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24. Wood Reuse	Establishments	4	24	7	12	13	1	73
	Employment	61	351	140	174	197	(D)	1,107
	Annual Payroll	1,039	3,068	4,156	5,453	3,377	(D)	18,964
	Estimated Receipts	9,988	24,350	32,003	65,800	32,460	(D)	182,274
	Estimated Throughput	0	N/A	N/A	N/A	N/A	N/A	N/A
25. Materials Exchange Services	Establishments	0	4	1	3	0	1	11
	Employment	0	42	(D)	8	0	(D)	54
	Annual Payroll	0	1,473	(D)	161	0	(D)	1,450
	Estimated Receipts	0	3,420	(D)	283	0	(D)	3,210
	Estimated Throughput	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26. Other Reuse	Establishments	0	3	6	7	7	1	29
	Employment	0	28	315	148	75	(D)	612
	Annual Payroll	0	484	1,932	1,894	2,080	(D)	7,845
	Estimated Receipts	0	5,488	31,472	15,499	10,004	(D)	64,211
	Estimated Throughput	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Reuse and Remanufacturing Subtotals	**Establishments**	96	623	619	1,572	1,164	104	5,005
	Employment	614	3,444	3,456	8,249	7,222	368	27,514
	Annual Payroll	9,759	67,441	69,028	179,896	114,925	4,937	524,513
	Estimated Receipts	53,403	342,039	386,732	953,240	574,028	28,043	2,716,512

GRAND TOTALS	**Establishments**	171	1,437	1,982	4,257	3,247	242	13,218
Recycling, Reuse and Remanufacturing	**Employment**	2,055	19,445	26,929	43,614	81,322	1,955	206,506
	Annual Payroll	56,040	557,648	850,574	1,327,529	2,886,264	58,172	6,820,225
	Estimated Receipts	469,746	3,580,518	5,869,095	9,014,119	18,398,776	404,288	44,204,372

Figures ES-1 through ES-4 present the grand totals for each funding state and the NERC region for: (a) number of establishments; (b) employment; (c) total annual payroll; and (d) total annual receipts.

Figure ES-1
Number of Recycling and Reuse Industry
Establishments in Select States

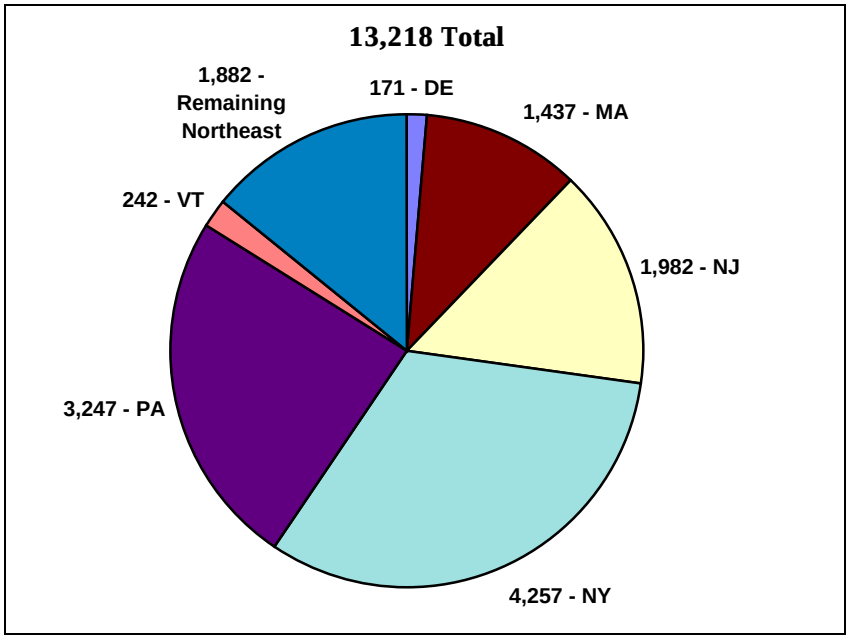


Figure ES-2
Recycling and Reuse Industry
Total Employment in Select States

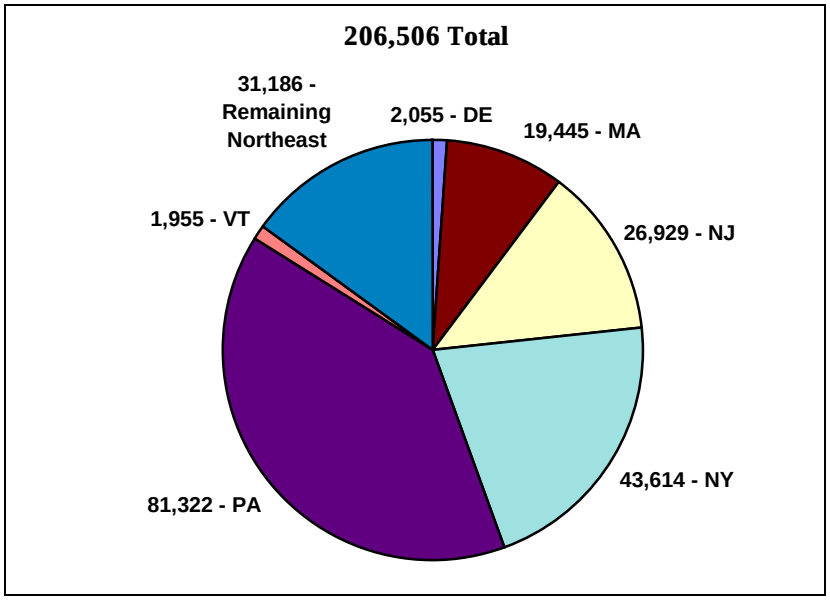


Figure ES-3
Recycling and Reuse Industry Total Annual Payroll in Select States
(in millions)

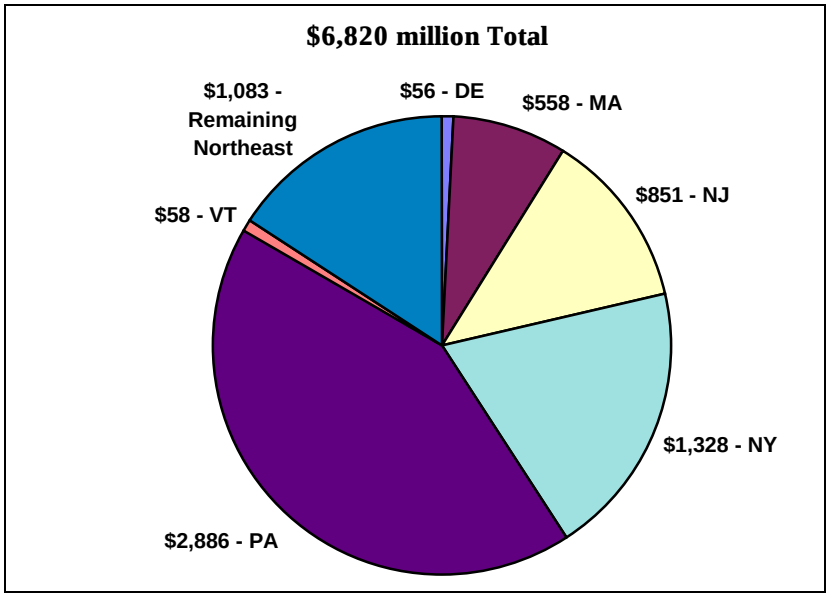
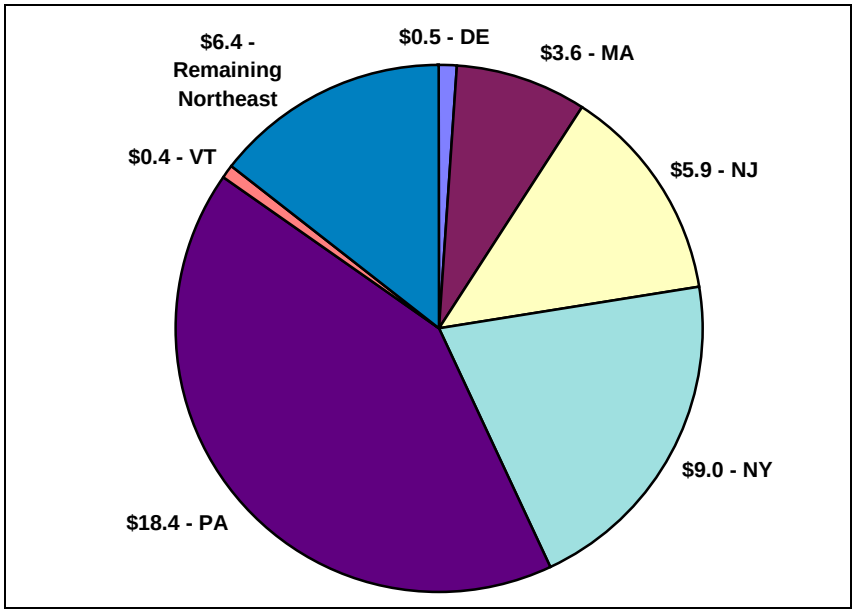


Figure ES-4
The Recycling and Reuse Industry Total Annual Receipts in Select States
(in billions)



SUMMARY OF INDIRECT AND INDUCED ECONOMIC ACTIVITY

In addition to the twenty-six categories of direct recycling and reuse establishments, the study estimated data for four specific categories of support businesses that provide goods or services to recycling and reuse industry establishments as shown in Table ES-2. The general category Other Indirect Establishments shown in the table includes all other indirect establishments that provide goods or services (such as office supply companies, accounting firms, legal firms, building and landscape maintenance firms, etc.).

Table ES-2
Estimates of Indirect Economic Activity of Select Support Business Categories
(Annual Payroll and Estimated Receipts are in $1,000)

Business Category	Data Type	DE	MA	NJ	NY	PA	VT	NERC Region
Recycling and Reuse Equipment Manufacturers [1]	Employment	(D)	1,343	2,191	1,696	3,322	31	11,026
	Annual Payroll	(D)	50,815	82,908	64,187	125,699	1,181	417,214
	Estimated Receipts	(D)	321,273	524,182	405,818	794,728	2,625	2,637,820
Consulting/Engineering [2]	Employment	21	155	223	362	819	16	1,712
	Annual Payroll	756	5,901	7,735	12,072	29,780	529	62,018
	Estimated Receipts	1,607	11,938	19,166	29,437	63,259	1,320	144,355
Brokers [2]	Employment	10	65	99	161	358	7	760
	Annual Payroll	905	6,218	8,623	13,458	32,673	590	69,142
	Estimated Receipts	1,363	8,921	15,095	23,184	49,224	1,040	113,693
Transporters [2]	Employment	215	1,834	2,450	3,969	8,798	178	18,791
	Annual Payroll	6,875	61,500	74,870	116,853	280,970	5,120	600,337
	Estimated Receipts	22,652	192,891	288,578	443,216	925,796	19,878	2,173,490

Notes:

(D) Data not disclosed due to a limited number of establishments in this business category and the need to avoid revealing data that could identify a single business.

[1] Data for Recycling and Reuse Equipment Manufacturers are based on a statistical analysis of survey results.

[2] Data for Delaware, Massachusetts, and Pennsylvania come from the output of unique I-O models created for each of the three states and reflect the indirect activity stimulated by the 26 direct categories of recycling and reuse establishments targeted by this study for direct data. Estimates for the remaining states and the NERC region as a whole come from an average of the Type 1 multipliers for Delaware, Massachusetts, Pennsylvania, and Florida (a sponsoring state to the U. S. Recycling Economic Information Study), which was in turn multiplied by the direct economic activity estimates for each state or the region as a whole.

The study also estimated other economic activity produced in the economies of Delaware, Massachusetts, and Pennsylvania attributable to the recycling and reuse industry using economic modeling. Furthermore, state government tax revenues arising from the recycling and reuse industry were also estimated for those three states. Table ES-3 shows summarized state government tax revenues for the direct economic activity of the 26 business categories.

Table ES-3
Summary of Recycling & Reuse Industry
Direct Effects on State Government Revenues
(in $ Millions)

	Delaware	Massachusetts	Pennsylvania
Recycling Collection	0.09	4.98	6.35
Recycling Processing	1.15	10.87	25.60
Recycling Manufacturing	6.86	40.47	259.70
Reuse/Remanufacturing	1.60	8.13	13.33
Total	**9.70**	**64.45**	**304.98**

CONCLUSIONS

The estimates of direct economic activity presented here reveal that recycling and reuse activities significantly contribute to the economy of the Northeast region. As a reference, comparisons to several other industries and business types can be made. For example, although the recycling and reuse industry in the Northeast employs slightly less than half the number of people as fast food restaurants do in the region, the total payroll is more than one-and-a-half times as large. The results of the economic modeling estimate that nearly 1 percent of jobs and total value added in Delaware and Massachusetts can be attributed to the recycling and reuse industry (including down-stream effects). In Pennsylvania, about 3.5 percent of jobs and value added are attributable to the recycling and reuse industry.

As noted previously, investments at the local level in collection and processing of recyclables and public policies that favor recycling and reuse certainly enable large private sector investments in downstream processing and manufacturing.

Results of the follow-on national REI study should be reviewed upon its completion to compare the contribution of recycling and reuse to the economy in the Northeast as compared to the remainder of the U.S. Additionally, the individual state results may be compared to those of other states of similar make-up in order to gain insight on the influence of public policies on states' recycling and reuse industries. However, further study is necessary to rigorously assess the impact of public policy on recycling economic activity and to document the growth over the baseline in this report.

1 INTRODUCTION

1.1 OVERVIEW

This report presents the results of the Recycling Economic Information (REI) Study commissioned by the Northeast Recycling Council (NERC). In 1997, the U.S. Environmental Protection Agency (EPA) sponsored a study to develop a methodology and estimate costs for gathering economic information on the recycling and reuse industries. NERC performed the necessary research and presented its recommended methodology to the EPA in its *Recycling Economic Information Project Final Report* in 1998. Subsequently, NERC retained R. W. Beck, Inc. to implement and refine the methodology in the ten Northeastern states that comprise the NERC region.[7] This study was funded by NERC with grant support from EPA and the states of Delaware, Massachusetts, New Jersey, New York, Pennsylvania, and Vermont.

This report provides statistics for the Northeast region as a whole and state-level statistics for the six sponsor states noted above. The first goal of the study was to document the size of the recycling and reuse industry by determining direct economic information for each of twenty-six categories of recycling and reuse establishments. The direct economic values that were measured included:

- Number of establishments;
- Employment;
- Annual payroll;
- Annual receipts; and
- Annual throughput (for applicable categories).

Furthermore, similar information was estimated for four categories of establishments intimately involved in the recycling and reuse industry. The broader effect of recycling and reuse businesses and their employees on the economy were derived for three states through economic modeling using direct data as inputs. This information included:

- Indirect economic values (inter-industry linkages as measured by purchase of intermediate commodities);
- Induced economic values (personal spending by employees of direct and indirect establishments);

[7] The ten states of the NERC region are Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

- Multipliers to calculate total economic values (the sum of direct, indirect, and induced) from direct economic values; and
- Tax revenues attributable to the recycling and reuse industry.

The second goal of the study was to review NERC's original proposed methodology and make refinements as necessary to create a workable methodology. In achieving this goal, NERC created an advisory committee (the Advisory Committee)[8] consisting of state recycling and economic development and EPA officials to review any proposed changes and offer advice as the study progressed. The primary changes involved merging and/or deleting some of the original business categories or using a different approach to data collection than originally outlined by NERC.

The final goal of the study was to create a standardized, functional method of documenting economic values for the recycling and reuse industry to support extension of the study to the rest of the nation. A follow-on study commissioned by the National Recycling Coalition with principle funding from the U. S. EPA will replicate this study for the remainder of the U.S. Like this study, the NRC study will develop state-level statistics for sponsoring states and incorporate the results of this study to present statistics for the nation as a whole.

1.2 STUDY BACKGROUND

The REI Study was conceived in 1997 in response to the lack of comprehensive economic information on the recycling and reuse industry and to gain a better understanding of the total economic activity attributable to that industry. Although certain types of information are available through trade associations, government agencies, and private financial data companies, these sources have many shortcomings, including:

- **No focus on recycling and reuse**. Most government and private economic data programs classify recycling and reuse businesses in categories that include other businesses not involved in recycling and reuse. Although certain segments of the industry, such as tire retreading, can be segregated, other segments include non-recycling establishments. For example, approximately 75 percent of paper mills utilize recovered paper in the production of new paper, paperboard, and paper products. However, no separate statistics are available to determine the number of employees or the amount of revenues associated with the recycling-related activities in each mill.
- **Inconsistency in defining the industry**. The absence of standard definitions for recycling and reuse activities results in data that often is not comparable from one source to another.

[8] Please refer to the Acknowledgements page at the beginning of this report for a complete list of Advisory Committee members.

- **Lack of comprehensive data.** Certain industry categories have a wide range of information available (e.g., paper and steel mills) while others have little or none (e.g., compost producers).
- **Lack of state-level statistics for certain categories.** Several sources provide data on a national level, but contain no state-level detail.

This study attempts to overcome major deficiencies in previously available economic information for recycling and reuse by defining twenty-six standard categories of recycling and reuse establishments, as well as four categories of support businesses, and creating a standardized methodology for documenting economic data at the state level.

1.3 Comparison to Similar Studies

The REI Study was motivated, in part, by the value that policy-makers found in several state and multi-state recycling economic information studies. At least seven other recycling economic information studies had been performed at the time this study was conceived. Although those existing studies quantified employment and most included other industry size estimates (such as annual sales or value-added), they used varying (and sometimes inconsistent) data collection methodologies and industry definitions. While capitalizing on the collective experience of past studies, this study lays the groundwork for obtaining comprehensive economic statistics on the nation's recycling industry. Unlike previous studies, the REI Study attempted to estimate some types of reuse in addition to recycling. Table 1-1 compares the types of data collected in this study to three previous economic information studies.

Table 1-1

Comparison of Data Presented in Similar Economic Information Studies

Name of Study	Types of Data Presented						
	Recycling Collection	Recycling Processing	Recycling End Use	Reuse	Support Businesses	Multipliers	Tax Revenues
NERC REI Study (2000)	●	●	●	●	●	●	●
Assessment of Economic Impacts of Recycling in Iowa		●	●				●
Arizona Recycling Market Development Study		●	●			●	
Value Added to Recyclable Materials in the Northeast - NERC (1994)	●	●	●				

1.4 Intended Uses for the Study

Recycling and reuse businesses, like other businesses, provide a number of economic benefits, including: creating jobs, making investments, and paying taxes. This study and the economic benefit information it contains may be used as a:

- Reference for economic development agencies, entrepreneurs, and financiers to understand and evaluate recycling and reuse businesses;
- Reference for lawmakers to assist them in evaluating legislation that would affect recycling and reuse;
- Tool for recycling advocates to increase understanding of the industry, promote awareness of recycling and reuse, and target resources for growth;
- Baseline of economic information to document future growth and development of the industry; and
- Template that provides standard definitions, categories, and methodologies for future studies of the industry.

1.5 REPORT ORGANIZATION

This report is organized into the following sections:

1. **Introduction**, which provides a brief overview of the development of the REI study, comparison to similar studies, and intended uses of the study;
2. **Data Characterization**, which briefly describes the development of the business categories, types of data, approaches to data development, and the included activities and boundaries of the study;
3. **Study Methodology**, which explains the methodology used in developing estimates for each category and data type;
4. **Study Results**, which presents detailed data tables and related notes for each sponsoring state and the region as a whole;
5. **Indirect and Induced Economic Information**, which presents the multipliers and related results of economic modeling for the states of Delaware, Massachusetts, and Pennsylvania; and
6. **Recommendations for Future Studies**, which provides suggestions for replication of the study.

The following appendices contain additional detail to support and further explain the methodology and results:

A. Description of Recycling and Reuse Business Categories
B. Changes in Methodology from the *Recycling Economic Information Project Final Report* (1998) Prepared by the Northeast Recycling Council
C. Evaluation of Data Sources
D. Sample of Raw Data from U.S. Census Bureau's *Standard Statistical Establishments List (SSEL)*
E. Survey Materials
F. Statistical Analysis of Survey Results

G. Calculations for Government and Private Staffed Residential Curbside Collection
H. Glossary of Terms

2 DATA CHARACTERIZATION

2.1 STUDY ACTIVITIES AND BOUNDARIES

Defining the recycling and reuse industry is complex. For example, one establishment may perform a variety of processing and/or manufacturing activities, only some of which are related to recycling or reuse. So the question arises whether the establishment should be included, and if so, what portion of that establishment's activities should be attributed to recycling/reuse. In the case of product manufacturing, both recycled and non-recycled materials may be used, again raising the question whether the total activity should be included or only a partial amount.

The most challenging issue this study faced was defining the extent of economic information to include when an industry is able to utilize recovered as well as virgin feedstock or makes an intermediate product as well as converts those intermediate products to end-products within the same facility.

In considering which activities to include, this study sought to draw consistent, appropriate boundaries around the industries by including those activities that are most essential to the continued recycling of materials or reuse of used products. The boundaries:

- Include all "supply side" activities involved in recovering and preparing materials and used products for resale;
- Include "demand side" activities up to the first point at which the recovered materials or used products have successfully competed directly against their respective primary, or virgin, equivalents;
- Exclude the activities of non-business entities such as individuals, and of advocacy, education and other organizations which do not directly add value to recovered materials and used products, or directly support such activities; and
- Exclude activities involving incineration or use of materials as fuel.

After careful consideration of the complexities involved, "Recycling and Reuse" as defined in this study includes the following "covered activities":

- Collecting materials or used products for the purposes of intermediate processing, manufacturing, and/or distribution by reuse sales establishments;
- Intermediate processing of recovered materials or used products including sorting, cleaning, consolidating, treating, disassembling, densifying, and/or transferring ownership for use in processing, product manufacturing, and/or for distribution by reuse sales establishments;

- Reclaiming of recovered materials or used products to produce refined raw materials and/or reusable products meeting the specifications of manufacturers, reuse sales establishments or other end-users;
- Manufacturing "first-stage" products containing recovered materials or used products;
- Operating wholesale or retail sales establishments that offer, largely or exclusively, used products prepared for reuse; and
- Intimately supporting the above activities through research, equipment development and sales, consulting, engineering, brokering, and exchange services.

The end-point chosen for the study was the "first-stage" manufactured product. "First-stage" refers to the first product produced from recycled materials, such as a roll of paper, sheet of plastic, glass bottle or metal billet. First-stage products are often converted into finished products (e.g., envelopes, plastic bottles, or metal parts), sometimes at the same facility. Only production of first-stage products is intended to be included in this definition. At this stage, the recycled material has successfully competed against virgin material and is often indistinguishable from other first-stage products that are made from those virgin materials. This report attempted to exclude economic activity associated with further conversion within the same facility as these are essentially manufacturing rather than recycling activities. This end-point is consistent with several of the previously completed recycling economic information studies.

2.2 BUSINESS CATEGORIES

The recycling and reuse industry was divided into twenty-six separate business categories in an attempt to eliminate classification of establishments in more than one category. Four categories of support businesses are also included because of their intimate involvement in the industry. The original NERC REI Study[9] protocol included 45 categories. As the current study progressed, the number of categories was narrowed down to 26 recycling and reuse categories and 4 support categories by combining or deleting several categories. Combining of categories was necessary for the following reasons:

- A category contained so few businesses that disclosure policies would not allow reporting; or
- Information on several combined categories was readily available from existing sources that did not report the categories separately.

[9] The original recommended methodology for conducting a study of the U.S. recycling and reuse industries is presented in *Recycling Economic Information Project Final Report*, Northeast Recycling Council, April 10, 1998.

The business categories were grouped into three major sectors:

- **Recycling Industry:** includes all collection and processing of recovered materials and manufacturing using recycled materials;
- **Reuse and Remanufacturing Industry**: includes preparation of materials for reuse and remanufacturing of used or broken equipment; and
- **Support Businesses:** businesses that do not directly recycle materials or reuse products, but provide specialized equipment and services necessary to the recycling and reuse industry.

Table 2-1 briefly defines each of the 30 business categories as used in this study.

Table 2-1
Business Category Definitions

Business Category	Definition
Recycling Industry	
1. Government Staffed Residential Curbside Collection	Recyclables collection using government employees
2. Private Staffed Residential Curbside Collection	Private sector collection of recyclables, including contract collection on behalf of municipalities
3. Compost and Miscellaneous Organics Producers	Produce compost, mulch, bark, or bedding from yard and wood waste, biosolids, or other organics, also includes vermiculture
4. Materials Recovery Facilities	Process commingled or recovered materials, usually from curbside/drop-off collection or recyclables separated from solid waste
5. Recyclable Material Wholesalers	Paper stock dealers, scrap metal processors, and other establishments that sort, remove contaminants, and densify recovered materials
6. Glass Container Manufacturing Plants	Produce finished glass containers
7. Glass Product Producers (other recycled uses)	Produce glass products other than containers
8. Nonferrous Secondary Smelting and Refining Mills	Recycling and alloying of nonferrous metals, primary products include billets, ingots, and other basic shapes
9. Nonferrous Product Producers	Produce nonferrous products through extrusion, rolling, or drawing processes
10. Nonferrous Foundries	Produce castings from nonferrous metals
11. Paper and Paperboard Mills/Deinked Market Pulp Producers	Produce paper and paperboard products from recovered paper or market pulp and/or deink recovered paper and sell pulp
12. Paper-based Product Manufacturers	Produce cellulose-based products from recovered paper or paperboard (e.g., cellulose insulation, hydro-seeding, animal bedding)
13. Pavement Mix Producers (asphalt and aggregate)	Produce asphalt paving mix from recycled materials such as crumb rubber, aggregates, or glass

Business Category	Definition
14. Plastics Reclaimers	Transform recovered plastics directly into products (e.g., plastic lumber) or raw materials ready for remanufacture
15. Plastics Converters	Convert a recycled plastic clean flake or pellet into an intermediate or end product
16. Rubber Product Manufacturers	Manufacture products using crumb rubber or cut rubber shapes and stampings as feedstock
17. Steel Mills	Produce iron and steel slabs, billets, bar, plate, and sheet from scrap and/or raw materials
18. Iron and Steel Foundries	Produce cast iron or steel products
19. Other Recycling Processors/Manufacturers	Other processors and manufacturers not elsewhere classified, using ash, sludge, engineering application of tires or other recyclable materials
Reuse and Remanufacturing Industry	
20. Computer and Electronic Appliance Demanufacturers	Sort, grade, dismantle and/or rebuild used electronic appliances
21. Motor Vehicle Parts (used)	Clean, sort, inspect, and remanufacture used automobile parts
22. Retail Used Merchandise Sales	Retail thrift stores, antique shops, reuse centers, and other shops dedicated to selling used merchandise
23. Tire Retreaders	Remove old tread from worn tires and add new tread
24. Wood Reuse	Process used wood for reuse (e.g., pallet rebuilders, construction materials)
25. Materials Exchange Services	Facilitate the reuse of products and materials by commercial and industrial establishments
26. Other Reuse	Other reuse or remanufacturing, not elsewhere classified
Support Businesses	
27. Recycling and Reuse Equipment Manufacturers	Produce new primary equipment designed for use by recycling businesses – conveyers, balers, wash systems, sorting systems
28. Consulting/Engineering	Provide technical research, development, and engineering services to recycling and reuse establishments
29. Brokers	Buy and sell recyclable materials or reusable products without processing or otherwise adding value
30. Transporters	Transport recyclable materials or reusable goods by air, rail, water, or truck

For more detailed definitions, please see Appendix A. For a complete listing of the original 45 categories and explanations of combined or deleted categories, please refer to Appendix B – Changes from Original NERC REI Project Methodology.

2.3 TYPES OF INFORMATION DEVELOPED

The two types of economic information developed in the study were:

1. **Direct Economic Information:** Information directly derived from the establishments in each business category and necessary to document industry size; and
2. **Total Economic Information**: Information on the economic values that recycling and reuse establishments induce in the greater economy at the regional and state level, including state tax revenue impacts.

In deriving the direct information, five primary data types were developed:

1. **Number of Establishments:** An establishment is a single physical location where business is conducted or where services or industrial operations are performed;
2. **Employment**: Consists of full and part-time employees, including salaried officers and executives of corporations;
3. **Total Annual Payroll**: Includes all forms of compensation, such as salaries, wages, commissions, bonuses, vacation allowances, sick-leave pay, and the value of payments in kind (e.g., free meals and lodgings) paid during the year to all employees;
4. **Total Annual Receipts**: Revenue for goods produced, distributed, or services provided, including revenue earned from premiums, commissions and fees, rents, interest, dividends, and royalties. Excludes all revenue collected for local, state, and federal taxes; and
5. **Total Throughput**: Total tons of recyclable materials collected or processed. This data type was not gathered for reuse and support business categories because reuse businesses typically do not track throughput data in a manner comparable to recycling businesses (e.g., they may use the number of units remanufactured rather than tons).

The total economic information, developed through economic modeling, generated four secondary data types:

1. **Indirect Economic Values**: Economic activity accrued by other establishments (suppliers and customers) as a result of the activities of the recycling and reuse businesses;
2. **Induced Economic Values:** Economic activity accrued by retail and other establishments because of personal purchases by recycling and reuse industry and indirect establishment employees;
3. **Multipliers**: The ratio of total values (direct, indirect, and induced) to direct values; and

4. **Tax Revenues:** State revenues derived from taxes, charges and fees, and miscellaneous revenues.

3 STUDY METHODOLOGY

3.1 OVERVIEW

This chapter provides a detailed description of the methodologies used to develop the economic activity estimates shown in Sections 4 and 5. This section includes general descriptions of strategies for data gathering and analysis employed in the study. Notes on the specific methodology for the direct data for each category are shown in Section 4 along with the results of the study.

3.2 APPROACHES TO DIRECT DATA DEVELOPMENT

In developing the direct economic information, one of three methods was employed for each business category, depending on the availability and adequacy of existing information and business lists:

- **Existing Data:** Obtained through existing sources of information (e.g., U.S. Census Bureau's Economic Census, U.S. Geological Survey's Mineral Commodity Reports, expert opinions by industry and trade associations);
- **Survey Data:** Gathered by surveying the businesses directly and compiling the data into a database of establishments; or
- **Derivation:** Limited existing data was used to derive estimates of economic activity.

The study focused on using existing data, of sufficient quality, and with categories defined consistently with the study, for as many business categories as possible to avoid duplicating efforts if sources of existing information were available. If little or no existing information was available but listings of businesses in a category were available, the next option was to develop a database of businesses and conduct surveys to obtain the desired economic information. When limited existing information was available, but no specific list of establishments could be found for purposes of surveying, estimates were derived based on limited existing data and estimations by industry experts.

After the direct economic values were developed, total economic values were estimated through economic modeling[10], using the direct data as inputs. In order to apply the economic model accurately, certain categories required additional information, known as intermediate inputs. To derive the total economic values, the following steps were taken:

[10] Economic modeling was performed only for the states of Delaware, Massachusetts, and Pennsylvania.

- Survey for Intermediate Inputs – A second, more detailed survey of a limited number of establishments was conducted to obtain estimates of the amounts of expenditures on inputs such as raw materials, chemicals, electricity, accounting services and other items necessary to production (usually expressed as a dollar amount per $1,000 in output for a particular type of industry); and
- Conduct Economic Modeling – A process based on an input-output approach developed by the U.S. Bureau of Economic Analysis. Several models have been developed, including RIMS II, Implan, and REMI. The model chosen for this study was the Implan.

In deciding on the appropriate data gathering approach for each of the business categories, R. W. Beck first reviewed the recommended sources of information and methodologies presented in the original NERC *REI Project Final Report*. Over 100 data sources were evaluated for possible use in documenting the industry. The resources evaluated include:

- State recycling directories;
- Trade association, recycling industry, and government publications; and
- Electronic databases of recycling businesses.

For a complete listing and evaluation of resources, please refer to Appendix C – Evaluation of Data Sources.

As a result of this review, recommendations for combining or deleting certain categories or changing the methodology were presented to the Advisory Committee. After discussion and approval by the Advisory Committee, one of the three approaches to data gathering and analysis described above was employed for each business category to develop the estimates of direct economic activity shown in Section 4. Due to the number of different business categories included in this study, the exact methodology used to calculate economic activity for each category was tailored to fit the material flows and processes found in each. The Advisory Committee relied on the opinions of experts from each industry when a clear and concise methodology was not easy to identify.

Table 3-1 lists the business categories and the approach used for each one. The breakdown of the number of categories served by each approach is:

- Existing Data - 11;
- Survey Data- 14;
- Derivation Data – 2; and
- Modeling – 3.

Table 3-1
Data Development Approach by Category

	Business Category	Approach
	Recycling Industry	
1.	Government Staffed Residential Curbside Collection	Derivation
2.	Private Staffed Residential Curbside Collection	Derivation
3.	Compost and Miscellaneous Organics Producers	Survey
4.	Materials Recovery Facilities	Survey
5.	Recyclable Material Wholesalers	Existing
6.	Glass Container Manufacturing Plants	Survey
7.	Glass Product Producers (other recycled uses)	Survey
8.	Nonferrous Secondary Smelting and Refining Mills	Existing
9.	Nonferrous Product Producers	Existing
10.	Nonferrous Foundries	Existing
11.	Paper and Paperboard Mills/Deinked Market Pulp Producers	Existing
12.	Paper-based Product Manufacturers	Survey
13.	Pavement Mix Producers (asphalt and aggregate)	Survey
14.	Plastics Reclaimers	Survey
15.	Plastics Converters	Existing
16.	Rubber Product Manufacturers	Survey
17.	Steel Mills	Existing
18.	Iron and Steel Foundries	Existing
19.	Other Recycling Processors/Manufacturers	Survey
	Reuse and Remanufacturing Industry	
20.	Computer and Electronic Appliance Demanufacturers	Survey
21.	Motor Vehicle Parts (used)	Existing
22.	Retail Used Merchandise Sales	Existing
23.	Tire Retreaders	Existing
24.	Wood Reuse	Survey
25.	Materials Exchange Services	Survey
26.	Other Reuse	Survey
	Support Businesses	
27.	Recycling and Reuse Equipment Manufacturers	Survey
28.	Consulting/Engineering	Modeling
29.	Brokers	Modeling
30.	Transporters	Modeling

Each of the three approaches is described in greater detail in the following subsections.

3.2.1 EXISTING DATA

The first strategy employed was to utilize existing data from public sources or trade associations. The most common example of this strategy was the use of U.S. Census Bureau reports when a category defined in the study was aligned with a distinct SIC

code. Reports from the U.S. Census included an extract created from the Standard Statistical Establishments List (SSEL) and the 1997 Economic Census. Other sources of publicly available data included U. S. Geological Survey reports and reports developed by individual state governments.

3.2.1.1 Relation of SIC and NAICS to Business Categories

The U.S. Department of Commerce, Bureau of the Census compiles and reports a wide range of economic data on U.S. industrial activity. Prior to 1997, the Census Bureau classified businesses according to the SIC system developed by the Executive Office of the President, Office of Management and Budget. The system classified establishments by their primary activity. Beginning in 1997, the SIC system is being phased out and will be replaced by the new *North American Industrial Classification System* (NAICS). The new system harmonizes systems used in Mexico and Canada, in accordance with the North American Free Trade Agreement.

Table A-1, in Appendix A, attempts to classify each business category in the study by SIC and NAICS. The codes were assigned by comparing each business category to the definitions listed in the SIC and NAICS manuals. In many cases, the listed SIC also includes businesses not involved in recycling and reuse.

3.2.1.2 Use of U.S. Department of Commerce, Bureau of Census Statistics

The primary source of U.S. Census data used for this study was an extract of the *Standard Statistical Establishments List* (SSEL) for relevant SIC codes. Because the most recent year available was 1996, the data for this study is referenced by SIC code. The SSEL provides number of establishments, number of employees, payroll, and receipts for each SIC code. It should be noted that certain data are not disclosed when an SIC code has a small of number of associated businesses and showing exact numbers would reveal sensitive information for a particular company.

In order to use the data when disclosure problems were encountered, a method of estimating based on suppression codes was developed. The U.S. Census Bureau uses lettered suppression codes to represent the range of employees for the category. When required, an estimate of number of employees was calculated by taking the midpoint of each suppression code range and adding all the midpoints for all suppression codes for a particular SIC code. For example, an SIC code with three establishments may have one establishment with code “a” (0-4 employees), one establishment with code “c” (10-19 employees) and the third establishment with code “d” (20-99 employees). In this case, the estimate used for this study was 2 for the first establishment, 14.5 for the second, and 59.5 for the third; for an estimated total of 76 employees. When fractions occurred in the total, the total was rounded down.

In cases of disclosure, the U.S. Census Bureau does not give any information for payroll and estimated receipts. In such cases, payroll and receipts were estimated by using an average payroll per employee and average receipts per employee, based on U.S. totals for employees, payroll, and receipts. When data was available for several

Northeast states, regional estimates of payroll per employee and receipts per employee were used in developing estimates for other Northeast states when the Bureau of Census did not disclose data for business categories in those other states. See Appendix D for a sample of data provided by U.S. Census SSEL.

3.2.1.3 Additional Sources of Existing Data

Although the most commonly used existing data was the U.S. Census SSEL, other sources provided throughput data or partial data for use in derivations. The most common source of throughput data was the 1997 Economic Census, a series of reports on industrial activity prepared by the U.S. Census Bureau. Other major sources of existing information and their contributions include:

- American Forest and Paper Association – State-wide throughput data for paper, paperboard, and deinked market pulp mills;
- American Plastics Council – Database provided employment and throughput data for plastics reclaimers;
- Steel Recycling Institute – Expert opinion on the steel recycling process and percentage of activities to include in the study; and
- U.S. Geological Survey – Expert opinions on the recycling of nonferrous metals and the percentage of activities to include in the study for nonferrous product producers and nonferrous foundries.

3.2.2 SURVEY DATA

When little or no existing data was available for a particular business category, R.W. Beck conducted surveys of those businesses and performed a statistical analysis of the results to develop estimates of economic activity.

3.2.2.1 Recycling Economic Information Study Database

The REI Study database was developed as a tool for surveying businesses in categories with little or no sources of existing data. The database was constructed from a database developed by NERC and further developed by adding recycling establishments from state directories, periodicals, and other sources. Refer to Appendix C for sources of database listings.

During the survey process, about 700 establishments were confirmed to be in survey categories in the ten-state NERC region. Of the remaining non-surveyed establishments, as many as 1,100 are likely to be in survey categories. Although the database contains a number of businesses that are not in survey categories, those listings are incidental incorporations from electronic directories. Please refer to Table 3-1 for a listing of the survey categories for which the database was developed.

3.2.2.2 Survey Design

The survey was designed to obtain economic information from businesses in categories with little or no existing information.

The survey cover page confirmed the database records for company name, mailing information, physical location, and contact information. For companies with more than one physical location, one cover page and survey for each physical location were mailed together and companies were asked to complete a separate survey for each physical location.

The survey used responses to the following questions to develop estimates of economic activity:

1. Classify your recycling activities according to the categories defined for the study: (respondents could check more than one activity);
2. Identify the single category that is most representative of the recycling-related operations for this establishment;
3. Give estimations of establishment size including number of employees, total annual payroll, and estimated receipts;
4. Estimate the percentages of labor and receipts based on covered recycling activities; and
5. Estimate the amounts, by type, of recycled materials processed.

Checkboxes with associated ranges (i.e., 0-9 employees, $50,000-$149,999 total payroll) were used for questions regarding number of employees, payroll, receipts, and percentages. Due to the sensitive nature of the survey questions, it was anticipated that asking for responses in ranges rather than exact numbers would increase the response rate. With enough responses, any variation from the exact amount was likely averaged out.

The survey cover page and form were accompanied by a cover letter describing the purpose of the study, naming the sponsor and contractor, and assuring confidentiality of individual results. All survey materials are in Appendix E.

3.2.2.3 Survey Approach

The cover letter, survey cover page, and survey form were mailed to all establishments in survey categories. After waiting three weeks for mail responses, trained surveyors began making phone calls to a randomly selected portion of the non-responding establishments.

Although the project budget constrained the total number of phone calls able to be placed, a statistical formula was used to ensure the correct number of completions was targeted and distributed appropriately by state and category. The number chosen for follow-up phone calls for each state and category depended on the

number of completed surveys needed in order to obtain statistics accurate to +/- 10 percent at a 95 percent level of confidence.

Within a given category for each state, all non-responding establishments were randomly numbered. Phone calls were placed beginning with the first randomly selected business for each state and category and continued until all businesses in the category were called or the number of completions needed for statistical confidence was reached. Additionally, members of the Advisory Committee reviewed the list of non-respondents for their respective states to ensure that no large facilities were overlooked and, in some cases, made extra efforts to gain a response.

Senior staff reviewed all survey data for accuracy and completeness. Responses were then entered into the REI Study database. After checking the database for errors, the raw data was compiled and analyzed using a statistical approach.

3.2.2.4 Survey Calculations

Survey data from the ten Northeastern states was analyzed in an attempt to identify the recycling characteristics of the region. Individual analyses were performed for the six sponsor states[11], and a combined analysis was performed on data for the aggregate ten-state region. Survey data on three variables (number of employees, payroll, and receipts) provided the primary information analyzed.

Survey information obtained from over 600 randomly selected firms was used to estimate the number of employees[12] involved in recycling activities, as well as the dollar value of recycling and reuse payroll and receipts. Based on initial estimates and survey participation responses, R. W. Beck estimated the total number of firms engaged in recycling activities for each of fourteen business categories in each state. In the combined ten-state area, nearly 1,600 firms are believed to be involved in recycling activities in these categories. For a detailed explanation of the statistical analysis of surveys, please refer to Appendix F – Statistical Analysis of Survey Results.

3.2.3 DERIVATION DATA

In the third strategy, derivations were made by using data from a variety of sources, such as trade organizations, industry experts, periodicals and other publications. Data points from various sources were pieced together to develop estimates of economic activity. As an example of this approach, a detailed explanation of the sources and methodology used for both public and private curbside collection of recyclables is given in Appendix G. Additionally, direct data for three of the four support business categories was derived as a result of economic modeling.

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[11] Delaware, Massachusetts, New Jersey, New York, Pennsylvania, and Vermont

[12] Employee responses were adjusted to a full-time equivalent basis. Thus, two employees each working 50% on recycling activities would be counted as one employee.

3.3 INTERMEDIATE INPUT DATA FOR ECONOMIC MODELING

Prior to beginning economic modeling, the 26 direct recycling and reuse business categories were evaluated to identify those categories where recycling establishments were thought to significantly differ from similar non-recycling establishments in the way they operate, their process inputs, and their purchases from other establishments in the economy. Next, existing in-house data from previous studies was examined to identify where recycling and reuse industry-specific data was lacking.

For those categories lacking adequate input data, a detailed survey that asked for much greater detail regarding the cost elements of production was sent to select establishments. Those establishments that were cooperative and expressed interest in the study during the gathering of the direct economic information (employment, payroll, and revenues) were targeted for the additional surveys. Only a handful of establishments were targeted for each business category because the major process inputs and cost elements of the businesses were assumed to be very similar to each other (and quite different from the cost elements of virgin business establishments).

3.4 ECONOMIC MODELING

This study modeled indirect, induced, and total economic values of 26 categories of recycling or reuse establishments for the states of Delaware, Massachusetts, and Pennsylvania using the Implan[13] economic model.

Economic modeling started with the purchase of data files that provided a standard inter-industrial accounting of the economies of each of the three states. These data files provided were procured from Minnesota IMPLAN Group, Inc., the data supplier for the Implan model. What followed was an eight-step process to construct a model for each state that would isolate the 26 categories of recycling and reuse establishments from other establishments in the state so that their economic values could be separately analyzed and reported.

The eight-step process is described below:

1. U.S. standard industrial classifications were identified that best corresponded to the kind of recycling product, process, or service that each of the 26 recycling and reuse categories produces. This was necessary because there is no specific set of "recycling and reuse" industries in the 537 industries contained in the data files.
2. These industrial types were controlled for in the initial model while the remaining industries were aggregated to the one-digit SIC level. The initial

[13] The modeling system used for this study is called IMPLAN Pro, published by the Minnesota IMPLAN Group, Inc. Data are available and may be purchased from this company for all states and all counties in the U.S. Their data standards are rigorous, their data sets are updated annually, and their methods for compiling and processing the main input-output data sets are widely considered to be a significant enhancement of the basic I-O data that are compiled and solicited by the U.S. Bureau of Economic Analysis. This company has the largest user base of any of the commercial input-output models available in the U.S.

model that was produced, then, had twenty-six specific recycling industry candidates and twelve broad industrial aggregates (e.g., farming, the remainders of manufacturing, wholesale trade, transportation, etc.).

3. The direct values obtained from the study were substituted for the direct values (also called the "social" accounts) in the models. Estimates of returns to proprietors, property income, and indirect tax payments to state and local governments were derived from the averages of the original industrial group. This assumed that the recycling or reuse firms yield roughly the same return on investment to sole proprietors or investors as the corresponding industry that may contain significant non-recycling establishments.

4. The remaining values in the parent category (the original values minus the recycling industry direct values) were then manually placed back into the one-digit industrial sector so that the only direct data in the sector reflected the recycling and reuse industries. This ensured the models' total amounts of industrial activity summed to precisely the same values as they had originally, before isolating recycling and reuse business categories.

5. Recycling and reuse establishments differ from non-recycling and reuse establishments in the way they operate, their process inputs, and their purchases from other establishments in the economy. This step attempted to account for these differences with data from two sources: (1) the additional intermediate input data that was collected as described previously; and (2) “in-house” data from other previous county-level studies that were conducted in Iowa, Illinois, Nebraska, and Wisconsin counties that reflected the kinds of recycling industries measured in this study but did not contain virgin-only establishments. Twelve models were built from in-house data from counties to isolate recycling industries (primarily ferrous and nonferrous metals, plastics manufacturing, and paper industries) and their production characteristics. The production inputs in the model were then re-configured so that the industrial linkages to raw commodities, mining, or refiners were reduced and linkages to recycling-related processors were strengthened. These changes resulted in a recalculation of all of the production input values for each recycling and reuse industry for each state.

6. There are several other components to input-output modeling that were investigated. One modification involved changing regional purchase coefficients in the model (RPCs). For some materials, recycled commodities may be shipped on average less or greater distances than the virgin alternative, including across state boundaries. In-house data from a previous Recycle Iowa Study (an early economic impact study of recycling) of the general likelihood of a recycled commodity being purchased locally for industrial usage was examined for its bearing on this study. Absent other information about some commodity types, the RPC adjustment for a recycling commodity that was believed to be much more likely purchased locally was estimated by taking the square root of the existing number for that industry. For example, an RPC of .31 in a commodity

supply category would be inflated to .56 to increase the likelihood that the input commodity was purchased locally. RPCs were only changed for a small subset of industries14 and were only done so to maximize the expected linkage between recovered materials collection, processing, and conversion into final demand goods.

There were other account categories that were assessed also in the I-O models. The byproducts category in the model itemizes the commodity production by industry. Each of these categories was scrutinized and assessed as to its reasonableness for each recycling or reuse industry. No other accounts categories were altered in the models (including exports, institutional demands, or household incomes).

7. The resulting models were then re-checked for errors, omissions, and reasonableness and re-estimated in final form. This step included rebalancing the models so that the gross totals for the states equaled their original starting values.
8. Once all three final state models were constructed, multipliers were generated for each recycling and reuse industry in each state for Total Industrial Output, Personal Income, Value Added, and Jobs. These multipliers were applied to the original direct values to isolate each industry's unique economic value in each state.

In order to estimate state revenues associated with the economic data (both direct as well as indirect and induced), data on each state's government finances were gathered for 1992 through 1997 from the U.S. Census of Governments publications. Data on incomes were obtained from the U.S. Bureau of Economic Analysis Regional Economic Information System. Annual incomes were converted to fiscal values, and the weighted average revenue incidences for state government own-source[15] revenues for each state were compiled for:

- All State Taxes (e.g., personal, corporate, sales, use, excise, etc.)
- Charges and Fees (e.g., direct state charges and fees, including higher education and health)
- Miscellaneous Revenues (e.g., special revenues, gifts, interest earnings, etc.)
- Total Own-Source Revenues (i.e., the sum of the previous three items).

The revenue indices that were developed were then applied to the direct and total values of industrial output and personal income to yield estimates of state revenues.

[14] RPCs were increased for the following categories: compost and miscellaneous organics producers, plastics reclaimers, motor vehicle parts (used),and wood reuse.

[15] Own-source means collected through the state revenue system and not received, for example, as a state disbursement of funds collected through the federal revenue system.

3.5 VALIDATION OF STUDY RESULTS

Upon completion of the REI study, various methods of internal and external review were used to ensure that both direct and indirect study results are valid and meaningful. The methods of internal review included:

- Review of completed surveys by senior staff;
- Comparisons to other industries in the region;
- Estimations of recycling and reuse as a portion of the state's economy for states that participated in modeling;
- Review of draft results by every state in the region; and
- Review of all results and reporting methods by Advisory Committee members.

External reviewers included representatives of funding states and industry trade associations. The trade associations that reviewed the study included:

- American Forest and Paper Association;
- American Plastics Council;
- Institute of Scrap Recycling Industries; and
- Steel Recycling Institute.

After review and consideration of their various comments and suggestions, all parties felt that the study fairly and conservatively characterized the level of economic activity for their state or industry.

4 STUDY RESULTS

This section presents the detailed results and explanations of estimates for individual data points. The section contains:

- A general description of the format for the data tables;
- A table of results for each sponsor state and the NERC region; and
- Numbered notes that correspond to specific data points in the data tables.

Section 4.1 describes the table format and column headings. Section 4.2 presents the detailed data tables while Section 4.3 gives a detailed explanation for each data point in the tables. For an explanation of a specific data point, simply look up the number of the associated note in Section 4.3.

4.1 General Notes on Data Tables

This section provides general information regarding the format of the data tables presented in section 4.2. Detailed descriptions of all table column headings and an explanation of the three tiers of data presented are given here.

4.1.1 Three-tiered Approach to Data Presentation

Three facts about recycling and reuse businesses complicate recycling economic information studies and have led to inconsistency in past efforts:

1. Most establishments involved in recycling and reuse are part of industries in which many establishments do not recycle or reuse recovered materials or products at all;
2. Some establishments involved in recycling or reuse are also involved in non-recycling activities not intended to be covered in this study; and
3. Many recycling manufacturers use less than 100 percent recycled feedstock and/or adjust the percentage of recycled feedstock throughout the year.

Past studies have handled each of these challenges differently. In an effort to exclude non-recycling activities, some studies relied on survey respondents to estimate recycling activities. Other studies have targeted all facilities involved in recycling and did not attempt to adjust the statistics to account for non-recycling activities. Various industry and recycling experts have criticized both approaches.

To overcome these challenges, the REI Study is reporting three tiers of statistics. The goals of this approach are:

- To report statistics on recycling and reuse-related businesses as they actually exist in the economy (i.e., as part of industries and establishments that do not always involve recycling); and

- To derive conservative estimates for the amount of economic activity that can "reasonably" be attributed exclusively to recycling. The three tiers of statistics are described below.

4.1.1.1 Tier One - Statistics on All Industry Establishments

Tier One statistics are reported only for certain business categories where data was available from a source that included all establishments in the category, even though some of them may not do any recycling. This information typically comes from U.S. Bureau of Census data by SIC code. For example, data for all paper mills in a given state will be shown even though some of those establishments do not utilize recovered paper.

4.1.1.2 Tier Two - Statistics on Establishments Involved in Recycling

Like Tier One, Tier Two statistics are only reported for certain business categories where data was available from a source that aggregated data for recycling and non-recycling establishments. The data covers only those establishments that have some involvement in recycling, and attempts to exclude data on establishments with no recycling activities. Although all of these establishments perform some amount of recycling or reuse activity, they may also perform non-recycling activities not covered in this report. For example, information on all paper mills that utilize recovered paper would be included here, even though some of these establishments may also be involved in non-covered activities like production of wood pulp.

4.1.1.3 Tier Three - Statistics on Covered Recycling Activities

Tier Three statistics are the heart of this study and are reported for all business categories. They are conservative estimates of the portion of economic activity in Tier One or Tier Two that can be reasonably attributed to the recycling activities covered in the study. Most Tier Three estimates are derived from survey results in which respondents themselves are asked to identify what percentage of their facility's activities involves “covered activities.”[16] For some important categories, including paper, plastics and metals manufacturers, an algorithm is being used to estimate covered economic activity. The algorithms begin with Tier One and Tier Two data as described above. Then, the percentage of Tier Two activity involving covered recycling activities is being estimated based on available statistics and industry expert opinions. The exact approach used for each category is documented in detail in Section 4.3. Additionally, Tier Three statistics are reported in two columns, depending on whether the establishments in the category are "100 percent dependent on recycling," or simply "undertaking recycling activities." Those establishments that are dependent on recycling have 100 percent of employment and revenues derived from recycling activities, while those that are “undertaking recycling activities” have only a portion of economic activity derived from recycling.

[16] For a complete definition of covered activities, refer to Section 2.1 and note 2 on page 4-33.

This distinction is intended to assist in accurately and conservatively reporting overall results and to further illuminate the actual structure of the recycling industry.

4.1.2 DEFINITIONS OF COLUMN HEADINGS IN THE DATA TABLES

For Tables 4-2 through 4-7, the lettered column headings are defined as follows:

A. Business Category; For a detailed list of business category definitions, refer to Appendix A.

B. Data Type; The data types presented in Tables 4-2 through 4-8 are:

- Establishments – an establishment is a single physical location of a company or government. A single company or government may have multiple establishments (physical locations).
- Employment – total number of employees for all establishments in a category.
- Annual Payroll – total annual payroll for all employees in a category; reported in thousands of dollars.
- Estimated Receipts – total annual estimated receipts for all establishments in a category; reported in thousands of dollars.
- Estimated Throughput – if possible, total tons of materials processed is estimated; reported in thousands of tons.[17]

C. Presents the combined statistics for all establishments in categories without regard to recycling activity.[18]

D. This is a subset of C and reports statistics on only those establishments with some portion of operations in covered recycling activities.[19] Establishments in this column may have all of their operations or only a portion of their operations involved in covered recycling activities. This column excludes any virgin-only establishments that may be shown in Column C.

E. This is a subset of D and focuses on the employment, payroll, and receipts figures in establishments with less than 100 percent of operations involved in recycling or reuse-related activities. The same establishments are considered in columns D and E. The employment, payroll, and receipts figures are adjusted to eliminate employees who are focused on virgin material preparation, and further discounted for other non-covered activities.

[17] Note that subtotals and grand totals for throughput are not shown due to the potential for triple-counting material by adding tons of the same material at three different stages - collection, local processing, and reclamation/manufacturing.

[18] A category may not show data for Column C because: (1) it does not have virgin-only establishments; or (2) virgin-only establishments were excluded from the data collection process.

[19] For a complete definition of covered recycling activities, refer to page 2-1 and note 2 on page 4-33.

F. Presents estimates for establishments with 100 percent of operations dependent on recycling or reuse, which in most cases establishments consume no virgin material.[20] This column presents data that is discounted for non-covered activities.

G. Presents conservative estimates of total recycling or reuse-related economic activity. These estimates were developed by adding Columns E and F.

4.1.3 ABBREVIATIONS USED IN DATA TABLES

Table 4-1 presents a list of abbreviations used in the data tables.

Table 4-1
Abbreviations Used in Tables of Results

Abbreviation	Definition
AF&PA	American Forest and Paper Association
AISE	American Iron and Steel Engineers
APC	American Plastics Council
GPI	Glass Packaging Institute
REI	Recycling Economic Information Study
SPI	Society of the Plastics Industry
SRI	Steel Recycling Institute
U.S. Census SSEL	U.S. Census *Standard Statistical Establishments List*
U.S.G.S.	U.S. Geological Survey

[20] All domestic steel mills depend on a minimum level of scrap in their processes. Therefore, all steel mill economic activity is included in this column even though some mills use virgin feedstock.

4.2 DATA TABLES

Table 4-2
State of Delaware
Summary of Recycling and Reuse Industry Economic Information

Annual Payroll and Estimated Receipts are in $1,000. Throughput is in thousands of tons.
All numbered notes are fully explained in Section 4.3 - Specific Notes on Data Tables
(D) - Data not disclosed due to a limited number of establishments in this business category and the need to avoid revealing data that could identify a single business. Data for multiple disclosure categories are included in totals.

		Delaware								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
Recycling Industry Economic Activity										
1. Government Staffed Residential Curbside Collection	Establishments							3	DE SW Authority 1998 data [6]	3
	Employment							12	DE SW Authority 1998 data [6]	12
	Annual Payroll							382	DE SW Authority 1998 data [6]	382
	Estimated Receipts							1,684	DE SW Authority 1998 data [6]	1,684
	Estimated Throughput							23	DE SW Authority 1998 data [7]	23
2. Private Staffed Residential Curbside Collection	Establishments							1	DE SW Authority 1998 data [8]	1
	Employment							6	DE SW Authority 1998 data [8]	6
	Annual Payroll							191	DE SW Authority 1998 data [8]	191
	Estimated Receipts							1,012	DE SW Authority 1998 data [8]	1,012
	Estimated Throughput							185	NERC Web Site '95-96 data [9]	185
3. Compost and Miscellaneous Organics Producers	Establishments							7	REI Study Database [10]	7
	Employment							19	Survey results extrapolated	19
	Annual Payroll							258	Based on DE responses.	258
	Estimated Receipts							995	(n=4). [11], [12]	995
	Estimated Throughput							3	DE SW Authority [13]	3
4. Materials Recovery Facilities (MRF's)	Establishments							1	DE SW Authority 1998 data [14]	1
	Employment							39	DE SW Authority 1998 data [14]	39
	Annual Payroll							911	DE SW Authority 1998 data [14]	911
	Estimated Receipts							2,303	DE SW Authority 1998 data [14]	2,303
	Estimated Throughput							18	APC Collection Manual [15]	18
5. Recyclable Material Wholesalers	Establishments							33	U.S. Census SSEL, 1996; SIC	33
	Employment							290	code 5093. [16], [17]	290
	Annual Payroll							6,024		6,024
	Estimated Receipts							70,090		70,090
	Estimated Throughput							187	Derivation [18]	187
6. Glass Container Manufacturing Plants	Establishments					0	[19]			0
	Employment					0				0
	Annual Payroll					0				0
	Estimated Receipts					0				0
	Estimated Throughput					0				0

		Delaware								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
7. Glass Product Producers (other recycled uses)	Establishments					2	REI Study Database[10]			2
	Employment					21	Survey results extrapolated			21
	Annual Payroll					404	based on DE responses.			404
	Estimated Receipts					523	(n=2). [11],[21]			523
	Estimated Throughput					14	R. W. Beck estimate [22]			14
8. Nonferrous secondary smelting and refining mills	Establishments			1	U.S. Census SSEL, 1996; SIC			1	From Column D [25]	1
	Employment			2	code 3341. [16], [23]			2	Column D adjusted for	2
	Annual Payroll			69				69	non-covered activities [25]	69
	Estimated Receipts			1,001				1,001		1,001
	Estimated Throughput			0.3	1992 Economic Census [24]			0.3	From Column D [25]	0.3
9. Nonferrous product producers	Establishments	0	[26]							0
	Employment	0								0
	Annual Payroll	0								0
	Estimated Receipts	0								0
	Estimated Throughput	0								0
10. Nonferrous foundries	Establishments	0	[30]							0
	Employment	0								0
	Annual Payroll	0								0
	Estimated Receipts	0								0
	Estimated Throughput	0								0
11. Paper and Paperboard Mills/Deinked Market Pulp Producers	Establishments	2	U.S. Census SSEL, 1996; SIC	1	Derived from column C with	1	From Column D [35]			1
	Employment	175	codes 2611, 2621, and 2631.	88	data from AF&PA Paper	61	Derived from Column D with			61
	Annual Payroll	8,312	[16],[32]	4,156	Matcher. [33]	2,909	data from AF&PA and adjustment			2,909
	Estimated Receipts	51,304		25,652		17,956	for non-covered activities. [35]			17,956
	Estimated Throughput			18	AF&PA [34]	18	From Column D [35]			18
12. Paper-based Product Manufacturers	Establishments							0	[37]	0
	Employment							0		0
	Annual Payroll							0		0
	Estimated Receipts							0		0
	Estimated Throughput							0		0
13. Pavement Mix Producers (asphalt and aggregate)	Establishments					4	REI Study Database [10]			4
	Employment					11	Survey results extrapolated			11
	Annual Payroll					380	based on DE responses.			380
	Estimated Receipts					1,425	(n=1). [11],[39]			1,425
	Estimated Throughput					35	NERC web site '95-96 data [40]			35
14. Plastics Reclaimers	Establishments							5	APC Database [41]	5
	Employment							72		72
	Annual Payroll							2,097	U.S. Census 1997 [41]	2,097
	Estimated Receipts							6,065	Plastics News [41]	6,065
	Estimated Throughput							11	APC Database [41]	11
15. Plastics Converters	Establishments	62	Probe Economics [42]	10	Derivation; from SPI data [43]	10	From Column D [45]			10
	Employment	3,536	Probe Economics [42]	576	Derivation; from SPI data [43]	461	Column D adjusted for			461
	Annual Payroll	99,008	Probe Economics [42]	16,124	Derivation; from SPI data [43]	12,899	non-covered activities [45]			12,899
	Estimated Receipts	1,326,000	Probe Economics [42]	215,949	Derivation; from SPI data [43]	172,759				172,759
	Estimated Throughput			9	APC Database [44]	9	From Column D [45]			9
16. Rubber Product Manufacturers	Establishments					0	[46]			0
	Employment					0				0
	Annual Payroll					0				0
	Estimated Receipts					0				0
	Estimated Throughput					0				0

		Delaware								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
17. Steel mills	Establishments			1	U.S. Census SSEL, 1996			1	From Column D [50]	1
	Employment			375	SIC code 3312. [16],[48]			356	Column D adjusted for	356
	Annual Payroll			18,658				17,725	non-covered activities [50]	17,725
	Estimated Receipts			121,426				115,355		115,355
	Estimated Throughput			117	Derivation [49]			117	From Column D [50]	117
18. Iron and Steel foundries	Establishments			0	[51]					0
	Employment			0						0
	Annual Payroll			0						0
	Estimated Receipts			0						0
	Estimated Throughput			0						0
19. Other Recycling Processors/Manufacturers	Establishments					6	REI Study Database [10]			6
	Employment					91	Survey results extrapolated			91
	Annual Payroll					2,031	based on DE responses.			2,031
	Estimated Receipts					25,175	(n=3). [11], [54]			25,175
	Estimated Throughput					18	R. W. Beck estimate [55]			18
Recycling Subtotals	**Establishments**					23		52		75
	Employment					645		796		1,441
	Annual Payroll					18,624		27,657		46,280
	Estimated Receipts					217,838		198,505		416,343

		Delaware								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
Reuse and Remanufacturing Industry Economic Activity										
20. Computer and Electronic Appliance Demanufacturers	Establishments					0	[56]			0
	Employment					0				0
	Annual Payroll					0				0
	Estimated Receipts					0				0
	Estimated Throughput					0				N/A
21. Motor Vehicle Parts (used)	Establishments							29	U.S. Census SSEL, 1996	29
	Employment							183	SIC code 5015; [16],[57]	183
	Annual Payroll							3,843		3,843
	Estimated Receipts							19,129		19,129
	Estimated Throughput							N/A		N/A
22. Retail Used Merchandise Sales	Establishments							60	U.S. Census SSEL, 1996	60
	Employment							306	SIC code 5932; [16],[58]	306
	Annual Payroll							3,470		3,470
	Estimated Receipts							17,006		17,006
	Estimated Throughput							N/A		N/A
23. Tire retreaders	Establishments							3	U.S. Census SSEL, 1996	3
	Employment							64	SIC code 7534; [16],[59]	64
	Annual Payroll							1,407		1,407
	Estimated Receipts							7,280		7,280
	Estimated Throughput							N/A		N/A
24. Wood Reuse	Establishments					4	REI Study Database[10]			4
	Employment					61	Survey results extrapolated			61
	Annual Payroll					1,039	based on regional average.			1,039
	Estimated Receipts					9,988	n=(23). [11],[60]			9,988
	Estimated Throughput					N/A				
25. Materials Exchange Services	Establishments							0	[61]	0
	Employment							0		0
	Annual Payroll							0		0
	Estimated Receipts							0		0
	Estimated Throughput							0		N/A
26. Other Reuse	Establishments					0	[62]			0
	Employment					0				0
	Annual Payroll					0				0
	Estimated Receipts					0				0
	Estimated Throughput					0				N/A
Reuse and Remanufacturing Subtotals	**Establishments**					4		92		96
	Employment					61		553		614
	Annual Payroll					1,039		8,720		9,759
	Estimated Receipts					9,988		43,415		53,403

GRAND TOTALS	**Establishments**					27		144		171
Recycling, Reuse and Remanufacturing	**Employment**					706		1,349		2,055
	Annual Payroll					19,663		36,377		56,040
	Estimated Receipts					227,826		241,920		469,746

Table 4-3
State of Massachusetts
Summary of Recycling and Reuse Industry Economic Information

Annual Payroll and Estimated Receipts are in $1,000. Throughput is in thousands of tons.
All numbered notes are fully explained in Section 4.3 - Specific Notes on Data Tables
(D) - Data not disclosed due to a limited number of establishments in this business category and the need to avoid revealing data that could identify a single business. Data for multiple disclosure categories are included in totals.

		Massachusetts								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
Recycling Industry Economic Activity										
1. Government Staffed Residential Curbside Collection	Establishments							53	Derivation; multiple sources [6]	53
	Employment							450	Derivation; multiple sources [6]	450
	Annual Payroll							16,401	Derivation; multiple sources [6]	16,401
	Estimated Receipts							18,488	Derivation; multiple sources [6]	18,488
	Estimated Throughput							311	MA DEP 1996 data [7]	311
2. Private Staffed Residential Curbside Collection	Establishments							103	Derivation; multiple sources [8]	103
	Employment							860	Derivation; multiple sources [8]	860
	Annual Payroll							31,344	Derivation; multiple sources [8]	31,344
	Estimated Receipts							35,889	Derivation; multiple sources [8]	35,889
	Estimated Throughput							2,016	MA DEP 1996 data [9]	2,016
3. Compost and Miscellaneous Organics Producers	Establishments							129	REI Study Database [10]	129
	Employment							444	Survey results extrapolated	444
	Annual Payroll							9,279	based on MA responses.	9,279
	Estimated Receipts							46,643	(n=50). [11], [12]	46,643
	Estimated Throughput							670	MA DEP 1996 data [13]	670
4. Materials Recovery Facilities (MRF's)	Establishments							22	REI Study Database [10]	22
	Employment							369	Survey results extrapolated	369
	Annual Payroll							7,241	based on MA responses.	7,241
	Estimated Receipts							23,581	(n=12). [11], [14].	23,581
	Estimated Throughput							163	MA DEP 1996 data [15]	163
5. Recyclable Material Wholesalers	Establishments							236	U.S. Census SSEL, 1996; SIC	236
	Employment							2,421	code 5093. [16], [17]	2,421
	Annual Payroll							71,655		71,655
	Estimated Receipts							799,993		799,993
	Estimated Throughput							1,493	Derivation [18]	1,493
6. Glass Container Manufacturing Plants	Establishments					1	REI Study Database [10]			1
	Employment					(D)	Survey results extrapolated			(D)
	Annual Payroll					(D)	based on MA responses.			(D)
	Estimated Receipts					(D)	(n=1). [11],[19]			(D)
	Estimated Throughput					(D)	1997 Economic Census [20]			(D)
7. Glass Product Producers (other recycled uses)	Establishments					4	REI Study Database [10]			4
	Employment					13	Survey results extrapolated			13
	Annual Payroll					160	based on MA responses.			160
	Estimated Receipts					288	(n=3). [11],[21]			288
	Estimated Throughput					8	R. W. Beck estimate [22]			8

		Massachusetts								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
8. Nonferrous secondary smelting and refining mills	Establishments			6	U.S. Census SSEL, 1996; SIC			6	From Column D [25]	6
	Employment			359	code 3341. [16], [23]			341	Column D adjusted for	341
	Annual Payroll			13,499				12,824	non-covered activities [25]	12,824
	Estimated Receipts			198,106				188,201		188,201
	Estimated Throughput			60	1992 Economic Census [24]			60	From Column D [25]	60
9. Nonferrous product producers	Establishments	8	U.S. Census SSEL, 1996; SIC	4	Column C adjusted for	4	From column D [29]			4
	Employment	453	codes 3351-3356. [16], [26]	227	non-recycling establishments [27]	204	Column D adjusted for			204
	Annual Payroll	15,530		7,765		6,989	non-covered activities [29]			6,989
	Estimated Receipts	165,151		82,576		74,318				74,318
	Estimated Throughput			15	1997 Economic Census [28]	15	From column D [29]			15
10. Nonferrous foundries	Establishments			43	U.S. Census SSEL, 1996; SIC	43	From column D [29]			43
	Employment			1,089	codes 3363-3369. [16], [30]	980	Column D adjusted for			980
	Annual Payroll			31,000		27,900	non-covered activities [29]			27,900
	Estimated Receipts			109,477		98,529				98,529
	Estimated Throughput			7	1997 Economic Census [31]	7	From column D [29]			7
11. Paper and Paperboard Mills/Deinked Market Pulp Producers	Establishments	30	U.S. Census SSEL, 1996; SIC	20	Derived from column C with	11	From Column D [35]	9	Derived from Column D with	20
	Employment	4,303	codes 2611, 2621, and 2631.	2,869	data from AF&PA Paper	1,104	Derived from Column D with	1,226	data from AF&PA [36]	2,331
	Annual Payroll	178,148	[16], [32]	118,765	Matcher. [33]	45,725	data from AF&PA and adjustment	50,772		96,497
	Estimated Receipts	1,243,875		829,250		319,261	for non-covered activities [35]	354,504		673,766
	Estimated Throughput			539	AF&PA [34]	208	Derived from Column D [35]	331	Column D - Column E [36]	539
12. Paper-based Product Manufacturers	Establishments							6	REI Study Database [10]	6
	Employment							124	Survey results extrapolated	124
	Annual Payroll							2,432	based on regional average.	2,432
	Estimated Receipts							16,913	(n=11). [11],[37]	16,913
	Estimated Throughput							25	R. W. Beck estimate [38]	25
13. Pavement Mix Producers (asphalt and aggregate)	Establishments					2	REI Study Database [10]			2
	Employment					45	Survey results extrapolated			45
	Annual Payroll					2,625	based on MA responses.			2,625
	Estimated Receipts					8,125	(n=2). [11],[39]			8,125
	Estimated Throughput					356	R. W. Beck estimate [40]			356
14. Plastics Reclaimers	Establishments							28	APC Database [41]	28
	Employment							542		542
	Annual Payroll							15,783	U.S. Census 1997 [41]	15,783
	Estimated Receipts							45,658	Plastics News [41]	45,658
	Estimated Throughput							85	APC Database [41]	85
15. Plastics Converters	Establishments	552	Probe Economics [42]	90	Derivation; from SPI data [43]	90	From Column D [45]			90
	Employment	35,890	Probe Economics [42]	5,845	Derivation; from SPI data [43]	4,676	Column D adjusted for			4,676
	Annual Payroll	1,060,800	Probe Economics [42]	172,759	Derivation; from SPI data [43]	138,207	non-covered activities [45]			138,207
	Estimated Receipts	7,514,000	Probe Economics [42]	1,223,709	Derivation; from SPI data [43]	978,967				978,967
	Estimated Throughput			53	APC Database [44]	53	From Column D [45]			53
16. Rubber Product Manufacturers	Establishments					5	REI Study Database [10]			5
	Employment					103	Survey results extrapolated			103
	Annual Payroll					1,982	based on regional average.			1,982
	Estimated Receipts					9,543	(n=15). [11],[46]			9,543
	Estimated Throughput					3	R. W. Beck estimate [47]			3
17. Steel Mills	Establishments			3	U.S. Census SSEL, 1996			3	From Column D [50]	3
	Employment			9	SIC code 3312. [16],[48]			9	Column D adjusted for	9
	Annual Payroll			448				426	non-covered activities [50]	426
	Estimated Receipts			2,914				2,768		2,768
	Estimated Throughput			0	No mill furnaces in the state			0	No mill furnaces in the state	0

		Massachusetts								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
18. Iron and Steel foundries	Establishments			25	U.S. Census SSEL, 1996; SIC	25	From Column D [53]			25
	Employment			895	codes 3321-3325. [16], [51]	850	(Column D-Column F) adjusted for			850
	Annual Payroll			32,190		30,581	non-covered activities [53]			30,581
	Estimated Receipts			96,456		91,633				91,633
	Estimated Throughput			77	1997 Economic Census [52]	77	From Column D [53]			77
19. Other Recycling Processors/Manufacturers	Establishments					34	REI Study Database [10]			34
	Employment					1,240	Survey results extrapolated			1,240
	Annual Payroll					17,883	based on regional average.			17,883
	Estimated Receipts					125,175	(n=30). [11],[54]			125,175
	Estimated Throughput					242	R. W. Beck estimate [55]			242
Recycling Subtotals	**Establishments**					219		595		814
	Employment					9,215		6,786		16,001
	Annual Payroll					272,051		218,157		490,208
	Estimated Receipts					1,705,840		1,532,639		3,238,479

		Massachusetts								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
Reuse and Remanufacturing Industry Economic Activity										
20. Computer and Electronic Appliance Demanufacturers	Establishments					16	REI Study Database [10]			16
	Employment					270	Survey results extrapolated			270
	Annual Payroll					7,604	based on regional average.			7,604
	Estimated Receipts					30,523	(n=22). [11],[56]			30,523
	Estimated Throughput					N/A				N/A
21. Motor Vehicle Parts (used)	Establishments							175	U.S. Census SSEL, 1996	175
	Employment							1,215	SIC code 5015; [16],[57]	1,215
	Annual Payroll							30,528		30,528
	Estimated Receipts							151,039		151,039
	Estimated Throughput							N/A		N/A
22. Retail Used Merchandise Sales	Establishments							389	U.S. Census SSEL, 1996	389
	Employment							1,484	SIC code 5932; [16],[58]	1,484
	Annual Payroll							23,352		23,352
	Estimated Receipts							121,843		121,843
	Estimated Throughput							N/A		N/A
23. Tire retreaders	Establishments							12	U.S. Census SSEL, 1996	12
	Employment							53	SIC code 7534; [16],[59]	53
	Annual Payroll							932		932
	Estimated Receipts							5,376		5,376
	Estimated Throughput							N/A		N/A
24. Wood Reuse	Establishments					24	REI Study Database [10]			24
	Employment					351	Survey results extrapolated			351
	Annual Payroll					3,068	based on MA responses.			3,068
	Estimated Receipts					24,350	(n=9). [11],[60]			24,350
	Estimated Throughput					N/A				N/A
25. Materials Exchange Services	Establishments							4	REI Study Database [10]	4
	Employment							42	Survey results extrapolated	42
	Annual Payroll							1,473	based on MA responses.	1,473
	Estimated Receipts							3,420	(n=2). [11],[61]	3,420
	Estimated Throughput							N/A		N/A
26. Other Reuse	Establishments					3	REI Study Database [10]			3
	Employment					28	Survey results extrapolated			28
	Annual Payroll					484	based on MA responses.			484
	Estimated Receipts					5,488	(n=2). [11],[62]			5,488
	Estimated Throughput					N/A				N/A
Reuse and Remanufacturing Subtotals	**Establishments**					43		580		623
	Employment					650		2,794		3,444
	Annual Payroll					11,156		56,285		67,441
	Estimated Receipts					60,361		281,678		342,039

GRAND TOTALS	**Establishments**					262		1,175		1,437
Recycling, Reuse and Remanufacturing	**Employment**					9,865		9,580		19,445
	Annual Payroll					283,207		274,441		557,648
	Estimated Receipts					1,766,201		1,814,317		3,580,518

Table 4-4
State of New Jersey
Summary of Recycling and Reuse Industry Economic Information

Annual Payroll and Estimated Receipts are in $1,000. Throughput is in thousands of tons.
All numbered notes are fully explained in Section 4.3 – Specific Notes on Data Tables
D) - Data not disclosed due to a limited number of establishments in this business category and the need to avoid revealing data that could identify a single business. Data for multiple disclosure categories are included in totals.

		New Jersey								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
Recycling Industry Economic Activity										
1. Government Staffed Residential Curbside Collection	Establishments							173	Derivation; multiple sources [6]	173
	Employment							640	Derivation; multiple sources [6]	640
	Annual Payroll							22,573	Derivation; multiple sources [6]	22,573
	Estimated Receipts							26,020	Derivation; multiple sources [6]	26,020
	Estimated Throughput							978	NJ DEP 1995 data [7]	978
2. Private Staffed Residential Curbside Collection	Establishments							337	Derivation; multiple sources [8]	337
	Employment							1,240	Derivation; multiple sources [8]	1,240
	Annual Payroll							43,735	Derivation; multiple sources [8]	43,735
	Estimated Receipts							50,508	Derivation; multiple sources [8]	50,508
	Estimated Throughput							9,126	NJ DEP 1995 data [9]	9,126
3. Compost and Miscellaneous Organics Producers	Establishments							156	REI Study Database [10]	156
	Employment							1,019	Survey results extrapolated	1,019
	Annual Payroll							33,619	based on NJ responses.	33,619
	Estimated Receipts							134,109	(n=53). [11], [12]	134,109
	Estimated Throughput							1,945	NJ DEP 1995 data [13]	1,945
4. Materials Recovery Facilities (MRF's)	Establishments							25	REI Study Database [10]	25
	Employment							921	Survey results extrapolated	921
	Annual Payroll							23,047	based on NJ responses.	23,047
	Estimated Receipts							43,771	(n=15). [11], [14].	43,771
	Estimated Throughput							623	NJ DEP 1995 data [15]	623
5. Recyclable Material Wholesalers	Establishments							397	U.S. Census SSEL, 1996; SIC	397
	Employment							5,378	code 5093. [16], [17]	5,378
	Annual Payroll							169,520		169,520
	Estimated Receipts							1,821,548		1,821,548
	Estimated Throughput							7,535	Derivation [18]	7,535
6. Glass Container Manufacturing Plants	Establishments					3	REI Study Database [10]			3
	Employment					617	Survey results extrapolated			617
	Annual Payroll					24,250	based on regional average.			24,250
	Estimated Receipts					134,167	(n=9). [11],[19]			134,167
	Estimated Throughput					70	1997 Economic Census [20]			70
7. Glass Product Producers (other recycled uses)	Establishments					3	REI Study Database [10]			3
	Employment					20	Survey results extrapolated			20
	Annual Payroll					416	based on regional average.			416
	Estimated Receipts					1,201	(n=7). [11],[21]			1,201
	Estimated Throughput					13	R. W. Beck estimate [22]			13

		New Jersey								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
8. Nonferrous secondary smelting and refining mills	Establishments			7	U.S. Census SSEL, 1996; SIC			7	From Column D [25]	7
	Employment			311	code 3341. [16], [23]			295	Column D adjusted for	295
	Annual Payroll			16,489				15,665	non-covered activities [25]	15,665
	Estimated Receipts			250,254				237,741		237,741
	Estimated Throughput			52	1992 Economic Census [24]			52	From Column D [25]	52
9. Nonferrous product producers	Establishments	13	U.S. Census SSEL, 1996; SIC	7	Column C adjusted for	7	From column D [29]			7
	Employment	1,904	codes 3351-3356. [16], [26]	952	non-recycling establishments [27]	857	Column D adjusted for			857
	Annual Payroll	68,439		34,220		30,798	non-covered activities [29]			30,798
	Estimated Receipts	621,780		310,890		279,801				279,801
	Estimated Throughput			62	1997 Economic Census [28]	62	From column D [29]			62
10. Nonferrous foundries	Establishments			42	U.S. Census SSEL, 1996; SIC	42	From column D [29]			42
	Employment			1,472	codes 3363-3369. [16], [30]	1,325	Column D adjusted for			1,325
	Annual Payroll			39,556		35,600	non-covered activities [29]			35,600
	Estimated Receipts			140,948		126,853				126,853
	Estimated Throughput			9	1997 Economic Census [31]	9	From column D [29]			9
11. Paper and Paperboard Mills/Deinked Market Pulp Producers	Establishments	23	U.S. Census SSEL, 1996; SIC	15	Derived from column C with	8	From Column D [35]	7	Derived from Column D with	15
	Employment	2,715	codes 2611, 2621, and 2631.	1,771	data from AF&PA Paper	682	Derived from Column D with	757	data from AF&PA [36]	1,439
	Annual Payroll	114,958	[16], [32]	74,973	Matcher. [33]	28,864	data from AF&PA and adjustment	32,051		60,915
	Estimated Receipts	768,766		501,369		193,027	for non-covered activities [35]	214,335		407,362
	Estimated Throughput			907	AF&PA [34]	349	Derived from Column D [35]	558	Column D - Column E [36]	907
12. Paper-based Product Manufacturers	Establishments							3	REI Study Database [10]	3
	Employment							62	Survey results extrapolated	62
	Annual Payroll							1,216	based on regional average.	1,216
	Estimated Receipts							8,457	(n=11). [11],[37]	8,457
	Estimated Throughput							12	R. W. Beck estimate [38]	12
13. Pavement Mix Producers (asphalt and aggregate)	Establishments					1	REI Study Database [10]			1
	Employment					(D)	Survey results extrapolated			(D)
	Annual Payroll					(D)	based on NJ responses.			(D)
	Estimated Receipts					(D)	(n=1). [11],[39]			(D)
	Estimated Throughput					(D)	R. W. Beck estimate [40]			(D)
14. Plastics Reclaimers	Establishments							21	APC Database [41]	21
	Employment							474		474
	Annual Payroll							13,803	U.S. Census 1997 [41]	13,803
	Estimated Receipts							39,930	Plastics News [41]	39,930
	Estimated Throughput							74	APC Database [41]	74
15. Plastics Converters	Establishments	821	Probe Economics [42]	134	Derivation; from SPI data [43]	134	From Column D [45]			134
	Employment	44,907	Probe Economics [42]	7,313	Derivation; from SPI data [43]	5,851	Column D adjusted for			5,851
	Annual Payroll	1,326,000	Probe Economics [42]	215,949	Derivation; from SPI data [43]	172,759	non-covered activities [45]			172,759
	Estimated Receipts	11,050,000	Probe Economics [42]	1,799,571	Derivation; from SPI data [43]	1,439,657				1,439,657
	Estimated Throughput			77	APC Database [44]	77	From Column D [45]			77
16. Rubber Product Manufacturers	Establishments					3	REI Study Database [10]			3
	Employment					62	Survey results extrapolated			62
	Annual Payroll					1,189	based on regional average.			1,189
	Estimated Receipts					5,726	(n=15). [11],[46]			5,726
	Estimated Throughput					2	R. W. Beck estimate [47]			2
17. Steel mills	Establishments			8	U.S. Census SSEL, 1996			8	From Column D [50]	8
	Employment			1,043	SIC code 3312. [16],[48]			991	Column D adjusted for	991
	Annual Payroll			58,406				55,486	non-covered activities [50]	55,486
	Estimated Receipts			436,459				414,636		414,636
	Estimated Throughput			327	Derivation [49]			327	From Column D [50]	327

		New Jersey								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
18. Iron and Steel foundries	Establishments			16	U.S. Census SSEL, 1996; SIC	16	From Column D [53]			16
	Employment			2,004	codes 3321-3325. [16], [51]	1,904	(Column D-Column F) adjusted for			1,904
	Annual Payroll			66,982		63,633	non-covered activities [53]			63,633
	Estimated Receipts			227,963		216,565				216,565
	Estimated Throughput			173	1997 Economic Census [52]	173	From Column D [53]			173
19. Other Recycling Processors/Manufacturers	Establishments					13	REI Study Database [10]			13
	Employment					373	Survey results extrapolated			373
	Annual Payroll					13,228	based on regional average.			13,228
	Estimated Receipts					93,600	(n=19). [11],[54]			93,600
	Estimated Throughput					73	R. W. Beck estimate [55]			73
Recycling Subtotals	**Establishments**					229		1,134		1,363
	Employment					11,691		11,777		23,467
	Annual Payroll					370,737		410,713		781,450
	Estimated Receipts					2,490,596		2,991,054		5,481,651

		New Jersey								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
Reuse and Remanufacturing Industry Economic Activity										
20. Computer and Electronic Appliance Demanufacturers	Establishments					9	REI Study Database [10]			9
	Employment					31	Survey results extrapolated			31
	Annual Payroll					1,139	based on NJ responses.			1,139
	Estimated Receipts					13,469	(n=5). [11],[56]			13,469
	Estimated Throughput					N/A				N/A
21. Motor Vehicle Parts (used)	Establishments							217	U.S. Census SSEL, 1996	217
	Employment							1,334	SIC code 5015; [16],[57]	1,334
	Annual Payroll							34,174		34,174
	Estimated Receipts							171,303		171,303
	Estimated Throughput							N/A		N/A
22. Retail Used Merchandise Sales	Establishments							329	U.S. Census SSEL, 1996	329
	Employment							1,346	SIC code 5932; [16],[58]	1,346
	Annual Payroll							19,973		19,973
	Estimated Receipts							98,920		98,920
	Estimated Throughput							N/A		N/A
23. Tire retreaders	Establishments							50	U.S. Census SSEL, 1996	50
	Employment							290	SIC code 7534; [16],[59]	290
	Annual Payroll							7,654		7,654
	Estimated Receipts							39,565		39,565
	Estimated Throughput							N/A		N/A
24. Wood Reuse	Establishments					7	REI Study Database [10]			7
	Employment					140	Survey results extrapolated			140
	Annual Payroll					4,156	based on NJ responses.			4,156
	Estimated Receipts					32,003	(n=4). [11],[60]			32,003
	Estimated Throughput					N/A				N/A
25. Materials Exchange Services	Establishments							1	REI Study Database [10]	1
	Employment							(D)	Survey results extrapolated	(D)
	Annual Payroll							(D)	based on NJ responses.	(D)
	Estimated Receipts							(D)	(n=1). [11],[61]	(D)
	Estimated Throughput							N/A		N/A
26. Other Reuse	Establishments					6	REI Study Database [10]			6
	Employment					315	Survey results extrapolated			315
	Annual Payroll					1,932	based on NJ responses.			1,932
	Estimated Receipts					31,472	(n=4). [11],[62]			31,472
	Estimated Throughput					N/A				N/A
Reuse and Remanufacturing Subtotals	**Establishments**					22		597		619
	Employment					486		2,970		3,456
	Annual Payroll					7,227		61,801		69,028
	Estimated Receipts					76,944		309,788		386,732

GRAND TOTALS	**Establishments**					251		1,731		1,982
Recycling, Reuse and Remanufacturing	**Employment**					12,177		14,747		26,929
	Annual Payroll					377,964		472,514		850,574
	Estimated Receipts					2,567,540		3,300,842		5,869,095

Table 4-5
State of New York
Summary of Recycling and Reuse Industry Economic Information

Annual Payroll and Estimated Receipts are in $1,000. Throughput is in thousands of tons.
All numbered notes are fully explained in Section 4.3 - Specific Notes on Data Tables .
(D) - Data not disclosed due to a limited number of establishments in this business category and the need to avoid revealing data that could identify a single business. Data for multiple disclosure categories are included in totals.

		New York								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities (includes recycling and non-recycling activities) [2],[3]		E. Statistics on Employees Undertaking Recycling or Reuse Activities (excluding virgin material preparation and downstream conversion activities) [2],[4]		F. Statistics on Establishments 100% Recycling or Reuse-Dependent (No virgin material) [2],[5]		G. Estimates of Total Recycling-Related Economic Activity (Sum of columns E and F)
A. Business Category	B. Data Type	Estimates	Sources	Estimates	Sources	Estimates	Sources	Estimates	Sources	
Recycling Industry Economic Activity										
1. Government Staffed Residential Curbside Collection	Establishments							500	Derivation; multiple sources	500
	Employment							1,200	Derivation; multiple sources	1,200
	Annual Payroll							36,386	Derivation; multiple sources	36,386
	Estimated Receipts							47,135	Derivation; multiple sources	47,135
	Estimated Throughput							974	NY DEC 1998 Data [7]	974
2. Private Staffed Residential Curbside Collection	Establishments							972	Derivation; multiple sources	972
	Employment							2,340	Derivation; multiple sources	2,340
	Annual Payroll							70,954	Derivation; multiple sources	70,954
	Estimated Receipts							91,497	Derivation; multiple sources	91,497
	Estimated Throughput							11,566	NY DEC 1998 Data [9]	11,566
3. Compost and Miscellaneous Organics Producers	Establishments							111	REI Study Database [10]	111
	Employment							382	Survey results extrapolated	382
	Annual Payroll							8,254	based on NY responses.	8,254
	Estimated Receipts							20,210	(n=41). [11], [12]	20,210
	Estimated Throughput							901	NY DEC 1998 data [13]	901
4. Materials Recovery Facilities (MRF's)	Establishments							23	REI Study Database [10]	23
	Employment							611	Survey results extrapolated	611
	Annual Payroll							15,138	based on NY responses.	15,138
	Estimated Receipts							23,115	(n=9). [11], [14].	23,115
	Estimated Throughput							1,317	NY DEC 1998 data [15]	1,317
5. Recyclable Material Wholesalers	Establishments							683	U.S. Census SSEL, 1996; SIC	683
	Employment							8,144	code 5093. [16], [17]	8,144
	Annual Payroll							217,471		217,471
	Estimated Receipts							2,385,730		2,385,730
	Estimated Throughput							10,323	Derivation [18]	10,323
6. Glass Container Manufacturing Plants	Establishments					3	REI Study Database [10]			3
	Employment					483	Survey results extrapolated			483
	Annual Payroll					21,375	based on NY responses.			21,375
	Estimated Receipts					133,750	(n=3). [11],[19]			133,750
	Estimated Throughput					55	1997 Economic Census [20]			55
7. Glass Product Producers (other recycled uses)	Establishments					1	REI Study Database [10]			1
	Employment					(D)	Survey results extrapolated			(D)
	Annual Payroll					(D)	based on regional average.			(D)
	Estimated Receipts					(D)	(n=6). [11],[21]			(D)
	Estimated Throughput					(D)	R. W. Beck estimate [22]			(D)

		New York								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities (includes recycling and non-recycling activities) [2],[3]		E. Statistics on Employees Undertaking Recycling or Reuse Activities (excluding virgin material preparation and downstream conversion activities) [2],[4]		F. Statistics on Establishments 100% Recycling or Reuse-Dependent (No virgin material) [2],[5]		G. Estimates of Total Recycling-Related Economic Activity (Sum of columns E and F)
A. Business Category	B. Data Type	Estimates	Sources	Estimates	Sources	Estimates	Sources	Estimates	Sources	
8. Nonferrous secondary smelting and refining mills	Establishments			17	U.S. Census SSEL, 1996; SIC			17	From Column D [25]	17
	Employment			1,223	code 3341. [16], [23]			1,162	Column D adjusted for	1,162
	Annual Payroll			44,945				42,698	non-covered activities [25]	42,698
	Estimated Receipts			672,194				638,584		638,584
	Estimated Throughput			205	1992 Economic Census [24]			205	From Column D [25]	205
9. Nonferrous product producers	Establishments	18	U.S. Census SSEL, 1996;	9	Column C adjusted for	9	From column D [29]			9
	Employment	3,434	codes 3351-3356. [16],	1,717	non-recycling establishments	1,545	Column D adjusted for			1,545
	Annual Payroll	144,786		72,393		65,154	non-covered activities [29]			65,154
	Estimated Receipts	1,370,173		685,087		616,578				616,578
	Estimated Throughput			112	1997 Economic Census [28]	112	From column D [29]			112
10. Nonferrous foundries	Establishments			78	U.S. Census SSEL, 1996; SIC	78	From column D [29]			78
	Employment			2,905	codes 3363-3369. [16], [30]	2,615	Column D adjusted for			2,615
	Annual Payroll			93,610		84,249	non-covered activities [29]			84,249
	Estimated Receipts			342,202		307,982				307,982
	Estimated Throughput			19	1997 Economic Census [31]	19	From column D [29]			19
11. Paper and Paperboard Mills/Deinked Market Pulp	Establishments	53	U.S. Census SSEL, 1996;	39	Derived from column C with	21	From Column D [35]	18	Derived from Column D with	39
	Employment	8,401	codes 2611, 2621, and	6,133	data from AF&PA Paper	2,361	Derived from Column D with	2,622	data from AF&PA [36]	4,983
	Annual Payroll	359,012	[16], [32]	262,079	Matcher. [33]	100,900	data from AF&PA and adjustment	112,039		212,939
	Estimated Receipts	2,347,252		1,713,494		659,695	for non-covered activities [35]	732,519		1,392,214
	Estimated Throughput			1,505	AF&PA [34]	579	Derived from Column D [35]	926	Column D - Column E [36]	1,505
12. Paper-based Product Manufacturers	Establishments							8	REI Study Database [10]	8
	Employment							166	Survey results extrapolated	166
	Annual Payroll							3,242	based on regional average.	3,242
	Estimated Receipts							22,551	(n=13). [11],[37]	22,551
	Estimated Throughput							33	R. W. Beck estimate [38]	33
13. Pavement Mix Producers (asphalt and aggregate)	Establishments					0	[39]			0
	Employment					0				0
	Annual Payroll					0				0
	Estimated Receipts					0				0
	Estimated Throughput					0				0
14. Plastics Reclaimers	Establishments							35	APC Database [41]	35
	Employment							775		775
	Annual Payroll							22,568	U.S. Census 1997 [41]	22,568
	Estimated Receipts							65,286	Plastics News [41]	65,286
	Estimated Throughput							121	APC Database [41]	121
15. Plastics Converters	Establishments	830	Probe Economics [42]	135	Derivation; from SPI data [43]	135	From Column D [45]			135
	Employment	53,217	Probe Economics [42]	8,667	Derivation; from SPI data [43]	6,933	Column D adjusted for			6,933
	Annual Payroll	1,414,400	Probe Economics [42]	230,345	Derivation; from SPI data [43]	184,276	non-covered activities [45]			184,276
	Estimated Receipts	9,724,000	Probe Economics [42]	1,583,623	Derivation; from SPI data [43]	1,266,898				1,266,898
	Estimated Throughput			68	APC Database [44]	68	From Column D [45]			68
16. Rubber Product Manufacturers	Establishments					11	REI Study Database [10]			11
	Employment					105	Survey results extrapolated			105
	Annual Payroll					4,618	based on NY responses.			4,618
	Estimated Receipts					8,824	(n=7). [11],[46]			8,824
	Estimated Throughput					3	R. W. Beck estimate [47]			3
17. Steel mills	Establishments			13	U.S. Census SSEL, 1996			13	From Column D [50]	13
	Employment			2,791	SIC code 3312. [16],[48]			2,651	Column D adjusted for	2,651
	Annual Payroll			127,748				121,361	non-covered activities [50]	121,361
	Estimated Receipts			954,023				906,322		906,322
	Estimated Throughput			874	1997 Economic Census [49]			874	From Column D [50]	874

		New York								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities (includes recycling and non-recycling activities) [2],[3]		E. Statistics on Employees Undertaking Recycling or Reuse Activities (excluding virgin material preparation and downstream conversion activities) [2],[4]		F. Statistics on Establishments 100% Recycling or Reuse-Dependent (No virgin material) [2],[5]		G. Estimates of Total Recycling-Related Economic Activity (Sum of columns E and F)
A. Business Category	B. Data Type	Estimates	Sources	Estimates	Sources	Estimates	Sources	Estimates	Sources	
18. Iron and Steel foundries	Establishments			26	U.S. Census SSEL, 1996; SIC	26	From Column D [53]			26
	Employment			1,087	codes 3321-3325. [16], [51]	1,033	(Column D-Column F) adjusted for			1,033
	Annual Payroll			34,838		33,096	non-covered activities [53]			33,096
	Estimated Receipts			106,593		101,263				101,263
	Estimated Throughput			94	1997 Economic Census [52]	94	From Column D [53]			94
19. Other Recycling Processors/Manufacturers	Establishments					21	REI Study Database [10]			21
	Employment					237	Survey results extrapolated			237
	Annual Payroll					3,855	based on NY responses.			3,855
	Estimated Receipts					32,940	(n=7). [11],[54]			32,940
	Estimated Throughput					46	R. W. Beck estimate [55]			46
Recycling Subtotals	Establishments					306		2,380		2,685
	Employment					15,312		20,053		35,365
	Annual Payroll					497,523		650,110		1,147,634
	Estimated Receipts					3,127,930		4,932,949		8,060,879

		New York								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities (includes recycling and non-recycling activities) [2],[3]		E. Statistics on Employees Undertaking Recycling or Reuse Activities (excluding virgin material preparation and downstream conversion activities) [2],[4]		F. Statistics on Establishments 100% Recycling or Reuse-Dependent (No virgin material) [2],[5]		G. Estimates of Total Recycling-Related Economic Activity (Sum of columns E and F)
A. Business Category	B. Data Type	Estimates	Sources	Estimates	Sources	Estimates	Sources	Estimates	Sources	
Reuse and Remanufacturing Industry Economic Activity										
20. Computer and Electronic Appliance Demanufacturers	Establishments					8	REI Study Database [10]			8
	Employment					135	Survey results extrapolated			135
	Annual Payroll					3,802	based on regional average.			3,802
	Estimated Receipts					15,261	(n=22). [11],[56]			15,261
	Estimated Throughput					N/A				N/A
21. Motor Vehicle Parts (used)	Establishments							424	U.S. Census SSEL, 1996	424
	Employment							3,470	SIC code 5015; [16],[57]	3,470
	Annual Payroll							76,771		76,771
	Estimated Receipts							381,130		381,130
	Estimated Throughput							N/A		N/A
22. Retail Used Merchandise Sales	Establishments							1,045	U.S. Census SSEL, 1996	1,045
	Employment							4,067	SIC code 5932; [16],[58]	4,067
	Annual Payroll							86,251		86,251
	Estimated Receipts							445,506		445,506
	Estimated Throughput							N/A		N/A
23. Tire retreaders	Establishments							73	U.S. Census SSEL, 1996	73
	Employment							247	SIC code 7534; [16],[59]	247
	Annual Payroll							5,564		5,564
	Estimated Receipts							29,761		29,761
	Estimated Throughput							N/A		N/A
24. Wood Reuse	Establishments					12	REI Study Database [10]			12
	Employment					174	Survey results extrapolated			174
	Annual Payroll					5,453	based on NY responses.			5,453
	Estimated Receipts					65,800	(n=3). [11],[60]			65,800
	Estimated Throughput					N/A				N/A
25. Materials Exchange Services	Establishments							3	REI Study Database [10]	3
	Employment							8	Survey results extrapolated	8
	Annual Payroll							161	based on NY responses.	161
	Estimated Receipts							283	(n=3). [11],[61]	283
	Estimated Throughput							N/A		N/A
26. Other Reuse	Establishments					7	REI Study Database [10]			7
	Employment					148	Survey results extrapolated			148
	Annual Payroll					1,894	based on regional average.			1,894
	Estimated Receipts					15,499	(n=15). [11],[62]			15,499
	Estimated Throughput					N/A				N/A
Reuse and Remanufacturing Subtotals	Establishments					27		1,545		1,572
	Employment					456		7,792		8,249
	Annual Payroll					11,148		168,747		179,896
	Estimated Receipts					96,561		856,680		953,240

GRAND TOTALS	Establishments					333		3,925		4,257
Recycling, Reuse and Remanufacturing	Employment					15,769		28,845		43,614
	Annual Payroll					508,672		818,857		1,327,529
	Estimated Receipts					3,224,491		5,789,628		9,014,119

Table 4-6
State of Pennsylvania
Summary of Recycling and Reuse Industry Economic Information

Annual Payroll and Estimated Receipts are in $1,000. Throughput is in thousands of tons.
All numbered notes are fully explained in Section 4.3 - Specific Notes on Data Tables
(D) - Data not disclosed due to a limited number of establishments in this business category and the need to avoid revealing data that could identify a single business. Data for multiple disclosure categories are included in totals.

		Pennsylvania								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
Recycling Industry Economic Activity										
1. Government Staffed Residential Curbside Collection	Establishments							299	Derivation; multiple sources [6]	299
	Employment							810	Derivation; multiple sources [6]	810
	Annual Payroll							22,213	Derivation; multiple sources [6]	22,213
	Estimated Receipts							24,737	Derivation; multiple sources [6]	24,737
	Estimated Throughput							271	PA DEP 1995 data [7]	271
2. Private Staffed Residential Curbside Collection	Establishments							580	Derivation; multiple sources [8]	580
	Employment							1,580	Derivation; multiple sources [8]	1,580
	Annual Payroll							43,330	Derivation; multiple sources [8]	43,330
	Estimated Receipts							48,019	Derivation; multiple sources [8]	48,019
	Estimated Throughput							1,576	PA DEP 1995 data [9]	1,576
3. Compost and Miscellaneous Organics Producers	Establishments							30	REI Study Database [10]	30
	Employment							424	Survey results extrapolated	424
	Annual Payroll							10,422	based on PA responses.	10,422
	Estimated Receipts							39,854	(n=13). [11], [12]	39,854
	Estimated Throughput							318	PA DEP 1995 data [13]	318
4. Materials Recovery Facilities (MRF's)	Establishments							48	REI Study Database [10]	48
	Employment							529	Survey results extrapolated	529
	Annual Payroll							10,390	based on PA responses.	10,390
	Estimated Receipts							50,366	(n=25). [11], [14].	50,366
	Estimated Throughput							322	PA DEP 1995 data [15]	322
5. Recyclable Material Wholesalers	Establishments							557	U.S. Census SSEL, 1996; SIC	557
	Employment							6,652	code 5093. [16], [17]	6,652
	Annual Payroll							197,844		197,844
	Estimated Receipts							2,150,790		2,150,790
	Estimated Throughput							1,207	Derivation [18]	1,207
6. Glass Container Manufacturing Plants	Establishments					4	REI Study Database [10]			4
	Employment					800	Survey results extrapolated			800
	Annual Payroll					30,000	based on PA responses.			30,000
	Estimated Receipts					150,000	(n=4). [11],[19]			150,000
	Estimated Throughput					91	1997 Economic Census [20]			91
7. Glass Product Producers (other recycled uses)	Establishments					1	REI Study Database [10]			1
	Employment					(D)	Survey results extrapolated			(D)
	Annual Payroll					(D)	based on regional average.			(D)
	Estimated Receipts					(D)	(n=6). [11],[21]			(D)
	Estimated Throughput					(D)	R. W. Beck estimate [22]			(D)

		Pennsylvania								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
8. Nonferrous secondary smelting and refining mills	Establishments			25	U.S. Census SSEL, 1996; SIC			25	From Column D [25]	25
	Employment			1,601	code 3341. [16], [23]			1,521	Column D adjusted for	1,521
	Annual Payroll			60,228				57,217	non-covered activities [25]	57,217
	Estimated Receipts			881,739				837,652		837,652
	Estimated Throughput			268	1992 Economic Census [24]			268	From Column D [25]	268
9. Nonferrous product producers	Establishments	26	U.S. Census SSEL, 1996; SIC	13	Column C adjusted for	13	From column D [29]			13
	Employment	6,558	codes 3351-3356. [16], [26]	3,279	non-recycling establishments	2,951	Column D adjusted for			2,951
	Annual Payroll	249,488		124,744		112,270	non-covered activities [29]			112,270
	Estimated Receipts	2,341,655		1,170,828		1,053,745				1,053,745
	Estimated Throughput			215	1997 Economic Census [28]	215	From column D [29]			215
10. Nonferrous foundries	Establishments			102	U.S. Census SSEL, 1996; SIC	102	From column D [29]			102
	Employment			5,214	codes 3363-3369. [16], [30]	4,693	Column D adjusted for			4,693
	Annual Payroll			151,456		136,310	non-covered activities [29]			136,310
	Estimated Receipts			540,756		486,680				486,680
	Estimated Throughput			34	1997 Economic Census [31]	34	From column D [29]			34
11. Paper and Paperboard Mills/Deinked Market Pulp	Establishments	29	U.S. Census SSEL, 1996; SIC	26	Derived from column C with	14	From Column D [35]	12	Derived from Column D with	26
	Employment	7,060	codes 2611, 2621, and 2631.	6,330	data from AF&PA Paper	2,437	Derived from Column D with	2,706	data from AF&PA [36]	5,143
	Annual Payroll	311,970	[16], [32]	279,697	Matcher. [33]	107,683	data from AF&PA and adjustment	119,571		227,254
	Estimated Receipts	1,941,649		1,740,789		670,204	for non-covered activities [35]	744,187		1,414,391
	Estimated Throughput			1,227	AF&PA [34]	472	Derived from Column D [35]	755	Column D - Column E [36]	1,227
12. Paper-based Product Manufacturers	Establishments							11	REI Study Database [10]	11
	Employment							228	Survey results extrapolated	228
	Annual Payroll							4,458	based on regional average.	4,458
	Estimated Receipts							31,008	(n=11). [11],[37]	31,008
	Estimated Throughput							46	R. W. Beck estimate [38]	46
13. Pavement Mix Producers (asphalt and aggregate)	Establishments					6	REI Study Database [10]			6
	Employment					48	Survey results extrapolated			48
	Annual Payroll					2,748	based on PA responses.			2,748
	Estimated Receipts					8,133	(n=3). [11],[39]			8,133
	Estimated Throughput					383	R. W. Beck estimate [40]			N/A
14. Plastics Reclaimers	Establishments							36	APC Database [41]	36
	Employment							1,042		1,042
	Annual Payroll							30,343	U.S. Census 1997 [41]	30,343
	Estimated Receipts							87,778	Plastics News [41]	87,778
	Estimated Throughput							163	APC Database [41]	163
15. Plastics Converters	Establishments	845	Probe Economics [42]	138	Derivation; from SPI data [43]	138	From Column D [45]			138
	Employment	61,350	Probe Economics [42]	9,991	Derivation; from SPI data [43]	7,993	Column D adjusted for			7,993
	Annual Payroll	1,679,600	Probe Economics [42]	273,535	Derivation; from SPI data [43]	218,828	non-covered activities [45]			218,828
	Estimated Receipts	10,961,600	Probe Economics [42]	1,785,175	Derivation; from SPI data [43]	1,428,140				1,428,140
	Estimated Throughput			77	APC Database [44]	77	From Column D [45]			77
16. Rubber Product Manufacturers	Establishments					15	REI Study Database [10]			15
	Employment					701	Survey results extrapolated			701
	Annual Payroll					8,621	based on PA responses.			8,621
	Estimated Receipts					67,688	(n=5). [11],[46]			67,688
	Estimated Throughput					18	R. W. Beck estimate [47]			18
17. Steel mills	Establishments			58	U.S. Census SSEL, 1996			58	From Column D [50]	58
	Employment			28,487	SIC code 3312. [16],[48]			27,063	Column D adjusted for	27,063
	Annual Payroll			1,407,145				1,336,788	non-covered activities [50]	1,336,788
	Estimated Receipts			9,302,322				8,837,206		8,837,206
	Estimated Throughput			8,919	1997 Economic Census [49]			8,919	From Column D [50]	8,919

		Pennsylvania								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic**
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Activity** (Sum of columns E and F)
18. Iron and Steel foundries	Establishments			106	U.S. Census SSEL, 1996; SIC codes 3321-3325. [16], [51]	106	From Column D [53]			106
	Employment			9,846		9,354	(Column D-Column F) adjusted for non-covered activities [53]			9,354
	Annual Payroll			312,717		297,081				297,081
	Estimated Receipts			1,050,856		998,313				998,313
	Estimated Throughput			851	1997 Economic Census [52]	851	From Column D [53]			851
19. Other Recycling Processors/Manufacturers	Establishments					28	REI Study Database [10]			28
	Employment					2,570	Survey results extrapolated			2,570
	Annual Payroll					25,223	based on PA responses.			25,223
	Estimated Receipts					110,250	(n=8). [11],[54]			110,250
	Estimated Throughput					501	R. W. Beck estimate [55]			501
Recycling Subtotals	**Establishments**					427		1,656		2,083
	Employment					31,546		42,554		74,101
	Annual Payroll					938,765		1,832,575		2,771,339
	Estimated Receipts					4,973,152		12,851,597		17,824,749

		Pennsylvania								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities (includes recycling and non-recycling activities) [2],[3]		E. Statistics on Employees Undertaking Recycling or Reuse Activities (excluding virgin material preparation and downstream conversion activities) [2],[4]		F. Statistics on Establishments 100% Recycling or Reuse-Dependent (No virgin material) [2],[5]		G. Estimates of Total Recycling-Related Economic Activity (Sum of columns E and F)
A. Business Category	B. Data Type	Estimates	Sources	Estimates	Sources	Estimates	Sources	Estimates	Sources	
Reuse and Remanufacturing Industry Economic Activity										
20. Computer and Electronic Appliance Demanufacturers	Establishments					7	REI Study Database [10]			7
	Employment					118	Survey results extrapolated			118
	Annual Payroll					3,327	based on regional average.			3,327
	Estimated Receipts					13,354	(n=22). [11],[56]			13,354
	Estimated Throughput					N/A				N/A
21. Motor Vehicle Parts (used)	Establishments							372	U.S. Census SSEL, 1996	372
	Employment							1,957	SIC code 5015; [16],[57]	1,957
	Annual Payroll							38,692		38,692
	Estimated Receipts							194,415		194,415
	Estimated Throughput							N/A		N/A
22. Retail Used Merchandise Sales	Establishments							697	U.S. Census SSEL, 1996	697
	Employment							4,309	SIC code 5932; [16],[58]	4,309
	Annual Payroll							53,831		53,831
	Estimated Receipts							253,454		253,454
	Estimated Throughput							N/A		N/A
23. Tire retreaders	Establishments							68	U.S. Census SSEL, 1996	68
	Employment							566	SIC code 7534; [16],[59]	566
	Annual Payroll							13,618		13,618
	Estimated Receipts							70,341		70,341
	Estimated Throughput							N/A		N/A
24. Wood Reuse	Establishments					13	REI Study Database [10]			13
	Employment					197	Survey results extrapolated			197
	Annual Payroll					3,377	based on regional average.			3,377
	Estimated Receipts					32,460	(n=23). [11],[60]			32,460
	Estimated Throughput					N/A				N/A
25. Materials Exchange Services	Establishments							0	[61]	0
	Employment							0		0
	Annual Payroll							0		0
	Estimated Receipts							0		0
	Estimated Throughput							N/A		N/A
26. Other Reuse	Establishments					7	REI Study Database [10]			7
	Employment					75	Survey results extrapolated			75
	Annual Payroll					2,080	based on PA responses.			2,080
	Estimated Receipts					10,004	(n=3). [11],[62]			10,004
	Estimated Throughput					N/A				N/A
Reuse and Remanufacturing Subtotals	**Establishments**					27		1,137		1,164
	Employment					390		6,832		7,222
	Annual Payroll					8,784		106,141		114,925
	Estimated Receipts					55,818		518,210		574,028

GRAND TOTALS	**Establishments**					454		2,793		3,247
Recycling, Reuse and Remanufacturing	**Employment**					31,936		49,386		81,322
	Annual Payroll					947,548		1,938,716		2,886,264
	Estimated Receipts					5,028,969		13,369,807		18,398,776

Table 4-7
State of Vermont
Summary of Recycling and Reuse Industry Economic Information

Annual Payroll and Estimated Receipts are in $1,000. Throughput is in thousands of tons.
All numbered notes are fully explained in Section 4.3 - Specific Notes on Data Tables
(D) - Data not disclosed due to a limited number of establishments in this business category and the need to avoid revealing data that could identify a single business. Data for multiple disclosure categories are included in totals.

		Vermont								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
Recycling Industry Economic Activity										
1. Government Staffed Residential Curbside Collection	Establishments							27	Derivation; multiple sources [6]	27
	Employment							10	Derivation; multiple sources [6]	10
	Annual Payroll							260	Derivation; multiple sources [6]	260
	Estimated Receipts							322	Derivation; multiple sources [6]	322
	Estimated Throughput							50	VT ANR 1994 data [7]	50
2. Private Staffed Residential Curbside Collection	Establishments							53	Derivation; multiple sources [8]	53
	Employment							20	Derivation; multiple sources [8]	20
	Annual Payroll							519	Derivation; multiple sources [8]	519
	Estimated Receipts							625	Derivation; multiple sources [8]	625
	Estimated Throughput							220	VT ANR 1994 data [9]	220
3. Compost and Miscellaneous Organics Producers	Establishments							10	REI Study Database [10]	10
	Employment							57	Survey results extrapolated	57
	Annual Payroll							1,343	based on regional average.	1,343
	Estimated Receipts							5,280	(n=198). [11], [12]	5,280
	Estimated Throughput							13	VT ANR 1994 data [13]	13
4. Materials Recovery Facilities (MRF's)	Establishments							4	REI Study Database [10]	4
	Employment							29	Survey results extrapolated	29
	Annual Payroll							543	based on VT responses.	543
	Estimated Receipts							3,225	(n=3). [11], [14].	3,225
	Estimated Throughput							90	VT ANR 1994 data [15]	90
5. Recyclable Material Wholesalers	Establishments							20	U.S. Census SSEL, 1996; SIC	20
	Employment							85	code 5093. [16], [17]	85
	Annual Payroll							2,212		2,212
	Estimated Receipts							28,268		28,268
	Estimated Throughput							167	Derivation [18]	167
6. Glass Container Manufacturing Plants	Establishments					0	[19]			0
	Employment					0				0
	Annual Payroll					0				0
	Estimated Receipts					0				0
	Estimated Throughput					0				0
7. Glass Product Producers (other recycled uses)	Establishments					1	REI Study Database [10]			1
	Employment					(D)	Survey results extrapolated			(D)
	Annual Payroll					(D)	based on VT responses.			(D)
	Estimated Receipts					(D)	(n=1). [11],[21]			(D)
	Estimated Throughput					(D)	R. W. Beck estimate [22]			(D)

		Vermont								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
8. Nonferrous secondary smelting and refining mills	Establishments			0	U.S. Census SSEL, 1996; SIC code 3341. [16], [23]					0
	Employment			0						0
	Annual Payroll			0						0
	Estimated Receipts			0						0
	Estimated Throughput			0						0
9. Nonferrous product producers	Establishments	0	U.S. Census SSEL, 1996; SIC codes 3351-3356. [16], [26]							0
	Employment	0								0
	Annual Payroll	0								0
	Estimated Receipts	0								0
	Estimated Throughput	0								0
10. Nonferrous foundries	Establishments			1	U.S. Census SSEL, 1996; SIC codes 3363-3369. [16], [30]	1	From column D [29]			1
	Employment			2		2	Column D adjusted for non-covered activities [29]			2
	Annual Payroll			56		50				50
	Estimated Receipts			193		174				174
	Estimated Throughput			0	1997 Economic Census [31]	0	From column D [29]			0
11. Paper and Paperboard Mills/Deinked Market Pulp	Establishments	6	U.S. Census SSEL, 1996; SIC codes 2611, 2621, and 2631. [16], [32]	6	Derived from column C with data from AF&PA Paper Matcher. [33]	3	From Column D [35]	3	Derived from Column D with data from AF&PA [36]	6
	Employment	1,152		1,152		444	Derived from Column D with data from AF&PA and adjustment for non-covered activities [35]	492		936
	Annual Payroll	43,869		43,869		16,890		18,754		35,644
	Estimated Receipts	324,805		324,805		125,050		138,854		263,904
	Estimated Throughput			57	AF&PA [34]	22	Derived from Column D [35]	35	Column D - Column E [36]	57
12. Paper-based Product Manufacturers	Establishments							0	[37]	0
	Employment							0		0
	Annual Payroll							0		0
	Estimated Receipts							0		0
	Estimated Throughput							0		0
13. Pavement Mix Producers (asphalt and aggregate)	Establishments					7	REI Study Database [10]			7
	Employment					8	Survey results extrapolated based on VT responses. (n=7). [11],[39]			8
	Annual Payroll					215				215
	Estimated Receipts					3,363				3,363
	Estimated Throughput					138				138
14. Plastics Reclaimers	Establishments							1	APC Database [41]	1
	Employment							(D)		(D)
	Annual Payroll							(D)	U.S. Census 1997 [41]	(D)
	Estimated Receipts							(D)	Plastics News [41]	(D)
	Estimated Throughput							(D)	APC Database [41]	(D)
15. Plastics Converters	Establishments	30	Probe Economics [42]	5	Derivation; from SPI data [43]	5	From Column D [45]			5
	Employment	2,564	Probe Economics [42]	418	Derivation; from SPI data [43]	334	Column D adjusted for non-covered activities [45]			334
	Annual Payroll	72,488	Probe Economics [42]	11,805	Derivation; from SPI data [43]	9,444				9,444
	Estimated Receipts	456,144	Probe Economics [42]	74,286	Derivation; from SPI data [43]	59,429				59,429
	Estimated Throughput			3	APC Database [44]	3	From Column D [45]			3
16. Rubber Product Manufacturers	Establishments					0	[46]			0
	Employment					0				0
	Annual Payroll					0				0
	Estimated Receipts					0				0
	Estimated Throughput					0				0
17. Steel mills	Establishments			0	[48]					0
	Employment			0						0
	Annual Payroll			0						0
	Estimated Receipts			0						0
	Estimated Throughput			0						0

		Vermont								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
18. Iron and Steel foundries	Establishments			2	U.S. Census SSEL, 1996; SIC	2	From Column D [53]			2
	Employment			62	codes 3321-3325. [16], [51]	59	(Column D-Column F) adjusted for			59
	Annual Payroll			1,919		1,823	non-covered activities [53]			1,823
	Estimated Receipts			5,858		5,565				5,565
	Estimated Throughput			5	1997 Economic Census [52]	5	From Column D [53]			5
19. Other Recycling Processors/Manufacturers	Establishments					1	REI Study Database [10]			1
	Employment					(D)	Survey results extrapolated			(D)
	Annual Payroll					(D)	based on VT responses.			(D)
	Estimated Receipts					(D)	(n=1). [11],[54]			(D)
	Estimated Throughput					(D)	R. W. Beck estimate [55]			(D)
Recycling Subtotals	**Establishments**					20		118		138
	Employment					846		694		1,587
	Annual Payroll					28,422		23,631		53,235
	Estimated Receipts					193,581		176,574		376,245

		Vermont								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
Reuse and Remanufacturing Industry Economic Activity										
20. Computer and Electronic Appliance Demanufacturers	Establishments					1	REI Study Database [10]			1
	Employment					(D)	Survey results extrapolated			(D)
	Annual Payroll					(D)	based on VT responses.			(D)
	Estimated Receipts					(D)	(n=1). [11],[56]			(D)
	Estimated Throughput					N/A				N/A
21. Motor Vehicle Parts (used)	Establishments							16	U.S. Census SSEL, 1996	16
	Employment							88	SIC code 5015; [16],[57]	88
	Annual Payroll							1,775		1,775
	Estimated Receipts							9,293		9,293
	Estimated Throughput							N/A		N/A
22. Retail Used Merchandise Sales	Establishments							81	U.S. Census SSEL, 1996	81
	Employment							223	SIC code 5932; [16],[58]	223
	Annual Payroll							2,119		2,119
	Estimated Receipts							11,893		11,893
	Estimated Throughput							N/A		N/A
23. Tire retreaders	Establishments							3	U.S. Census SSEL, 1996	3
	Employment							17	SIC code 7534; [16],[59]	17
	Annual Payroll							374		374
	Estimated Receipts							1,934		1,934
	Estimated Throughput							N/A		N/A
24. Wood Reuse	Establishments					1	REI Study Database [10]			1
	Employment					(D)	Survey results extrapolated			(D)
	Annual Payroll					(D)	based on regional average.			(D)
	Estimated Receipts					(D)	(n=23). [11],[60]			(D)
	Estimated Throughput					N/A				N/A
25. Materials Exchange Services	Establishments							1	REI Study Database [10]	1
	Employment							(D)	Survey results extrapolated	(D)
	Annual Payroll							(D)	based on NY responses.	(D)
	Estimated Receipts							(D)	(n=3). [11],[61]	(D)
	Estimated Throughput							N/A		N/A
26. Other Reuse	Establishments					1	REI Study Database [10]			1
	Employment					(D)	Survey results extrapolated			(D)
	Annual Payroll					(D)	based on VT responses.			(D)
	Estimated Receipts					(D)	(n=1). [11],[62]			(D)
	Estimated Throughput					N/A				N/A
Reuse and Remanufacturing Subtotals	**Establishments**					3		101		104
	Employment					(D)		328		368
	Annual Payroll					(D)		4,268		4,937
	Estimated Receipts					(D)		23,120		28,043

GRAND TOTALS	**Establishments**					23		219		247
Recycling, Reuse and Remanufacturing	**Employment**					899		1,057		1,955
	Annual Payroll					29,396		28,773		58,172
	Estimated Receipts					202,076		200,959		404,288

Table 4-8
NERC Region
Summary of Recycling and Reuse Industry Economic Information

Annual Payroll and Estimated Receipts are in $1,000. Throughput is in thousands of tons.
All numbered notes are fully explained in Section 4.3 - Specific Notes on Data Tables
(D) - Data not disclosed due to a limited number of establishments in this business category and the need to avoid revealing data that could identify a single business. Data for multiple disclosure categories are included in totals.

		NERC Region								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
Recycling Industry Economic Activity										
1. Government Staffed Residential Curbside Collection	Establishments							1,162	Derivation; multiple sources [6]	1,162
	Employment							3,540	Derivation; multiple sources [6]	3,540
	Annual Payroll							114,045	Derivation; multiple sources [6]	114,045
	Estimated Receipts							136,246	Derivation; multiple sources [6]	136,246
	Estimated Throughput							3,004	NERC Web Site '95-96 data [7]	3,004
2. Private Staffed Residential Curbside Collection	Establishments							2,255	Derivation; multiple sources [8]	2,255
	Employment							6,870	Derivation; multiple sources [8]	6,870
	Annual Payroll							221,167	Derivation; multiple sources [8]	221,167
	Estimated Receipts							264,478	Derivation; multiple sources [8]	264,478
	Estimated Throughput							25,869	NERC Web Site '95-96 data [9]	25,869
3. Compost and Miscellaneous Organics Producers	Establishments							584	REI Study Database [10]	584
	Employment							3,340	Survey results extrapolated	3,340
	Annual Payroll							78,441	based on regional average.	78,441
	Estimated Receipts							308,333	(n=198). [11], [12]	308,333
	Estimated Throughput							4,182	NERC Web Site '95-96 data [13]	4,182
4. Materials Recovery Facilities (MRF's)	Establishments							148	REI Study Database [10]	148
	Employment							2,988	Survey results extrapolated	2,988
	Annual Payroll							70,058	based on regional average.	70,058
	Estimated Receipts							180,573	(n=70). [11], [14].	180,573
	Estimated Throughput							3,118	NERC Web Site '95-96 data [15]	3,118
5. Recyclable Material Wholesalers	Establishments							2,194	U.S. Census SSEL, 1996; SIC	2,194
	Employment							26,160	code 5093. [16], [17]	26,160
	Annual Payroll							759,502		759,502
	Estimated Receipts							8,291,248		8,291,248
	Estimated Throughput							21,573	Derivation [18]	21,573
6. Glass Container Manufacturing Plants	Establishments					12	REI Study Database [10]			12
	Employment					2,472	Survey results extrapolated			2,472
	Annual Payroll					96,996	based on regional average.			96,996
	Estimated Receipts					536,664	(n=9). [11],[19]			536,664
	Estimated Throughput					282	1997 Economic Census [20]			282
7. Glass Product Producers (other recycled uses)	Establishments					13	REI Study Database [10]			13
	Employment					89	Survey results extrapolated			89
	Annual Payroll					1,804	based on regional average.			1,804
	Estimated Receipts					5,203	(n=6). [11],[21]			5,203
	Estimated Throughput					58	R. W. Beck estimate [22]			58

		NERC Region								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
8. Nonferrous secondary smelting and refining mills	Establishments			67	U.S. Census SSEL, 1996; SIC			67	From Column D [25]	67
	Employment			3,823	code 3341. [16], [23]			3,632	Column D adjusted for	3,632
	Annual Payroll			145,830				138,539	non-covered activities [25]	138,539
	Estimated Receipts			2,155,007				2,047,257		2,047,257
	Estimated Throughput			640	1992 Economic Census [24]			640	From Column D [25]	640
9. Nonferrous product producers	Establishments	83	U.S. Census SSEL, 1996; SIC	42	Column C adjusted for	42	From column D [29]			42
	Employment	14,248	codes 3351-3356. [16], [26]	7,124	non-recycling establishments	6,412	Column D adjusted for			6,412
	Annual Payroll	561,219		280,610		252,549	non-covered activities [29]			252,549
	Estimated Receipts	5,383,103		2,691,552		2,422,396				2,422,396
	Estimated Throughput			466	1997 Economic Census [28]	466	From column D [29]			466
10. Nonferrous foundries	Establishments			346	U.S. Census SSEL, 1996; SIC	346	From column D [29]			346
	Employment			12,260	codes 3363-3369. [16], [30]	11,034	Column D adjusted for			11,034
	Annual Payroll			361,245		325,121	non-covered activities [29]			325,121
	Estimated Receipts			1,296,354		1,166,719				1,166,719
	Estimated Throughput			79	1997 Economic Census [31]	79	From column D [29]			79
11. Paper and Paperboard Mills/Deinked Market Pulp	Establishments	180	U.S. Census SSEL, 1996; SIC	139	Derived from column C with	76	From Column D [35]	63	Derived from Column D with	139
	Employment	38,651	codes 2611, 2621, and 2631.	29,847	data from AF&PA Paper	11,491	Derived from Column D with	12,760	data from AF&PA [36]	24,251
	Annual Payroll	1,724,405	[16], [32]	1,331,624	Matcher. [33]	512,675	data from AF&PA and adjustment	569,269		1,081,944
	Estimated Receipts	10,931,377		8,441,452		3,249,959	for non-covered activities [35]	3,608,721		6,858,680
	Estimated Throughput			5,633	AF&PA [34]	2,169	Derived from Column D [35]	3,464	Column D - Column E [36]	5,633
12. Paper-based Product Manufacturers	Establishments							35	REI Study Database [10]	35
	Employment							725	Survey results extrapolated	725
	Annual Payroll							14,185	based on regional average.	14,185
	Estimated Receipts							98,660	(n=11). [11],[37]	98,660
	Estimated Throughput							145	R. W. Beck estimate [38]	145
13. Pavement Mix Producers (asphalt and aggregate)	Establishments					29	REI Study Database [10]			29
	Employment					300	Survey results extrapolated			300
	Annual Payroll					20,833	based on regional average.			20,833
	Estimated Receipts					135,464	(n=17). [11],[39]			135,464
	Estimated Throughput					2,404	R. W. Beck estimate [40]			2,404
14. Plastics Reclaimers	Establishments							152	APC Database [41]	152
	Employment							3,533		3,533
	Annual Payroll							102,881	U.S. Census 1997 [41]	102,881
	Estimated Receipts							297,620	Plastics News [41]	297,620
	Estimated Throughput							551	APC Database [41]	551
15. Plastics Converters	Establishments	3,694	Probe Economics [42]	602	Derivation; from SPI data [43]	602	From Column D [45]			602
	Employment	240,272	Probe Economics [42]	39,130	Derivation; from SPI data [43]	31,304	Column D adjusted for			31,304
	Annual Payroll	6,749,340	Probe Economics [42]	1,099,178	Derivation; from SPI data [43]	879,343	non-covered activities [45]			879,343
	Estimated Receipts	47,296,652	Probe Economics [42]	7,702,598	Derivation; from SPI data [43]	6,162,078				6,162,078
	Estimated Throughput			331	APC Database [44]	331	From Column D [45]			331
16. Rubber Product Manufacturers	Establishments					35	REI Study Database [10]			35
	Employment					723	Survey results extrapolated			723
	Annual Payroll					13,872	based on regional average.			13,872
	Estimated Receipts					66,800	(n=15). [11],[46]			66,800
	Estimated Throughput					18	R. W. Beck estimate [47]			18
17. Steel Mills	Establishments			90	U.S. Census SSEL, 1996			90	From Column D [50]	90
	Employment			32,986	SIC code 3312. [16],[48]			31,337	Column D adjusted for	31,337
	Annual Payroll			1,626,386				1,545,067	non-covered activities [50]	1,545,067
	Estimated Receipts			10,935,133				10,388,376		10,388,376
	Estimated Throughput			10,325	1997 Economic Census [49]			10,325	From Column D [50]	10,325

		NERC Region								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic**
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Activity** (Sum of columns E and F)
18. Iron and Steel foundries	Establishments			196	U.S. Census SSEL, 1996; SIC codes 3321-3325. [16], [51]	196	From Column D [53]			196
	Employment			17,013		16,162	(Column D-Column F) adjusted for non-covered activities [53]			16,162
	Annual Payroll			547,296		519,931				519,931
	Estimated Receipts			1,794,780		1,705,041				1,705,041
	Estimated Throughput			1,471	1997 Economic Census [52]	1,471	From Column D [53]			1,471
19. Other Recycling Processors/Manufacturers	Establishments					113	REI Study Database [10]			113
	Employment					4,120	Survey results extrapolated			4,120
	Annual Payroll					59,436	based on regional average.			59,436
	Estimated Receipts					416,024	(n=30). [11],[54]			416,024
	Estimated Throughput					803	R. W. Beck estimate [55]			803
Recycling Subtotals	**Establishments**					1,464		6,750		8,213
	Employment					84,108		94,885		178,992
	Annual Payroll					2,682,559		3,613,153		6,295,712
	Estimated Receipts					15,866,348		25,621,512		41,487,860

		NERC Region								
		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		**D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities** (includes recycling and non-recycling activities) [2],[3]		**E. Statistics on Employees Undertaking Recycling or Reuse Activities** (excluding virgin material preparation and downstream conversion activities) [2],[4]		**F. Statistics on Establishments 100% Recycling or Reuse-Dependent** (No virgin material) [2],[5]		**G. Estimates of Total Recycling-Related Economic Activity** (Sum of columns E and F)
A. Business Category	**B. Data Type**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	**Estimates**	**Sources**	
Reuse and Remanufacturing Industry Economic Activity										
20. Computer and Electronic Appliance Demanufacturers	Establishments					58	REI Study Database [10]			58
	Employment					980	Survey results extrapolated			980
	Annual Payroll					27,566	based on regional average.			27,566
	Estimated Receipts					110,645	(n=22). [11],[56]			110,645
	Estimated Throughput					N/A				N/A
21. Motor Vehicle Parts (used)	Establishments							1,410	U.S. Census SSEL, 1996	1,410
	Employment							9,492	SIC code 5015; [16],[57]	9,492
	Annual Payroll							216,518		216,518
	Estimated Receipts							1,079,777		1,079,777
	Estimated Throughput							N/A		N/A
22. Retail Used Merchandise Sales	Establishments							3,202	U.S. Census SSEL, 1996	3,202
	Employment							13,915	SIC code 5932; [16],[58]	13,915
	Annual Payroll							220,250		220,250
	Estimated Receipts							1,109,841		1,109,841
	Estimated Throughput							N/A		N/A
23. Tire retreaders	Establishments							222	U.S. Census SSEL, 1996	222
	Employment							1,355	SIC code 7534; [16],[59]	1,355
	Annual Payroll							31,921		31,921
	Estimated Receipts							166,555		166,555
	Estimated Throughput							N/A		N/A
24. Wood Reuse	Establishments					73	REI Study Database [10]			73
	Employment					1,107	Survey results extrapolated			1,107
	Annual Payroll					18,964	based on regional average.			18,964
	Estimated Receipts					182,274	(n=23). [11],[60]			182,274
	Estimated Throughput					N/A				N/A
25. Materials Exchange Services	Establishments							11	REI Study Database [10]	11
	Employment							54	Survey results extrapolated	54
	Annual Payroll							1,450	based on regional average.	1,450
	Estimated Receipts							3,210	(n=7). [11],[61]	3,210
	Estimated Throughput							N/A		N/A
26. Other Reuse	Establishments					29	REI Study Database [10]			29
	Employment					612	Survey results extrapolated			612
	Annual Payroll					7,845	based on regional average.			7,845
	Estimated Receipts					64,211	(n=15). [11],[62]			64,211
	Estimated Throughput					N/A				N/A
Reuse and Remanufacturing Subtotals	**Establishments**					160		4,845		5,005
	Employment					2,698		24,816		27,514
	Annual Payroll					54,374		470,139		524,513
	Estimated Receipts					357,130		2,359,383		2,716,512

GRAND TOTALS	**Establishments**					1,624		11,595		13,218
Recycling, Reuse and Remanufacturing	**Employment**					86,805		119,700		206,506
	Annual Payroll					2,736,933		4,083,292		6,820,225
	Estimated Receipts					16,223,477		27,980,895		44,204,372

4.3 Specific Notes on Data Tables

The purpose of this section is to provide detailed descriptions of the numbered notes presented in Tables 4-2 through 4-7.

[1] Statistics for Column C include data for all establishments in industries with recycling or reuse-related activities. Although the industry overall performs recycling or reuse-related activities, it may include some establishments with no recycling or reuse-related activities.

[2] Covered activities is defined as all activities that support:

- Transforming pre-consumer materials or post-consumer products into a recycled material;
- Transforming recycled materials into a first intermediate product (e.g. sheet, fiber, roll);
- Transforming recycled materials directly into a finished product;
- Preparing used products for reuse; and
- Manufacturing equipment for the recycling or reuse industries.

Covered activities *do not* include converting a first intermediate product to finished or semi-finished products or preparing materials for fuel use.

[3] Statistics are for establishments with some amount of covered recycling activities. Establishments may perform both non-recycling and recycling activities.

[4] These estimates include activities where virgin and recycled feedstock materials are co-processed. The estimates do not include virgin-only feedstock material preparation activities and further conversion of intermediate products to finished or semi-finished goods.

[5] Statistics on establishments where 100 percent of labor and receipts are dependent on recycling or reuse-related activities. The estimates do not include virgin-only feedstock material preparation activities and further conversion of intermediate products to finished or semi-finished goods.

[6] The data for Category 1, Government Staffed Residential Curbside Collection, was derived through an algorithm based on data points from a variety of sources. The following tables summarize calculations and data sources used in making estimates of economic activity for this category.

Table 4-9
Summary of Calculations

Data Type	Calculation
Establishments	1) K*D
Recycling Collection Employees	2) ((A/(B*C*F))*D*E)*(1+G)*(1+H)
Yard Waste Collection Employees	3) ((A/(B*L*F))*D*M*N*O)*(1+G)*(1+H)
Total Curbside Recycling and Yard Waste Collection Employees	4) Calculation 2+ Calculation 3
Annual Payroll	5) Calculation 4*I
Receipts	6) (A/B)*D*J*12 months/year

Table 4-10
Summary of Data Sources Used for
Government Staffed Residential Curbside Collection

Data Label	Data Type	Value	Reference
A	Population with curbside collection	Varies by State	BioCycle (4/99)
B	Persons per household	Varies by State	U.S. Census Bureau
C	Homes collected per truck per day	900	Estimate
D	Percent of homes collected by government staffed collection	34%	R. W. Beck Privatization Study
E	Average crew per truck	1.5	R. W. Beck Estimate
F	Collection days per cycle	5	Assumes once per week collection
G	Additional percent supervisory	10%	R. W. Beck Estimate
H	Additional percent absenteeism, recycling coordinator, etc.	5%	R. W. Beck Estimate
I	Average payroll per employee	Varies by State	1997 U.S. Economic Census
J	Recycling collection cost per household per month	Varies by State	R. W. Beck Estimate
K	Number of curbside programs	Varies by State	BioCycle (4/99)
Additional Data for Yard Waste Collection			
L	Homes collected per truck per day	1,000	R. W. Beck Estimate
M	Average crew per truck	2	R. W. Beck Estimate
N	Percent of households with yard waste collection	Varies by State	Estimated from BioCycle (5/98)
O	Percent of year collection takes place	66%	R. W. Beck Estimate

For Delaware, estimates are based on data provided by Delaware Solid Waste Authority's Recycling Coordinator. Number of DE establishments is equal to two communities plus the Solid Waste Authority.

[7] Estimated throughput is equal to total tons of residential recyclables plus yard waste from each state's annual solid waste report times the percentage of homes collected by government staffed collection.

[8] Calculations and values for Private Staffed Residential Curbside Collection are the same as those presented in Note 6, with the exception of Data Label D. For Category 2, Data Label D is "Percent of Homes Collected by Private Sector" and has a value of 66 percent.

[9] Throughput is equal to total state recycling collection minus throughput by government staffed curbside collection.

[10] Number of establishments for all survey categories is based on the REI study database.

[11] In general, data for all survey categories is based on a statistical analysis of survey results. See section 3.2.2 for a detailed description of survey design and calculations. The number of completed surveys on which results are based is given as "n." For categories with disclosure issues, (D), totals for all disclosure categories will be added to the Grand Totals. If a state has only one disclosure category, the disclosure figures will not be added to the Grand Totals.

[12] Number of employees, payroll, and receipts for Compost and Organics Producers are based on a statistical analysis of survey results. Surveys focused on active processing of organic materials for beneficial use. As a result, number of establishments and potential economic activity associated with inactive composting techniques (i.e., allowing materials to slowly and independently decompose over time) may not be fully reflected in totals.

[13] Throughput is equal to tons of yard waste recycled as reported by each state's annual solid waste report.

[14] Number of employees, payroll, and receipts for Materials Recovery Facilities (MRF's) are based on a statistical analysis of survey results. Statistics are based on a total of 46 completed surveys for the NERC region. All DE data are based on information from the DE SW Authority for 1998.

[15] Throughput is derived by multiplying the curbside tons from state reports by 66 percent (assumes that two-thirds of material collected goes to MRF's). For DE, throughput is derived from the DE SW Authority data plus estimates from the APC collection manual. APC estimates 76 tons of containers and 228 tons of fibers per year per 1,000 homes on route in bottle bill states.

[16] Data derived from the 1995 U.S. Census Bureau's Standard Statistical Establishments List. See section 3.2.1.2 for a detailed description of the use of census bureau statistics.

[17] Data are taken directly from U.S. Census SSEL for SIC code 5093 – Recyclable Material Wholesalers. This category includes a number of different types of businesses including scrap metal and plastics dealers, C&D processors, beneficiation facilities, crumb rubber producers and textile processors. No adjustments were made to Census data since the category is defined as 100 percent recycling-related.

[18] Throughput for Recyclable Material Wholesalers is derived as follows: Government Staffed Throughput + Private Staffed Throughput – Compost/Organics Throughput – Materials Recovery Facilities Throughput.

[19] Number of employees, payroll, and receipts for Glass Container Manufacturing Plants are based on a statistical analysis of survey results. No DE or VT establishments in the database.

[20] Throughput is estimated based on 1997 Economic Census reports showing a national average of 114 tons of cullet per employee. Throughput is equal to 114 tons x number of employees.

[21] Number of employees, annual payroll, and receipts for Glass Product Producers are based on a statistical analysis of survey results.

[22] Throughput is estimated as 650 tons per employee based on a limited number of survey responses and Glass Packaging Institute secondary glass use data of 614,000 tons per year nationally.

[23] Data for Nonferrous Smelting and Refining Mills is taken from SIC code 3341, Secondary Smelting and Refining. Estimates assume that a sizeable percentage of nonferrous scrap is recovered in secondary nonferrous mills. No establishments listed in VT.

[24] Throughput for nonferrous smelting and refining is estimated based on national scrap consumption for smelting and refining mills from the 1992 Economic Census, adjusted upward based on employment increases for this category. Data from the 1997 Economic Census were not used because they conform to the new NAICS system, which includes data for making nonferrous metal powder, paste, and flake from purchased nonferrous metals. Allocations to the state-level are on a state-employment basis.

[25] Employment, payroll, and receipts are derived from Column D with an adjustment for the percent of covered activities (95 percent). Number of establishments and throughput are from Column D with no adjustment.

[26] Data for Nonferrous Product Producers is taken from U.S. Census SSEL for SIC codes 3351-3355 with no adjustments. Census reports no establishments in DE or VT.

[27] Data are derived by multiplying Column C figures by 50 percent, the percentage of establishments assumed to be utilizing scrap or recycled materials, based on comments from U.S.G.S. nonferrous metals specialists.

[28] Throughput for Nonferrous Product Producers is estimated based on scrap purchases reported in the 1997 Economic Census. Total tons of scrap for the U.S. is calculated as:
Total Scrap Cost (by SIC) / ($0.45/lb) / (2,000 lbs/ton).
Tons of scrap on a state-level is estimated as:
Total tons of scrap x State Employees/U.S. Employees.

[29] Estimates of employees, payroll, and receipts are derived from Column D with an adjustment for the percent of covered activities (90 percent). Number of establishments and throughput are from Column D with no adjustments.

[30] Data for Nonferrous Foundries is taken from U.S. Census SSEL for SIC codes 3363, 3365, 3366, and 3369, with no adjustments. Census reports no foundries for DE.

[31] Throughput for Nonferrous Foundries is estimated based on scrap purchases reported in the 1997 Economic Census. Total tons of scrap for the U.S. is calculated as:
Total Scrap Cost (by SIC) / ($0.45/lb) / (2,000 lbs/ton).
Tons of scrap on a state-level is estimated as:
Total tons x State Employees/U.S. Employees.

[32] Data for Paper, Paperboard, and Deinked Market Pulp Producers is taken directly from the U.S. Census SSEL for SIC codes 2611, 2621, and 2631, with no adjustments.

[33] Establishments, employees, payroll, and revenue figures are derived from Column C by multiplying each data point by the percentage of total pulp, paper, and paperboard mills in the state utilizing recovered paper (as found in *Paper Matcher*).

[34] Throughput is taken from the AF&PA *Annual Statistical Summary Recovered Paper Utilization* (April, 1999). Throughput numbers used are for 1995 to coincide with the data from U.S. Census SSEL. For DE, AF&PA reported recovered paper consumption combined with MD. Therefore, throughput is apportioned based on DE employees as a percent of total MD and DE employees.

[35] Data in column E is derived from Column D based on data from AF&PA *Paper Matcher*. Number of establishments from Column D is multiplied by 55 percent (national percentage of mills utilizing recovered paper but which do not entirely depend on recovered paper). Employees, payroll, and receipts from Column D are multiplied by 55 percent and again by 70 percent (average percent of employees involved in covered recycling –related activities in mills that are not entirely dependent on recycling). For DE, the number of establishments is equal to Column D since only 1 mill consumes recovered paper. Employment, payroll, receipts and throughput numbers are taken directly from column D and included in Column E with the assumption that the mill is not entirely dependent on recovered paper. Throughput is derived from Column D by multiplying by 55 percent and again by 70 percent.

[36] Data in column F is derived from Column D based on data from AF&PA *Paper Matcher*. Number of establishments, employees, payroll, and receipts from Column D are multiplied by 45 percent (national percentage of mills utilizing recovered paper which are entirely dependent on recovered paper) and again by 95 percent (adjustment for non-covered activities). Throughput is equal to Column D – Column E.

[37] Number of employees, payroll, receipts, and throughput for Paper-based Product Manufacturers are based on a statistical analysis of survey results. No DE or VT establishments listed in the database.

[38] Throughput is estimated on a tons per employee basis derived from a limited number of survey responses for the NERC region.

[39] Number of employees, payroll, and receipts for Pavement Mix Producers are based on a statistical analysis of survey results. No NY establishments listed in the database.

[40] Throughput for Pavement Mix Producers is estimated based on NERC web site data for asphalt/concrete when available or is estimated as 8,000 tons per employee based on a limited number of survey responses.

[41] For Plastics Reclaimers, establishments, employees, and throughput are based on the American Plastics Council Handler & Reclaimer database developed by R.W. Beck. Payroll is calculated by multiplying employment figures by Census Bureau's 1997 average wage for plastics industry employees ($29,120). Estimated receipts is calculated by multiplying pounds of recycled resins produced times an average of recycled resin prices from Plastics News.

[42] Establishments, employees, payroll, and receipts in column C for Plastics Converters are obtained from *Contribution of Plastics to the U.S. Economy*, prepared for the Society of the Plastics Industry by Probe Economics, and multiplied by 84 percent (national employment percentage of the "industry" that converts products instead of selling resins, making molds, selling machinery, and wholesaling products).

[43] Number of establishments, employees, payroll, and estimated receipts in Column D are derived by multiplying column C figures by the industry-wide recycled-content percentage (5.7 percent) divided by the average recycled content of products that contain recycled materials (35 percent).

[44] Throughput is estimated based on data from the APC Handler & Reclaimer database developed by R. W. Beck.

[45] Number of establishments and throughput are directly from Column D. Employees, payroll, and receipts are derived from Column D by multiplying by the estimated percent of employees at recycling-related establishments that are involved in covered recycling-related activities (80 percent).

[46] Number of employees, payroll, and receipts for Rubber Product Manufacturers are based on a statistical analysis of survey results. No DE or VT establishments in the database.

[47] Throughput for Rubber Product Manufacturers is estimated as 25 tons per employee, based on data for the State of Florida.

[48] All estimates for Steel Mills are derived from U.S. Census SSEL for SIC codes 3312, with no adjustments. Per Steel Recycling Institute, 100 percent of mills are dependent on utilizing anywhere from 15 percent-100 percent recovered steel to make new steel. Therefore, no adjustments to U.S. Census data are necessary for presenting data in Column D. No establishments listed in VT. No steel mills in Massachusetts – all economic activity is believed to be associated with offices for mills located out of state.

[49] Throughput is calculated state's percentage of national steel mill employees multiplied by the total tons of steel scrap consumed (1997 Economic Census) by steel mills nationally.

[50] Employment, payroll, and receipts are equal to estimates from Column D multiplied by 95 percent (5 percent deduction to account for downstream conversion). Based on comments from SRI, 100 percent of steel mills are dependent on recovered steel to make new steel. Therefore, the only deduction taken is to account for non-covered activities. Establishments and throughput are from Column D with no adjustment.

[51] For Iron and Steel Foundries, estimates for column D are taken directly from U.S. Census SSEL with no adjustments. SRI states that all foundries as a matter of practice utilize a significant percentage of scrap in the making of new iron products.

[52] Throughput for Iron and Steel Foundries is estimated as the state's percentage of total national foundry employees multiplied by national scrap consumption by foundries (1997 Economic Census).

[53] In Column E, establishments and throughput are taken directly from Column D. Employees, payroll, and receipts from Column D are multiplied by 95 percent, the estimated percent of foundry employees involved in covered recycling-related activities.

[54] Number of employees, payroll, and receipts for Other Recycling Processors/Manufacturers are based on a statistical analysis of survey results.

[55] Throughput is estimated as 195 tons per employee based on a limited number of survey responses for the NERC region.

[56] Number of employees, payroll, and receipts for Computer and Electronic Appliance Demanufacturers are based on a statistical analysis of survey results. No DE establishments in the database.

[57] Estimates for Motor Vehicle Parts are taken directly from U.S. Census SSEL for SIC code 5015 with no adjustments.

[58] Estimates for Retail Used Merchandise Sales are taken directly from U.S. Census SSEL for SIC code 5932 with no adjustments.

[59] Estimates for Tire Retreaders are taken directly from U.S. Census SSEL for SIC code 7534 with no adjustments.

[60] Number of employees, payroll, and receipts for Wood Reuse are based on a statistical analysis of survey results.

[61] Number of employees, payroll, and receipts for Materials Exchange Services are based on a statistical analysis of survey results. No DE establishments in the database.

[62] Number of employees, payroll, and receipts for Other Reuse are based on a statistical analysis of survey results. No DE establishments in the database.

4.4 ANALYSIS OF RESULTS

Table 4-11 presents an analysis of three data types related to the results presented in Tables 4-2 through 4-8. The three analyses performed for each category and sector (recycling and reuse/remanufacturing businesses) were:

- The number of establishments, employees, payroll, and receipts as a percentage of the total for all categories;
- Number of employees per establishment; and
- Average annual payroll per employee.

Over half of the economic activity for the recycling and reuse industry is accounted for by the following four categories:

- Recyclable material wholesalers;
- Paper, paperboard, and deinked market pulp mills;
- Plastics converters; and
- Steel mills.

These four categories alone account for approximately 55 percent of all employees, 63 percent of total payroll, and 72 percent of total receipts. The average payroll of $37,700 per employee for these four categories is 14 percent higher than the average of $33,000 for all categories. At 37, the average number of employees per establishment for the top four categories is also higher than the average number of employees for all categories of 16.

A noticeable distinction exists between the recycling and reuse sectors regarding the size of establishments and average annual payroll. The recycling establishments have an average of 22 employees each, with an average annual payroll per employee of $35,000. Comparatively, the reuse sector is made up of smaller establishments (an average of 5 employees per establishment) with an average annual payroll of $19,000 per employee. Although the reuse and remanufacturing sector comprises 37 percent of total establishments, it makes up only 13 percent of total employees, 8 percent of payroll, and 6 percent of receipts.

These figures are thought to represent the minimum amount of reuse and remanufacturing captured by the methodology, however, because remanufacturing activities are often included with traditional manufacturing industries that were not included in this study. A report entitled *The Remanufacturing Industry: Hidden Giant* by Professor Robert T. Lund of Boston University estimated remanufacturing activities on a national level, although state or regional-level estimates were not attempted. Extrapolating the figures from that report down to the NERC region indicated that reuse and remanufacturing categories may be as much as 20 to 30 percent of total jobs, wages, and receipts for all categories.

Table 4-11
Analysis of Economic Activity for the Recycling and Reuse Industry
In the Northeast Region

Annual Payroll and Estimated Receipts are in $1,000. Throughput is in thousands of tons.

Business Category	Data Type	Estimates of Regional Recycling and Reuse-Related Economic Activity	Percent of Total for All Categories	Employees per Establishment	Annual Payroll per Employee	Estimated Receipts per Employee
Recycling Industry Economic Activity						
1. Government Staffed Residential Curbside Collection	Establishments	1,162	8.8%			
	Employment	3,540	1.7%	3		
	Annual Payroll	114,045	1.7%		32	
	Estimated Receipts	136,246	0.3%			38
2. Private Staffed Residential Curbside Collection	Establishments	2,255	17.1%			
	Employment	6,870	3.3%	3		
	Annual Payroll	221,167	3.2%		32	
	Estimated Receipts	264,478	0.6%			38
3. Compost and Miscellaneous Organics Producers	Establishments	584	4.4%			
	Employment	3,340	1.6%	6		
	Annual Payroll	78,441	1.2%		23	
	Estimated Receipts	308,333	0.7%			92
4. Materials Recovery Facilities (MRF's)	Establishments	148	1.1%			
	Employment	2,988	1.4%	20		
	Annual Payroll	70,058	1.0%		23	
	Estimated Receipts	180,573	0.4%			60
5. Recyclable Material Wholesalers	Establishments	2,194	16.6%			
	Employment	26,160	12.7%	12		
	Annual Payroll	759,502	11.1%		29	
	Estimated Receipts	8,291,248	18.8%			317
6. Glass Container Manufacturing Plants	Establishments	12	0.1%			
	Employment	2,472	1.2%	206		
	Annual Payroll	96,996	1.4%		39	
	Estimated Receipts	536,664	1.2%			217
7. Glass Product Producers (other recycled uses)	Establishments	13	0.1%			
	Employment	89	<0.1%	7		
	Annual Payroll	1,804	<0.1%		20	
	Estimated Receipts	5,203	<0.1%			59
8. Nonferrous Secondary Smelting and Refining Mills	Establishments	67	0.5%			
	Employment	3,632	1.8%	54		
	Annual Payroll	138,539	2.0%		38	
	Estimated Receipts	2,047,257	4.6%			564
9. Nonferrous Product Producers	Establishments	42	0.3%			
	Employment	6,412	3.1%	154		
	Annual Payroll	252,549	3.7%		39	
	Estimated Receipts	2,422,396	5.5%			378
10. Nonferrous Foundries	Establishments	346	2.6%			
	Employment	11,034	5.3%	32		
	Annual Payroll	325,121	4.8%		29	
	Estimated Receipts	1,166,719	2.6%			106
11. Paper and Paperboard Mills/Deinked Market Pulp	Establishments	139	1.1%			
	Employment	24,251	11.7%	174		
	Annual Payroll	1,081,944	15.9%		45	
	Estimated Receipts	6,858,680	15.5%			283
12. Paper-based Product Manufacturers	Establishments	35	0.3%			
	Employment	725	0.4%	21		
	Annual Payroll	14,185	0.2%		20	
	Estimated Receipts	98,660	0.2%			136
13. Pavement Mix Producers (asphalt and aggregate)	Establishments	29	0.2%			
	Employment	300	0.1%	10		
	Annual Payroll	20,833	0.3%		69	
	Estimated Receipts	135,464	0.3%			451
14. Plastics Reclaimers	Establishments	152	1.1%			
	Employment	3,533	1.7%	23		
	Annual Payroll	102,881	1.5%		29	
	Estimated Receipts	297,620	0.7%			84
15. Plastics Converters	Establishments	602	4.6%			
	Employment	31,304	15.2%	52		
	Annual Payroll	879,343	12.9%		28	
	Estimated Receipts	6,162,078	13.9%			197

Business Category	Data Type	Estimates of Regional Recycling and Reuse-Related Economic Activity	Percent of Total for All Categories	Employees per Establishment	Annual Payroll per Employee	Estimated Receipts per Employee
16. Rubber Product Manufacturers	Establishments	35	0.3%			
	Employment	723	0.4%	21		
	Annual Payroll	13,872	0.2%		19	
	Estimated Receipts	66,800	0.2%			92
17. Steel Mills	Establishments	90	0.7%			
	Employment	31,337	15.2%	348		
	Annual Payroll	1,545,067	22.7%		49	
	Estimated Receipts	10,388,376	23.5%			332
18. Iron and Steel Foundries	Establishments	196	1.5%			
	Employment	16,162	7.8%	82		
	Annual Payroll	519,931	7.6%		32	
	Estimated Receipts	1,705,041	3.9%			105
19. Other Recycling Processors/Manufacturers	Establishments	113	0.9%			
	Employment	4,120	2.0%	36		
	Annual Payroll	59,436	0.9%		14	
	Estimated Receipts	416,024	0.9%			101
Recycling Subtotals	**Establishments**	8,213	62.1%			
	Employment	178,992	86.7%	22		
	Annual Payroll	6,295,712	92.3%		35	
	Estimated Receipts	41,487,860	93.9%			232
Reuse and Remanufacturing Industry Economic Activity						
20. Computer and Electronic Appliance Demanufacturers	Establishments	58	0.4%			
	Employment	980	0.5%	17		
	Annual Payroll	27,566	0.4%		28	
	Estimated Receipts	110,645	0.3%			113
21. Motor Vehicle Parts (used)	Establishments	1,410	10.7%			
	Employment	9,492	4.6%	7		
	Annual Payroll	216,518	3.2%		23	
	Estimated Receipts	1,079,777	2.4%			114
22. Retail Used Merchandise Sales	Establishments	3,202	24.2%			
	Employment	13,915	6.7%	4		
	Annual Payroll	220,250	3.2%		16	
	Estimated Receipts	1,109,841	2.5%			80
23. Tire Retreaders	Establishments	222	1.7%			
	Employment	1,355	0.7%	6		
	Annual Payroll	31,921	0.5%		24	
	Estimated Receipts	166,555	0.4%			123
24. Wood Reuse	Establishments	73	0.6%			
	Employment	1,107	0.5%	15		
	Annual Payroll	18,964	0.3%		17	
	Estimated Receipts	182,274	0.4%			165
25. Materials Exchange Services	Establishments	11	0.1%			
	Employment	54	<0.1%	5		
	Annual Payroll	1,450	<0.1%		27	
	Estimated Receipts	3,210	<0.1%			60
26. Other Reuse	Establishments	29	0.2%			
	Employment	612	0.3%	21		
	Annual Payroll	7,845	0.1%		13	
	Estimated Receipts	64,211	0.1%			105
Reuse and Remanufacturing Subtotals	**Establishments**	5,005	37.9%			
	Employment	27,514	13.3%	5		
	Annual Payroll	524,513	7.7%		19	
	Estimated Receipts	2,716,512	6.1%			99
GRAND TOTALS	**Establishments**	13,218	100.0%			
Recycling, Reuse and Remanufacturing	**Employment**	206,506	100.0%	16		
	Annual Payroll	6,820,225	100.0%		33	
	Estimated Receipts	44,204,372	100.0%			214

Another interesting observation can be made by comparing recycling categories that are primarily "local" establishments performing collection, sorting, and densification activities to those that source material from large distances for downstream processing, conversion, or manufacturing operations. Local collection and processing (baling, grading, densifying, etc.) includes:

- Government staffed residential curbside collection;
- Privately-staffed residential curbside collection;
- Compost and miscellaneous organics products producers;
- Materials recovery facilities; and
- Recyclable material wholesalers.

Establishments in the remaining recycling categories are considered to be downstream processors of recycled materials and tend to utilize recycled materials in manufacturing. When the two groups are compared, "local" collection and processing make up about 21 percent of total recycling employment and receipts whereas non-local downstream processing makes up the remaining 79 percent of employment and receipts. This indicates that public and private investment in local recyclables collection and processing infrastructure pays great dividends in downstream private recycling economic activity. Public policy in the form of state or local laws and regulations that require collection of recyclables or that discourage disposal (e.g. disposal taxes, material specific bans, etc.), directly affects these local public and private sector establishments and indirectly the larger recycling and reuse industry as a whole.

4.5 Accuracy and Completeness of Results

The results of this study for the categories identified are thought to be realistic and generally somewhat conservative. The results for categories which used existing U.S. Census data are believed to be the most accurate, followed by data for survey categories, while the derivations are likely to be the least accurate because of the limited amount of available data for estimations. Census data, although updated yearly, lags in publication by three years so that data is not as current as data for survey categories. Survey data is current and, based on average confidence intervals for the NERC region, is likely to be accurate within 10 percent for total employment, payroll, and receipts. Confidence levels for individual states, however, will be larger and depend on the number of recycling and reuse industry establishments.

The study did encounter a number of limitations that impacted the ability to accurately capture all recycling and reuse activity. The limitations of the study include:

- Survey data asked for intervals rather than discrete numbers;
- Business categories that were included in the original NERC REI methodology were excluded for logistical reasons. Examples include equipment remanufacturers (only national-level data was available) and collectors of commercial and industrial recyclables (very difficult to quantify).
- Many companies in non-traditional recycling categories, such as fluorescent lamps and carpets, were not easily identifiable and may not be included under any of the categories.
- Some derivations, such as that for plastics converters, are based on the best of several less than desirable options available; it is very difficult to assess the accuracy of those results.

Although the study was not able to capture every possible type of recycling and reuse activity, it is reasonably accurate for the categories shown and conservatively estimates the total amount of recycling and reuse activity taking place.

5 INDIRECT AND INDUCED ECONOMIC INFORMATION

5.1 OVERVIEW

This study modeled the economic values of twenty-six recycling or reuse categories for Delaware, Massachusetts, and Pennsylvania. Further calculations were made to estimate selected state government revenues that would be associated with the levels of economic activity that were identified through the modeling process. This section provides an overview of the process of input-output modeling, its strengths, its limitations, and its adaptation to this study. This section also defines the terms used and what the model output data represents. The following section provides the results in tabular form.

5.1.1 INPUT-OUTPUT MODELING PROCESS AND LIMITATIONS

Economic values or economic effects studies are usually conducted with input-output (I-O) econometric models of a regional economy. Input-output modeling allows researchers to investigate the interdependencies that industries, institutions, and households have with each other in a region of study. I-O models, therefore, relate the products made within a region and the products consumed by industries and households in that same region.

At a basic level, any industry's or institution's output (usually its gross sales) requires employees, materials, utilities, capital investments, financing, maintenance, equipment, and service inputs. The probability that a firm purchases its inputs locally (meaning within the region being modeled) is estimated in the I-O model. Estimates of an industry's inputs mix and whether those inputs are purchased within the region being modeled are based on national and regional industrial surveys.

Primary survey information to update the national or regional statistics is needed to improve the quality of the model output, particularly where the industry segment under study may differ from national or regional averages. As was discussed previously in the Study Methodology section, this study performed limited surveys to obtain additional intermediate input data. Furthermore, it made use of in-house data from previous county-level and state-level modeling projects to further improve the quality of the models that were produced (a separate model was produced for Delaware, Massachusetts, and Pennsylvania).

There are important limitations to these models that must be acknowledged. First and foremost, absent highly detailed and costly local industry surveys, which was not done for this study, national and regional averages for major industrial input categories (the production functions) and the likelihood of a local purchase of inputs for the industries that were studied (regional purchasing coefficients) were still heavily relied on. Industries that fall within general industrial categories normally have very similar

industrial input characteristics. A plastics firm that produces finished goods from recycled stock will be configured very similarly to a plastics firm that produces goods primarily from virgin inputs. Except for the source of their commodity input into production and the physical configuration of their processing machinery, their overall remaining operational characteristics -- transportation, utilities, services, maintenance, financial inputs, etc. -- are likely to be very similar. Consequently, in most instances, production characteristics of existing firms in the state of study provided a very good first pass at identifying intra-regional linkages and supply chains of goods and services required for production. Although the I-O model has information on up to 537 industries, there is no specific set of "recycling and reuse" industries. Consequently, the models that were produced were significantly modified to accept recycling and reuse industries distinctly. Furthermore, the use of in-house data and additional surveys for select recycling and reuse industries enhanced the quality of the model output for this study.

Other limits in these types of models include:

- Difficulties in capturing economies of scale, particularly for industries with relatively small numbers of establishments, where establishment-to-establishment variation may be significant (the current input values or production functions are, therefore, initially constant);
- An inability to identify input substitutes – especially in new technologies or in instances where input modes have changed;
- Dated data on industrial performance and purchases, particularly for industries that are newly-emerging or rapidly changing;
- In-state and out-of-state purchases of commodities within a study area are fixed (regional purchasing coefficients must be adjusted if it is suspected that the regional averages are not right); and
- An implicit assumption that input commodity supply is infinite and perfectly elastic.

I-O models, therefore, are just that -- models -- that simulate industrial inter-dependencies in the current economy under study. I-O models are not necessarily good models for forecasting because they model the existing economy, and do not forecast the net impact of replacing a virgin-commodity establishment with a recycled-commodity establishment, for example. Furthermore, the results for one region reflect the economy of that particular region and generally are not transferrable to other regions. I-O models, therefore, have limits. Nevertheless, I-O models are comparably much less expensive to produce than more involved models, and do an excellent job of estimating the role a particular industry has (such as the recycling industry) on a specific economy.

The generic term “economic impact” is frequently used to describe a set of economic activities in a region. This term often suffers from serious misapplication. There are

several kinds of economic activities that may occur within a particular region. For example:

- Firms may produce goods or provide services for export outside the region. They attract outside funds into the region that supports employment, industrial purchases, and household spending.
- Firms may substitute locally produced commodity inputs for those that previously were purchased from outside the region. In this case funds are retained in the region and flow to local suppliers to an industry.
- Firms may produce goods and services for local consumption (either by industries or by households). Although they may help to retain funds in the region, they may not cause significant additional economic activity.

I-O models identify the overall size and contribution of an industry -- its *economic effect* or *economic value* -- to the area mix of economic activity along with interdependencies that exist between it and other firms or service suppliers. In other words, the strength of linkages that exist among industries and the overall value (output, incomes, and jobs) of their production. The impact of an industry hasn't yet been determined.

In the case of firms that produce finished goods for export outside a region, there is a measurable *economic impact* – were it not for the external demand for the locally-produced product, the economic activity would not be in the local economy.

A much harder measure of potential economic impact falls into the category of import substitution. If a region is able to develop indigenous industries that produce a good that substitutes for a good that is imported, then that industry is *retaining* dollars in the state that used to be exported. An industry that produces a good using recycled feedstock that is supplied locally will create a product that substitutes local inputs for non-local inputs. Recycling industries often fit into the import substitution category, particularly in states without virgin feedstock production infrastructures. By utilizing recycled content, they are purchasing locally and, therefore, stimulating indigenous economic activity.

This study generally reserves the use of the term *economic impact* only for industries that have verifiable levels of exports -- where the output that they are producing is a genuine and real increase in industrial output for the region of study -- or for true import substitutes. To claim economic impacts over and above those just mentioned would involve much more extensive industrial measures for each category of establishments that was assessed in this study, and over a period of time.

This study does, however, isolate *total economic values* -- estimates, by category, of the value of economic inter-relationships that exist in the study regions for the industries. These values are the intrinsic worth of a set of industrial activities to the various states and the NERC region. They represent a slice of the economic pie from a particular point of view.

In summary, economic models are and only can be estimates of inter-industrial linkages and regional values. They are based on an amalgam of federal, county, and state data, academic procedures, along with some survey-derived direct data, all compiled with due diligence for accuracy and reasonableness. Consequently, although an inter-industrial accounting framework is implied, all estimates are simulations of economic values based on the data employed and the assumptions implicit in the modeling.

5.1.2 KINDS OF ECONOMIC INFORMATION PRODUCED BY I-O MODELS

Input-output models produce many kinds of data for analysis and decision making. The more useful results for industrial leaders, planners, and policy makers are estimates of (1) total industrial output, (2) personal income, (3) value added, and (4) jobs. These are the categories of economic activity that are reported in detail in the data tables that follow this section. These terms are defined below:

- *Total industrial output* for most private industries is simply gross sales. For public or quasi-public institutions this normally includes all public outlays, along with the value of government sales and other subsidies received, to isolate the current economic value of their output to the citizens or the area served.
- *Personal income* includes the wages and salaries of employees and proprietors, normal profits to sole proprietors, and an estimate of the cash value of all benefits (e.g., social insurance, retirement, and medical benefits).
- *Value added* is a measure of gross regional product. It includes all personal income (employment compensation, incomes to sole proprietors) plus property incomes (dividends, interests, and rents), and indirect tax payments (primarily excise and sales taxes paid by individuals to businesses).
- *Jobs* is the number of positions in the economy, not the number of employed persons. This distinction is important because the relationship between job growth and labor force growth is very different in different industries. Some industries rely heavily on semi-skilled and part-time labor. Other industries generally only produce full-time, skilled jobs. It is always important, when possible, to quantitatively assess whether the jobs that are stimulated are part-time or full-time or higher-paying versus lower-paying.

Economic data is further reported as direct, indirect, induced, and total economic effects.

- *Direct effects* refer to the operational characteristics of the firms or institutions that are studied. This study measured the apparent value of twenty-six categories of recycling and reuse establishments. The direct output of these entities is, therefore, their reported gross sales. The direct jobs are the jobs that the firms that were surveyed in the states listed. The direct personal

income contains their reported payments to all employees, plus an additional estimate of benefit values and of returns to sole proprietors. The estimate of benefit values and returns to sole proprietors were based on industrial averages in industries that are similar to the recycling and reuse industries included in this study.

- *Indirect effects* measure the value of additional economic demands that the direct firms or institutions place on supplying industries in the region. When firms produce goods or conduct business or when public entities provide public goods or services, they must make many purchases. Some of these are from suppliers in the area. Some are not. Public utilities, communications systems, fuel, wholesale goods and services, manufactured goods, financial and legal services, raw and processed commodities, and a variety of professional services are necessary to produce the direct values described above.
- *Induced effects* accrue when workers in the direct and indirect industries spend their earnings on goods and services in the region. Induced effects can also be called household effects, and the terms are often used interchangeably. When workers in direct and indirect industries purchase goods and services for household consumption, they, in turn, stimulate another layer of the economy. Most induced activity accrues to retail, services, and finance, insurance, and housing spending. Because employment is stimulated in these industries as well, *their* demands for inputs increase, yielding an additional round or additional rounds of indirect purchases and additional rounds of induced activity. The I-O models solve for these iterative rounds of transactions until all of the possible inter-industrial transactions have been accumulated.
- *Total economic effects* are the sum of direct, indirect, and induced effects. They are all of the transactions attributable, either directly or indirectly, to the activities of establishments in the business categories included in this study.

The term *multiplier* or *multiplier effect* is frequently used when referring to economic effects or economic impacts. There are different kinds of multipliers -- this study reports two types. The Type I multiplier identifies the value of direct and indirect transactions -- e.g., the output of a business category and all other output that it purchases from its suppliers in the region – relative to the value of only the direct transactions. The Type II multiplier identifies the value of <u>all</u> economic transactions (direct, indirect, and induced) that are stimulated in the economy by an industry under study, including the personal spending of employees throughout the supply chain whose economic activity is apportioned to the industry, relative to the value of only the direct transactions.

5.2 RESULTS

Table 5-1 shows estimates of economic activity accruing to establishments in business categories that provide goods or services to recycling and reuse industry establishments. The category Other Indirect Establishments shown in the table includes all other indirect establishments that provide goods or services (such as office supply companies, accounting firms, legal firms, building and landscape maintenance firms, etc.).

Table 5-1
Estimates of Indirect Economic Activity of Select Support Business Categories
(Annual Payroll and Estimated Receipts are in $1,000)

Business Category	Data Type	DE	MA	NJ	NY	PA	VT	NERC Region
Recycling and Reuse Equipment Manufacturers [1]	Employment	(D)	1,343	2,191	1,696	3,322	31	11,026
	Annual Payroll	(D)	50,815	82,908	64,187	125,699	1,181	417,214
	Estimated Receipts	(D)	321,273	524,182	405,818	794,728	2,625	2,637,820
Consulting/Engineering [2]	Employment	21	155	223	362	819	16	1,712
	Annual Payroll	756	5,901	7,735	12,072	29,780	529	62,018
	Estimated Receipts	1,607	11,938	19,166	29,437	63,259	1,320	144,355
Brokers [2]	Employment	10	65	99	161	358	7	760
	Annual Payroll	905	6,218	8,623	13,458	32,673	590	69,142
	Estimated Receipts	1,363	8,921	15,095	23,184	49,224	1,040	113,693
Transporters [2]	Employment	215	1,834	2,450	3,969	8,798	178	18,791
	Annual Payroll	6,875	61,500	74,870	116,853	280,970	5,120	600,337
	Estimated Receipts	22,652	192,891	288,578	443,216	925,796	19,878	2,173,490
Other Indirect Establishments [2]	Employment	884	8,055	(N)	(N)	62,067	(N)	(N)
	Annual Payroll	41,988	345,658	(N)	(N)	2,333,648	(N)	(N)
	Estimated Receipts	107,361	1,054,985	(N)	(N)	6,459,926	(N)	(N)
Support Businesses Totals	**Employment**	1,130	11,452	(N)	(N)	75,364	(N)	(N)
	Annual Payroll	50,524	470,092	(N)	(N)	2,802,770	(N)	(N)
	Estimated Receipts	132,983	1,590,008	(N)	(N)	8,292,933	(N)	(N)

Notes:

(D) Data not included due to disclosure.

(N) Not determined.

[1] Data for Recycling and Reuse Equipment Manufacturers are based on a statistical analysis of survey results.

[2] Data for Delaware, Massachusetts, and Pennsylvania come from the output of unique I-O models created for each of the three states and reflect the indirect activity stimulated by the 26 direct categories of recycling and reuse establishments targeted by this study for direct data. Estimates for the remaining states and the NERC region as a whole come from an average of the Type 1 multipliers for Delaware, Massachusetts, Pennsylvania, and Florida (a sponsoring state to the U. S. Recycling Economic Information Study), which was in turn multiplied by the direct economic activity estimates for each state or the region as a whole.

As Table 5-1 shows, the indirect economic activity accruing to Recycling and Reuse Equipment Manufacturers and Transporters composes a very significant portion of the total indirect effects, typically representing approximately 20-30 percent depending on the data type or state that is considered. It is important to note that the data for Recycling and Reuse Equipment Manufacturers is based on a statistical analysis of survey data and therefore represents complete data for those types of establishments located in a state. Totals for the other categories represent indirect activity relating to only the 26 categories of recycling and reuse industry establishments investigated for this study.

Listed below in Table 5-2 are the titles of data tables that follow and a description of the information they contain.

Table 5-2
Guide to Data Tables

Number	Title	Information Contained
Table 5-3	Summary of Recycling & Reuse Industry Economic Values and Multipliers by State	Summarizes direct, indirect, and induced economic values and multipliers for Delaware, Massachusetts, and Pennsylvania
Table 5-4	Delaware Recycling and Reuse Industry Economic Values and Multipliers	Shows direct, indirect, and induced economic values and multipliers for the 26 categories of recycling and reuse establishments for Delaware
Table 5-5	Massachusetts Recycling and Reuse Industry Economic Values and Multipliers	Shows direct, indirect, and induced economic values and multipliers for the 26 categories of recycling and reuse establishments for Massachusetts
Table 5-6	Pennsylvania Recycling and Reuse Industry Economic Values and Multipliers	Shows direct, indirect, and induced economic values and multipliers for the 26 categories of recycling and reuse establishments for Pennsylvania
Table 5-7	Recycling and Reuse Industrial Multipliers Compared to Multipliers for Other Industries	Shows multipliers for the recycling and reuse industry as compared to multipliers for other major industrial sectors for Delaware, Massachusetts, and Pennsylvania
Table 5-8	Summary of Recycling & Reuse Industry Effects on State Government Revenues	Shows state taxes, charges and fees, miscellaneous revenues, and total state revenues associated with direct and total economic values for Delaware, Massachusetts, and Pennsylvania
Table 5-9	Delaware Summary of Recycling & Reuse Industry Effects on Own-Source State Government Revenues	Shows state taxes, charges and fees, miscellaneous revenues, and total state revenues associated with direct and total economic values for the 26 categories of recycling and reuse establishments for Delaware
Table 5-10	Massachusetts Summary of Recycling & Reuse Industry Effects on State Government Revenues	Shows state taxes, charges and fees, miscellaneous revenues, and total state revenues associated with direct and total economic values for the 26 categories of recycling and reuse establishments for Massachusetts
Table 5-11	Pennsylvania Summary of Recycling & Reuse Industry Effects on State Government Revenues	Shows state taxes, charges and fees, miscellaneous revenues, and total state revenues associated with direct and total economic values for the 26 categories of recycling and reuse establishments for Pennsylvania

Table 5-3
Summary of Recycling & Reuse Industry Economic Values and Multipliers by State

	Jobs (Actual)				Jobs Multiplier		Personal Income (in $ Millions)				Income Multiplier		Industrial Output (in $ Millions)				Output Multiplier		Value Added (in $ Millions)				Value Added Multiplier	
	Direct	Indirect	Induced	Total	Type I	Type II	Direct	Indirect	Induced	Total	Type I	Type II	Direct	Indirect	Induced	Total	Type I	Type II	Direct	Indirect	Induced	Total	Type I	Type II
Delaware																								
Recycling Collection	18	6	7	32	1.35	1.76	1	0	0	1	1.38	1.74	3	1	1	4	1.27	1.65	1	1	0	2	1.55	1.82
Recycling Processing	348	117	171	635	1.34	1.83	8	2	3	13	1.28	1.61	73	16	23	113	1.22	1.54	15	3	4	23	1.21	1.49
Recycling Manufacturing	1,075	879	700	2,654	1.82	2.47	48	43	23	115	1.90	2.38	340	101	51	492	1.30	1.45	85	49	29	162	1.57	1.91
Reuse/Remanufacturing	614	128	160	902	1.21	1.47	11	5	4	20	1.41	1.76	53	15	13	82	1.29	1.54	17	7	7	32	1.42	1.82
Total	2,055	1,130	1,038	4,223	1.55	2.06	68	50	30	148	1.74	2.18	470	133	89	692	1.28	1.47	118	60	40	218	1.50	1.84
Massachusetts																								
Recycling Collection	1,310	81	350	1,740	1.06	1.33	49	3	12	64	1.07	1.30	54	6	31	92	1.12	1.68	56	5	18	79	1.09	1.41
Recycling Processing	3,234	1,198	2,108	6,540	1.37	2.02	107	30	46	184	1.28	1.71	870	225	364	1,460	1.26	1.68	156	38	64	258	1.24	1.65
Recycling Manufacturing	11,457	7,767	7,467	26,692	1.68	2.34	391	340	246	978	1.87	2.51	2,314	905	644	3,863	1.39	1.67	627	509	400	1,536	1.82	2.46
Reuse/Remanufacturing	3,444	852	1,209	5,505	1.25	1.60	80	37	39	156	1.46	1.94	342	108	121	571	1.32	1.67	126	58	68	252	1.46	2.00
Total	19,445	9,898	11,134	40,477	1.51	2.09	628	410	343	1,381	1.66	2.21	3,581	1,245	1,159	5,985	1.35	1.67	965	610	550	2,126	1.64	2.21
Pennsylvania																								
Recycling Collection	2,390	230	563	3,183	1.10	1.33	68	19	29	117	1.28	1.71	73	18	41	132	1.25	1.81	78	17	34	128	1.21	1.65
Recycling Processing	7,605	2,550	5,121	15,275	1.34	2.01	276	73	122	472	1.27	1.71	2,241	571	1,048	3,860	1.25	1.72	479	104	205	789	1.22	1.65
Recycling Manufacturing	64,432	67,372	66,471	198,275	2.05	3.08	2,801	2,516	1,874	7,190	1.90	2.57	15,479	6,705	4,797	26,981	1.43	1.74	3,784	3,994	3,009	10,787	2.06	2.85
Reuse/Remanufacturing	7,222	1,897	2,704	11,822	1.26	1.64	144	69	74	287	1.48	2.00	574	204	240	1,019	1.36	1.78	238	111	131	480	1.47	2.02
Total	81,648	72,048	74,858	228,555	1.88	2.80	3,289	2,677	2,100	8,066	1.81	2.45	18,366	7,499	6,126	31,992	1.41	1.74	4,579	4,226	3,379	12,184	1.92	2.66

Table 5-4
Delaware Recycling and Reuse Industry Economic Values and Multipliers

	Jobs (Actual)				Jobs Multiplier		Personal Income (in $ Millions)				Income Multiplier		Industrial Output (in $ Millions)				Output Multiplier		Value Added (in $ Millions)				Value Added Multiplier	
	Direct	Indirect	Induced	Total	Type I	Type II	Direct	Indirect	Induced	Total	Type I	Type II	Direct	Indirect	Induced	Total	Type I	Type II	Direct	Indirect	Induced	Total	Type I	Type II
Recycling Collection																								
1. Government Staffed Residential Curbside Collection	12	3	4	20	1.28	1.63	0	0	0	1	1.34	1.70	2	0	1	3	1.27	1.75	1	0	0	1	1.58	1.79
2. Private Staffed Residential Curbside Collection	6	3	3	12	1.50	2.02	0	0	0	0	1.44	1.81	1	0	0	2	1.28	1.49	0	0	0	1	1.48	1.88
Subtotal	18	6	7	32	1.35	1.76	1	0	0	1	1.38	1.74	3	1	1	4	1.27	1.65	1	1	0	2	1.55	1.82
Recycling Processing																								
3. Compost and Miscellaneous Organics Producers	19	3	4	25	1.15	1.34	0	0	0	0	1.27	1.58	1	0	0	2	1.26	1.52	0	0	0	1	1.25	1.58
4. Materials Recovery Facilities (MRF's)	39	27	21	87	1.69	2.23	1	1	0	2	1.74	2.17	2	1	0	3	1.33	1.51	2	1	0	3	1.42	1.69
5. Recyclable Material Wholesalers	290	87	146	523	1.30	1.80	7	1	2	10	1.21	1.52	70	15	23	108	1.22	1.54	13	2	4	19	1.18	1.46
Subtotal	348	117	171	635	1.34	1.83	8	2	3	13	1.28	1.61	73	16	23	113	1.22	1.54	15	3	4	23	1.21	1.49
Recycling Manufacturing																								
6. Glass Container Manufacturing Plants	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
7. Glass Product Producers (other recycled uses)	21	0	4	25	1.02	1.20	0	0	0	1	1.03	1.29	1	0	0	1	1.07	1.60	0	0	0	1	1.04	1.43
8. Nonferrous secondary smelting and refining mills	2	3	2	7	2.58	3.48	0	0	0	0	2.76	3.45	1	0	0	1	1.34	1.47	0	0	0	0	2.80	3.51
9. Nonferrous product producers	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
10. Nonferrous foundries	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
11. Paper and Paperboard Mills/Deinked Market Pulp Producers	61	48	46	155	1.79	2.53	3	2	1	6	1.66	2.08	18	6	3	27	1.32	1.50	6	3	2	11	1.52	1.86
12. Paper-based Product Manufacturers	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
13. Pavement Mix Producers (asphalt and aggregate)	11	3	5	19	1.26	1.71	0	0	0	1	1.30	1.63	1	0	0	2	1.27	1.51	1	0	0	2	1.39	1.83
14. Plastics Reclaimers	72	61	42	175	1.85	2.43	2	3	1	6	2.19	2.74	6	2	1	9	1.29	1.41	3	2	1	5	1.48	1.71
15. Plastics Converters	461	392	266	1,119	1.85	2.43	20	24	11	56	2.19	2.74	173	50	21	244	1.29	1.41	43	20	10	73	1.48	1.71
16. Rubber Product Manufacturers	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
17. Steel mills	356	317	288	961	1.89	2.70	18	12	8	38	1.67	2.10	115	35	21	171	1.30	1.48	22	19	12	53	1.85	2.41
18. Iron and Steel foundries	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
19. Other Recycling Processors/Manufacturers	91	54	48	193	1.60	2.13	3	2	1	7	1.59	1.99	25	8	5	38	1.31	1.50	10	4	3	17	1.45	1.78
Subtotal	1,075	879	700	2,654	1.82	2.47	48	43	23	115	1.90	2.38	340	101	51	492	1.30	1.45	85	49	29	162	1.57	1.91
Reuse/Remanufacturing																								
20. Computer and Electronic Appliance Demanufacturers	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
21. Motor Vehicle Parts (used)	183	51	54	289	1.28	1.58	4	2	1	7	1.52	1.91	19	6	4	29	1.32	1.52	4	3	2	9	1.76	2.35
22. Retail Used Merchandise Sales	306	28	55	388	1.09	1.27	4	1	1	6	1.16	1.46	17	3	6	26	1.20	1.55	8	1	2	12	1.16	1.46
23. Tire retreaders	64	19	22	104	1.29	1.63	2	1	1	3	1.39	1.75	7	2	2	11	1.25	1.46	3	1	1	5	1.31	1.60
24. Wood Reuse	61	31	29	121	1.51	1.99	2	1	1	4	1.69	2.12	10	4	2	16	1.39	1.59	2	2	1	5	1.97	2.60
25. Materials Exchange Services	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
26. Other Reuse	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
Subtotal	614	128	160	902	1.21	1.47	11	5	4	20	1.41	1.76	53	15	13	82	1.29	1.54	17	7	7	32	1.42	1.82
Total All Groups	2,055	1,130	1,038	4,223	1.55	2.06	68	50	30	148	1.74	2.18	470	133	89	692	1.28	1.47	118	60	40	218	1.50	1.84

Table 5-5
Massachusetts Recycling and Reuse Industry Economic Values and Multipliers

	Jobs (Actual)				Jobs Multiplier		Personal Income (in $ Millions)				Income Multiplier		Industrial Output (in $ Millions)				Output Multiplier		Value Added (in $ Millions)				Value Added Multiplier	
	Direct	Indirect	Induced	Total	Type I	Type II	Direct	Indirect	Induced	Total	Type I	Type II	Direct	Indirect	Induced	Total	Type I	Type II	Direct	Indirect	Induced	Total	Type I	Type II
Recycling Collection																								
1. Government Staffed Residential Curbside Collection	450	21	135	606	1.05	1.35	16	1	4	22	1.05	1.32	18	0	14	32	1.02	1.75	20	1	7	28	1.06	1.42
2. Private Staffed Residential Curbside Collection	860	60	215	1,135	1.07	1.32	33	2	7	42	1.07	1.29	36	6	17	59	1.17	1.65	36	4	11	51	1.10	1.41
Subtotal	1,310	81	350	1,740	1.06	1.33	49	3	12	64	1.07	1.30	54	6	31	92	1.12	1.68	56	5	18	79	1.09	1.41
Recycling Processing																								
3. Compost and Miscellaneous Organics Producers	444	155	208	807	1.35	1.82	15	5	7	27	1.34	1.78	47	12	17	76	1.26	1.62	23	8	11	42	1.34	1.81
4. Materials Recovery Facilities (MRF's)	369	74	167	610	1.20	1.65	12	3	5	20	1.22	1.63	24	5	9	38	1.22	1.61	19	4	7	30	1.20	1.58
5. Recyclable Material Wholesalers	2,421	968	1,734	5,124	1.40	2.12	80	22	34	136	1.28	1.71	800	208	338	1,346	1.26	1.68	114	26	46	186	1.23	1.63
Subtotal	3,234	1,198	2,108	6,540	1.37	2.02	107	30	46	184	1.28	1.71	870	225	364	1,460	1.26	1.68	156	38	64	258	1.24	1.65
Recycling Manufacturing																								
6. Glass Container Manufacturing Plants	(D)	(D)	(D)	(D)	1.90	2.63	(D)	(D)	(D)	(D)	2.12	2.83	(D)	(D)	(D)	(D)	1.41	1.64	(D)	(D)	(D)	(D)	2.11	2.83
7. Glass Product Producers (other recycled uses)	13	1	2	15	1.04	1.18	0	0	0	0	1.13	1.50	0	0	0	0	1.19	1.72	0	0	0	0	1.19	1.75
8. Nonferrous secondary smelting and refining mills	341	866	552	1,760	3.54	5.16	14	40	18	72	3.94	5.26	188	98	44	330	1.52	1.75	20	45	29	94	3.25	4.70
9. Nonferrous product producers	204	234	185	624	2.15	3.06	7	11	6	24	2.46	3.29	74	30	15	119	1.40	1.60	11	17	10	37	2.55	3.46
10. Nonferrous foundries	980	294	420	1,694	1.30	1.73	28	13	14	55	1.46	1.94	99	35	33	167	1.36	1.70	38	20	22	80	1.52	2.10
11. Paper and Paperboard Mills/Deinked Market Pulp Producers	2,331	2,447	2,102	6,880	2.05	2.95	99	107	69	276	2.08	2.78	674	283	172	1,129	1.42	1.68	179	165	111	454	1.92	2.54
12. Paper-based Product Manufacturers	124	48	48	221	1.39	1.78	3	2	2	6	1.86	2.48	17	6	4	26	1.33	1.55	5	3	2	11	1.68	2.17
13. Pavement Mix Producers (asphalt and aggregate)	45	13	34	91	1.29	2.05	3	1	1	4	1.22	1.63	8	2	3	12	1.20	1.53	5	1	2	7	1.19	1.56
14. Plastics Reclaimers	542	352	321	1,216	1.65	2.24	16	15	10	41	1.93	2.58	46	18	12	75	1.39	1.65	20	18	13	51	1.91	2.56
15. Plastics Converters	4,676	3,039	2,771	10,487	1.65	2.24	141	131	92	365	1.93	2.58	979	382	250	1,611	1.39	1.65	231	210	150	590	1.91	2.56
16. Rubber Product Manufacturers	103	32	34	169	1.31	1.64	2	1	1	4	1.66	2.22	10	4	3	16	1.37	1.65	3	2	2	7	1.77	2.44
17. Steel mills	9	10	9	27	2.13	3.17	0	0	0	1	1.97	2.63	3	1	1	5	1.40	1.65	1	1	0	2	2.32	3.21
18. Iron and Steel foundries	850	306	464	1,621	1.36	1.91	32	13	15	60	1.41	1.89	92	33	37	162	1.36	1.77	36	20	24	81	1.55	2.21
19. Other Recycling Processors/Manufacturers	1,240	124	524	1,888	1.10	1.52	45	5	17	68	1.11	1.49	125	14	71	210	1.12	1.68	79	8	35	122	1.11	1.54
Subtotal	11,457	7,767	7,467	26,692	1.68	2.34	391	340	246	978	1.87	2.51	2,314	905	644	3,863	1.39	1.67	627	509	400	1,536	1.82	2.46
Reuse/Remanufacturing																								
20. Computer and Electronic Appliance Demanufacturers	270	86	121	478	1.32	1.77	8	4	4	16	1.46	1.95	31	10	10	50	1.32	1.64	11	6	6	23	1.54	2.14
21. Motor Vehicle Parts (used)	1,215	462	572	2,249	1.38	1.85	35	20	19	74	1.58	2.11	151	54	45	250	1.36	1.66	42	31	30	102	1.73	2.44
22. Retail Used Merchandise Sales	1,484	148	360	1,992	1.10	1.34	29	6	12	46	1.21	1.61	122	28	55	205	1.23	1.68	60	12	25	97	1.20	1.62
23. Tire retreaders	53	16	19	88	1.30	1.66	1	1	1	2	1.53	2.05	5	2	2	9	1.31	1.59	2	1	1	4	1.42	1.83
24. Wood Reuse	351	95	87	533	1.27	1.52	4	4	3	11	1.96	2.61	24	11	7	43	1.46	1.75	7	6	5	18	1.97	2.65
25. Materials Exchange Services	42	19	29	89	1.46	2.14	2	1	1	3	1.36	1.81	3	1	1	5	1.19	1.43	3	1	1	5	1.16	1.37
26. Other Reuse	28	26	22	76	1.91	2.68	1	1	1	3	1.96	2.62	5	3	2	10	1.48	1.80	2	2	1	4	1.94	2.61
Subtotal	3,444	852	1,209	5,505	1.25	1.60	80	37	39	156	1.46	1.94	342	108	121	571	1.32	1.67	126	58	68	252	1.46	2.00
Total All Groups	19,445	9,898	11,134	40,477	1.51	2.09	628	410	343	1,381	1.66	2.21	3,581	1,245	1,159	5,985	1.35	1.67	965	610	550	2,126	1.64	2.21

(D) - Data not disclosed due to a limited number of establishments in this business category and the need to avoid revealing data that could identify a single business. Data for multiple disclosure categories are included in totals.

Table 5-6
Pennsylvania Recycling and Reuse Industry Economic Values and Multipliers

	Jobs (Actual)				Jobs Multiplier		Personal Income (in $ Millions)				Income Multiplier		Industrial Output (in $ Millions)				Output Multiplier		Value Added (in $ Millions)				Value Added Multiplier	
	Direct	Indirect	Induced	Total	Type I	Type II	Direct	Indirect	Induced	Total	Type I	Type II	Direct	Indirect	Induced	Total	Type I	Type II	Direct	Indirect	Induced	Total	Type I	Type II
Recycling Collection																								
1. Government Staffed Residential Curbside Collection	810	54	219	1,082	1.07	1.34	22	2	6	30	1.08	1.36	25	4	16	45	1.18	1.82	27	3	11	41	1.11	1.54
2. Private Staffed Residential Curbside Collection	1,580	177	344	2,100	1.11	1.33	46	18	23	87	1.38	1.88	48	14	25	87	1.29	1.81	51	14	23	87	1.27	1.71
Subtotal	2,390	230	563	3,183	1.10	1.33	68	19	29	117	1.28	1.71	73	18	41	132	1.25	1.81	78	17	34	128	1.21	1.65
Recycling Processing																								
3. Compost and Miscellaneous Organics Producers	424	89	246	759	1.21	1.79	17	3	7	27	1.17	1.58	40	8	18	65	1.19	1.64	24	5	11	39	1.19	1.66
4. Materials Recovery Facilities (MRF's)	529	66	173	768	1.13	1.45	13	4	6	24	1.31	1.77	50	10	32	92	1.19	1.82	29	6	14	50	1.20	1.68
5. Recyclable Material Wholesalers	6,652	2,395	4,702	13,748	1.36	2.07	246	66	109	421	1.27	1.71	2,151	554	999	3,703	1.26	1.72	426	94	180	700	1.22	1.64
Subtotal	7,605	2,550	5,121	15,275	1.34	2.01	276	73	122	472	1.27	1.71	2,241	571	1,048	3,860	1.25	1.72	479	104	205	789	1.22	1.65
Recycling Manufacturing																								
6. Glass Container Manufacturing Plants	800	520	629	1,949	1.65	2.44	32	19	18	68	1.59	2.15	150	50	46	245	1.33	1.64	51	30	29	110	1.58	2.14
7. Glass Product Producers (other recycled uses)	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
8. Nonferrous secondary smelting and refining mills	1,521	2,525	2,083	6,129	2.66	4.03	72	96	59	226	2.33	3.15	838	246	151	1,234	1.29	1.47	105	151	95	352	2.44	3.34
9. Nonferrous product producers	2,951	3,571	3,513	10,035	2.21	3.40	146	137	99	382	1.94	2.62	1,054	380	254	1,688	1.36	1.60	227	216	160	603	1.95	2.65
10. Nonferrous foundries	4,693	1,971	2,652	9,315	1.42	1.99	144	72	75	290	1.50	2.02	487	195	193	875	1.40	1.80	193	112	122	427	1.58	2.21
11. Paper and Paperboard Mills/Deinked Market Pulp Producers	5,143	4,629	5,014	14,786	1.90	2.87	232	170	142	544	1.73	2.34	1,414	457	362	2,234	1.32	1.58	391	266	227	884	1.68	2.26
12. Paper-based Product Manufacturers	228	105	105	438	1.46	1.92	5	4	3	11	1.84	2.49	31	10	8	49	1.33	1.57	8	6	5	19	1.73	2.30
13. Pavement Mix Producers (asphalt and aggregate)	48	40	53	141	1.83	2.94	3	1	1	6	1.53	2.06	8	3	4	15	1.38	1.85	5	2	2	9	1.35	1.82
14. Plastics Reclaimers	1,368	870	896	3,134	1.64	2.29	31	26	24	80	1.83	2.60	55	23	16	94	1.41	1.69	38	33	27	98	1.86	2.56
15. Plastics Converters	7,993	6,155	5,555	19,703	1.77	2.47	229	220	157	606	1.96	2.64	1,428	636	453	2,516	1.45	1.76	348	355	264	967	2.02	2.78
16. Rubber Product Manufacturers	701	386	288	1,374	1.55	1.96	9	14	8	31	2.46	3.32	68	35	21	123	1.52	1.82	14	21	13	49	2.47	3.37
17. Steel mills	27,063	42,218	38,930	108,211	2.56	4.00	1,526	1,602	1,102	4,230	2.05	2.77	8,837	4,279	2,816	15,932	1.48	1.80	1,942	2,563	1,766	6,272	2.32	3.23
18. Iron and Steel foundries	9,354	3,741	5,991	19,087	1.40	2.04	341	136	169	646	1.40	1.89	998	350	430	1,779	1.35	1.78	393	212	270	875	1.54	2.23
19. Other Recycling Processors/Manufacturers	2,570	643	761	3,974	1.25	1.55	32	19	18	69	1.61	2.18	110	42	45	198	1.38	1.79	67	27	29	122	1.40	1.83
Subtotal	64,432	67,372	66,471	198,275	2.05	3.08	2,801	2,516	1,874	7,190	1.90	2.57	15,479	6,705	4,797	26,981	1.43	1.74	3,784	3,994	3,009	10,787	2.06	2.85
Reuse/Remanufacturing																								
20. Computer and Electronic Appliance Demanufacturers	118	46	63	227	1.39	1.92	3	2	2	7	1.52	2.05	13	5	5	23	1.37	1.71	4	3	3	10	1.63	2.32
21. Motor Vehicle Parts (used)	1,957	842	932	3,731	1.43	1.91	42	33	26	101	1.79	2.41	194	89	67	350	1.46	1.80	51	51	42	144	1.99	2.82
22. Retail Used Merchandise Sales	4,309	431	1,113	5,852	1.10	1.36	71	14	30	115	1.20	1.62	253	59	126	438	1.23	1.73	136	27	59	222	1.20	1.63
23. Tire retreaders	566	306	367	1,239	1.54	2.19	19	11	10	40	1.56	2.11	70	28	27	125	1.40	1.77	34	17	17	68	1.50	1.99
24. Wood Reuse	197	219	166	581	2.11	2.95	5	8	5	18	2.42	3.27	32	20	12	64	1.61	1.97	8	10	7	26	2.27	3.18
25. Materials Exchange Services	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0.00	0.00
26. Other Reuse	75	54	63	191	1.72	2.57	3	2	2	7	1.56	2.11	10	5	5	19	1.45	1.91	4	3	3	10	1.65	2.31
Subtotal	7,222	1,897	2,704	11,822	1.26	1.64	144	69	74	287	1.48	2.00	574	204	240	1,019	1.36	1.78	238	111	131	480	1.47	2.02
Total All Groups	81,648	72,048	74,858	228,555	1.88	2.80	3,289	2,677	2,100	8,066	1.81	2.45	18,366	7,499	6,126	31,992	1.41	1.74	4,579	4,226	3,379	12,184	1.92	2.66

Table 5-7
Recycling and Reuse Industrial Multipliers Compared to Multipliers for Other Industries

Delaware	Output		Jobs		Personal Income		Value Added	
	Type I	Type II	Type I	Type II	Type I	Type II	Type I	Type II
Recycling and Reuse	*1.28*	*1.47*	*1.55*	*2.06*	*1.74*	*2.18*	*1.50*	*1.84*
Agriculture	1.34	1.49	1.30	1.54	1.66	2.08	1.67	2.06
Mining	1.20	1.57	1.27	1.98	1.16	1.45	1.19	1.60
Construction	1.22	1.57	1.23	1.69	1.17	1.47	1.25	1.69
Manufacturing	1.27	1.49	1.82	2.86	1.39	1.74	1.38	1.73
Transportation, Communications, & Utilities	1.28	1.57	1.44	1.99	1.34	1.68	1.28	1.58
Wholesale Trade	1.22	1.54	1.30	1.80	1.21	1.52	1.18	1.46
Trade	1.20	1.55	1.09	1.27	1.16	1.46	1.16	1.46
Financial, Insurance, & Real Estate	1.19	1.38	1.39	1.89	1.33	1.66	1.16	1.31
Services	1.32	1.73	1.22	1.54	1.26	1.58	1.32	1.76
Government	1.04	1.57	1.02	1.38	1.02	1.28	1.02	1.37

Massachusetts	Output		Jobs		Personal Income		Value Added	
	Type I	Type II	Type I	Type II	Type I	Type II	Type I	Type II
Recycling and Reuse	*1.35*	*1.67*	*1.51*	*2.09*	*1.66*	*2.21*	*1.64*	*2.21*
Agriculture	1.13	1.51	1.05	1.27	1.11	1.48	1.11	1.44
Mining	1.19	1.47	1.23	1.71	1.25	1.67	1.16	1.45
Construction	1.28	1.72	1.25	1.74	1.24	1.66	1.34	1.96
Manufacturing	1.30	1.63	1.55	2.36	1.41	1.88	1.43	1.95
Transportation, Communications, & Utilities	1.27	1.60	1.49	2.20	1.39	1.86	1.27	1.60
Wholesale Trade	1.26	1.68	1.40	2.12	1.28	1.71	1.23	1.63
Trade	1.23	1.68	1.10	1.34	1.21	1.61	1.20	1.62
Financial, Insurance, & Real Estate	1.23	1.47	1.50	2.21	1.40	1.87	1.20	1.41
Services	1.32	1.89	1.23	1.68	1.25	1.67	1.32	1.91
Government	1.06	1.75	1.03	1.46	1.03	1.37	1.04	1.54

Pennsylvania	Output		Jobs		Personal Income		Value Added	
	Type I	Type II	Type I	Type II	Type I	Type II	Type I	Type II
Recycling and Reuse	*1.41*	*1.74*	*1.88*	*2.80*	*1.81*	*2.45*	*1.92*	*2.66*
Agriculture	1.40	1.69	1.23	1.44	1.59	2.15	1.62	2.15
Mining	1.32	1.66	1.65	2.75	1.41	1.90	1.32	1.72
Construction	1.30	1.77	1.29	1.88	1.25	1.68	1.35	2.01
Manufacturing	1.36	1.69	1.70	2.63	1.51	2.04	1.53	2.10
Transportation, Communications, & Utilities	1.31	1.69	1.55	2.38	1.41	1.91	1.30	1.70
Wholesale Trade	1.26	1.72	1.36	2.07	1.27	1.71	1.22	1.64
Trade	1.23	1.73	1.10	1.36	1.20	1.62	1.20	1.63
Financial, Insurance, & Real Estate	1.23	1.49	1.42	2.03	1.42	1.91	1.20	1.42
Services	1.34	1.96	1.24	1.72	1.27	1.71	1.34	1.98
Government	1.07	1.83	1.03	1.53	1.03	1.39	1.04	1.57

Table 5-8
Summary of Recycling & Reuse Industry Effects on Own-Source State Government Revenues

	Direct Establishment Effects (in $ Millions)				Total Effects (in $ Millions)			
	All State Taxes	Charges & Fees	Miscellaneous Revenues	Total Revenues	All State Taxes	Charges & Fees	Miscellaneous Revenues	Total Revenues
Delaware								
Recycling Collection	0.06	0.02	0.02	0.09	0.10	0.03	0.03	0.15
Recycling Processing	0.74	0.20	0.21	1.15	1.19	0.33	0.34	1.85
Recycling Manufacturing	4.39	1.22	1.25	6.86	10.46	2.90	2.99	16.35
Reuse/Remanufacturing	1.02	0.28	0.29	1.60	1.81	0.50	0.52	2.82
Total	6.21	1.72	1.77	9.70	13.55	3.76	3.87	21.18
Massachusetts								
Recycling Collection	3.65	0.52	0.80	4.98	4.75	0.68	1.05	6.47
Recycling Processing	7.97	1.14	1.76	10.87	13.65	1.96	3.01	18.61
Recycling Manufacturing	29.68	4.26	6.54	40.47	74.37	10.67	16.39	101.43
Reuse/Remanufacturing	5.96	0.86	1.31	8.13	11.59	1.66	2.55	15.81
Total	47.26	6.78	10.41	64.45	104.36	14.98	22.99	142.33
Pennsylvania								
Recycling Collection	4.75	0.86	0.74	6.35	8.13	1.47	1.27	10.87
Recycling Processing	19.14	3.46	3.00	25.60	32.70	5.91	5.12	43.72
Recycling Manufacturing	194.21	35.10	30.39	259.70	498.55	90.10	78.02	666.67
Reuse/Remanufacturing	9.97	1.80	1.56	13.33	19.92	3.60	3.12	26.64
Total	228.07	41.22	35.69	304.98	559.30	101.07	87.52	747.90

Table 5-9

Delaware Summary of Recycling & Reuse Industry Effects on Own-Source State Government Revenues

	Direct Effects (in $ Millions)				Total Effects (in $ Millions)			
	All State Taxes	Charges & Fees	Miscellaneous Revenues	Total Revenues	All State Taxes	Charges & Fees	Miscellaneous Revenues	Total Revenues
Recycling Collection								
1. Government Staffed Residential Curbside Collection	0.03	0.01	0.01	0.05	0.06	0.02	0.02	0.09
2. Private Staffed Residential Curbside Collection	0.02	0.01	0.01	0.03	0.04	0.01	0.01	0.06
Subtotal	0.06	0.02	0.02	0.09	0.10	0.03	0.03	0.15
Recycling Processing								
3. Compost and Miscellaneous Organics Producers	0.03	0.01	0.01	0.04	0.04	0.01	0.01	0.07
4. Materials Recovery Facilities (MRF's)	0.09	0.03	0.03	0.15	0.20	0.06	0.06	0.32
5. Recyclable Material Wholesalers	0.62	0.17	0.18	0.96	0.94	0.26	0.27	1.47
Subtotal	0.74	0.20	0.21	1.15	1.19	0.33	0.34	1.85
Recycling Manufacturing								
6. Glass Container Manufacturing Plants	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Glass Product Producers (other recycled uses)	0.04	0.01	0.01	0.06	0.05	0.01	0.01	0.08
8. Nonferrous secondary smelting and refining mills	0.01	0.00	0.00	0.01	0.02	0.01	0.01	0.04
9. Nonferrous product producers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10. Nonferrous foundries	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11. Paper and Paperboard Mills/Deinked Market Pulp Producers	0.27	0.07	0.08	0.42	0.56	0.15	0.16	0.87
12. Paper-based Product Manufacturers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13. Pavement Mix Producers (asphalt and aggregate)	0.04	0.01	0.01	0.06	0.06	0.02	0.02	0.09
14. Plastics Reclaimers	0.22	0.06	0.06	0.34	0.59	0.16	0.17	0.92
15. Plastics Converters	1.85	0.51	0.53	2.90	5.09	1.41	1.45	7.95
16. Rubber Product Manufacturers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17. Steel mills	1.67	0.46	0.48	2.61	3.50	0.97	1.00	5.47
18. Iron and Steel foundries	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19. Other Recycling Processors/Manufacturers	0.30	0.08	0.09	0.47	0.60	0.17	0.17	0.94
Subtotal	4.39	1.22	1.25	6.86	10.46	2.90	2.99	16.35
Reuse/Remanufacturing								
20. Computer and Electronic Appliance Demanufacturers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21. Motor Vehicle Parts (used)	0.35	0.10	0.10	0.55	0.67	0.19	0.19	1.05
22. Retail Used Merchandise Sales	0.35	0.10	0.10	0.55	0.51	0.14	0.15	0.80
23. Tire retreaders	0.15	0.04	0.04	0.24	0.26	0.07	0.08	0.41
24. Wood Reuse	0.17	0.05	0.05	0.26	0.36	0.10	0.10	0.56
25. Materials Exchange Services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26. Other Reuse	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal	1.02	0.28	0.29	1.60	1.81	0.50	0.52	2.82
Total All Groups	6.21	1.72	1.77	9.70	13.55	3.76	3.87	21.18

Table 5-10

Massachusetts Summary of Recycling & Reuse Industry Effects on State Government Revenues

	Direct Effects (in $ Millions)				Total Effects (in $ Millions)			
	All State Taxes	Charges & Fees	Miscellaneous Revenues	Total Revenues	All State Taxes	Charges & Fees	Miscellaneous Revenues	Total Revenues
Recycling Collection								
1. Government Staffed Residential Curbside Collection	1.22	0.17	0.27	1.66	1.61	0.23	0.35	2.19
2. Private Staffed Residential Curbside Collection	2.43	0.35	0.54	3.32	3.14	0.45	0.69	4.28
Subtotal	3.65	0.52	0.80	4.98	4.75	0.68	1.05	6.47
Recycling Processing								
3. Compost and Miscellaneous Organics Producers	1.14	0.16	0.25	1.55	2.03	0.29	0.45	2.76
4. Materials Recovery Facilities (MRF's)	0.92	0.13	0.20	1.26	1.51	0.22	0.33	2.06
5. Recyclable Material Wholesalers	5.91	0.85	1.30	8.06	10.11	1.45	2.23	13.79
Subtotal	7.97	1.14	1.76	10.87	13.65	1.96	3.01	18.61
Recycling Manufacturing								
6. Glass Container Manufacturing Plants	0.60	0.09	0.13	0.82	1.70	0.24	0.37	2.31
7. Glass Product Producers (other recycled uses)	0.01	0.00	0.00	0.02	0.02	0.00	0.00	0.03
8. Nonferrous secondary smelting and refining mills	1.02	0.15	0.23	1.39	5.37	0.77	1.18	7.32
9. Nonferrous product producers	0.55	0.08	0.12	0.75	1.81	0.26	0.40	2.47
10. Nonferrous foundries	2.11	0.30	0.46	2.88	4.10	0.59	0.90	5.59
11. Paper and Paperboard Mills/Deinked Market Pulp Producers	7.39	1.06	1.63	10.08	20.53	2.95	4.52	27.99
12. Paper-based Product Manufacturers	0.19	0.03	0.04	0.25	0.46	0.07	0.10	0.63
13. Pavement Mix Producers (asphalt and aggregate)	0.20	0.03	0.04	0.27	0.33	0.05	0.07	0.45
14. Plastics Reclaimers	1.18	0.17	0.26	1.61	3.06	0.44	0.67	4.17
15. Plastics Converters	10.49	1.51	2.31	14.31	27.09	3.89	5.97	36.95
16. Rubber Product Manufacturers	0.15	0.02	0.03	0.20	0.33	0.05	0.07	0.45
17. Steel mills	0.03	0.00	0.01	0.04	0.09	0.01	0.02	0.12
18. Iron and Steel foundries	2.37	0.34	0.52	3.24	4.48	0.64	0.99	6.11
19. Other Recycling Processors/Manufacturers	3.38	0.48	0.74	4.61	5.02	0.72	1.11	6.85
Subtotal	29.68	4.26	6.54	40.47	74.37	10.67	16.39	101.43
Reuse/Remanufacturing								
20. Computer and Electronic Appliance Demanufacturers	0.60	0.09	0.13	0.82	1.18	0.17	0.26	1.61
21. Motor Vehicle Parts (used)	2.62	0.38	0.58	3.57	5.53	0.79	1.22	7.54
22. Retail Used Merchandise Sales	2.13	0.31	0.47	2.90	3.43	0.49	0.76	4.68
23. Tire retreaders	0.09	0.01	0.02	0.12	0.18	0.03	0.04	0.25
24. Wood Reuse	0.33	0.05	0.07	0.45	0.85	0.12	0.19	1.16
25. Materials Exchange Services	0.11	0.02	0.02	0.15	0.20	0.03	0.05	0.28
26. Other Reuse	0.08	0.01	0.02	0.11	0.21	0.03	0.05	0.29
Subtotal	5.96	0.86	1.31	8.13	11.59	1.66	2.55	15.81
Total All Groups	47.26	6.78	10.41	64.45	104.36	14.98	22.99	142.33

Table 5-11

Pennsylvania Summary of Recycling & Reuse Industry Effects on State Government Revenues

	Direct Effects (in $ Millions)				Total Effects (in $ Millions)			
	All State Taxes	Charges & Fees	Miscellaneous Revenues	Total Revenues	All State Taxes	Charges & Fees	Miscellaneous Revenues	Total Revenues
Recycling Collection								
1. Government Staffed Residential Curbside Collection	1.54	0.28	0.24	2.06	2.10	0.38	0.33	2.80
2. Private Staffed Residential Curbside Collection	3.21	0.58	0.50	4.29	6.03	1.09	0.94	8.06
Subtotal	4.75	0.86	0.74	6.35	8.13	1.47	1.27	10.87
Recycling Processing								
3. Compost and Miscellaneous Organics Producers	1.18	0.21	0.18	1.58	1.86	0.34	0.29	2.49
4. Materials Recovery Facilities (MRF's)	0.93	0.17	0.15	1.24	1.64	0.30	0.26	2.19
5. Recyclable Material Wholesalers	17.04	3.08	2.67	22.78	29.20	5.28	4.57	39.05
Subtotal	19.14	3.46	3.00	25.60	32.70	5.91	5.12	43.72
Recycling Manufacturing								
6. Glass Container Manufacturing Plants	2.21	0.40	0.35	2.95	4.75	0.86	0.74	6.35
7. Glass Product Producers (other recycled uses)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8. Nonferrous secondary smelting and refining mills	4.98	0.90	0.78	6.66	15.68	2.83	2.45	20.96
9. Nonferrous product producers	10.11	1.83	1.58	13.52	26.47	4.78	4.14	35.39
10. Nonferrous foundries	9.95	1.80	1.56	13.31	20.11	3.63	3.15	26.89
11. Paper and Paperboard Mills/Deinked Market Pulp Producers	16.12	2.91	2.52	21.55	37.72	6.82	5.90	50.43
12. Paper-based Product Manufacturers	0.31	0.06	0.05	0.42	0.78	0.14	0.12	1.05
13. Pavement Mix Producers (asphalt and aggregate)	0.19	0.04	0.03	0.26	0.40	0.07	0.06	0.54
14. Plastics Reclaimers	2.15	0.39	0.34	2.87	5.58	1.01	0.87	7.46
15. Plastics Converters	15.89	2.87	2.49	21.25	42.01	7.59	6.57	56.18
16. Rubber Product Manufacturers	0.65	0.12	0.10	0.87	2.15	0.39	0.34	2.87
17. Steel mills	105.80	19.12	16.56	141.48	293.31	53.01	45.90	392.22
18. Iron and Steel foundries	23.64	4.27	3.70	31.62	44.80	8.10	7.01	59.91
19. Other Recycling Processors/Manufacturers	2.20	0.40	0.34	2.95	4.80	0.87	0.75	6.42
Subtotal	194.21	35.10	30.39	259.70	498.55	90.10	78.02	666.67
Reuse/Remanufacturing								
20. Computer and Electronic Appliance Demanufacturers	0.23	0.04	0.04	0.31	0.48	0.09	0.07	0.64
21. Motor Vehicle Parts (used)	2.89	0.52	0.45	3.87	6.99	1.26	1.09	9.34
22. Retail Used Merchandise Sales	4.92	0.89	0.77	6.58	7.97	1.44	1.25	10.66
23. Tire retreaders	1.31	0.24	0.21	1.76	2.77	0.50	0.43	3.71
24. Wood Reuse	0.38	0.07	0.06	0.51	1.24	0.22	0.19	1.66
25. Materials Exchange Services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26. Other Reuse	0.22	0.04	0.04	0.30	0.47	0.09	0.07	0.63
Subtotal	9.97	1.80	1.56	13.33	19.92	3.60	3.12	26.64
Total All Groups	228.07	41.22	35.69	304.98	559.30	101.07	87.52	747.90

5.3 INTERPRETATION OF MODELING RESULTS

This section is intended to aid readers in interpreting the results of the tables in the previous section.

Economic values are most accurate at the business category level. Summing totals by groups of recycling or reuse activity for the state as a whole (as has been done in the tables) results in some degree of duplicated accounting of economic activity. This is true for any set of industrial assessments in any output modeling scenario -- it is not a problem with recycling, per se, nor with this study, but arises simply because of the many business categories that are included in this study.

For example, direct sales by a raw commodity processor represent an input purchase by an industry producing a finished good for sale. A large portion of the raw commodity processor's direct sales is already reflected in the finished good industry's input purchases. In this case, then, aggregation biases the economic values in the subtotals and totals upwards. As a general rule, the higher the Type I multiplier (which is a measure of how strongly a firm depends on supplier inputs), the higher the probability of aggregation bias in reporting subtotals and totals. This is an inherent *Catch 22* in input-output modeling: to eliminate aggregation bias of this sort, the industries must be lumped together in the construction of the model so that inter-industrial transactions are properly accounted and the resulting multipliers are properly dampened. Doing so, however, eliminates the industrial detail that is desired.

Nevertheless, subtotals and totals have been produced so that relative comparisons can be made. Users of these findings, however, must be cautious to avoid claims about the recycling and reuse industry that may be unwarranted given that there is some degree of inflation in the subtotals or totals. Based on other modeling experience, it is believed that aggregation bias may have inflated the subtotals and totals by up to 15 percent, and possible higher. It is important to note that this bias is associated with any total that is derived from indirect and induced information, including total economic activity, subtotal/total multipliers, and total government tax revenues. Alternatively, **totals derived only from direct information and government tax revenues derived from direct economic activity do not include bias**.

Multipliers reveal potential changes in the regional economy attributable to a change in direct activity in a particular industry in that same economy. Multipliers can be instructive for anticipating economic growth, in the case of a new or expanding firm, and economic decline, in the case of a plant closing. Economic multipliers are often misunderstood and therefore improperly used. Developers, planners, and decision-makers frequently use national level multipliers that are produced by the U.S. Bureau of Economic Analysis (BEA) as points of comparison. These multipliers are called RIMS II (Regional Input-Output Multiplier System), and they are widely used by development groups to support economic investment or public spending.

Multipliers are available for over 500 industries in the categories of earnings, employment, and industrial output. Many users, however, mistakenly apply these statistics because they:

- Fail to account for regional production and cost of living differences (detailed multipliers are available at the state and county level, but project promoters often rely on national averages due to costs);
- Use the wrong multiplier to describe a phenomenon (multipliers for different categories of economic activity can vary substantially); or
- Seek to promote industries with the largest multipliers possible without consideration of either the appropriateness of the application or of the actual scope of local production.

The reader can be assured that this study produced Type I and Type II multipliers that are specific to the states studied and are not directly derivative of national averages.

Before making any comparisons among multipliers, it is important to understand what influences them. Firms with strong linkages to area supplying firms or that pay relatively high earnings may yield comparatively higher multipliers. Firms that are otherwise not linked strongly to local suppliers or that pay lower than average wages will usually produce lower multipliers. More urbanized areas and states with larger and more diversified economies have, on the average, much higher multipliers than less populated, more rural states for the same types of businesses. The study results illustrate this. For example, Table 5-3 shows that average recycling and reuse multipliers for Delaware are less than those for the larger and more industrially diverse states of Massachusetts and Pennsylvania. Therefore, one cannot necessarily conclude that Delaware has a weaker recycling and reuse industry than other states, or that Delaware's recycling and reuse industry is any less important to its state economy than the industry is in other states. The simple fact may be that Delaware's multipliers are smaller because its small geographic size facilitates cross-border trade.

Given the above guides to interpreting the data, there are several general conclusions that can be drawn:

- Recycling manufacturing business categories tend to have higher multipliers than other recycling and reuse business categories. This is because they tend to rely heavily on supplier goods and service inputs and they tend to pay higher wages for skilled labor that is higher than other industries may require.
- Non-ferrous smelting and refining, non-ferrous product producers, steel mills, and wood reuse tended to have the highest multipliers for the states that were modeled.
- Larger and more populous states tend to produce industries with higher multipliers than other states.

- Investments in local recycling collection and processing and policies that encourage recycling and reuse yield significant total state government revenues from taxes, charges, fees, and miscellaneous revenues. In Massachusetts, for example, over 70 percent of total recycling industry tax revenues arise from recycling manufacturing establishments and their indirect and induced economic activity.

6 RECOMMENDATIONS FOR FUTURE STUDIES

This section summarizes the recommendations for extending the study to the remainder of the nation in the follow-on national study and for replicating the study in future years. Recommendations are:

- Carefully review changes in definitions from the SIC classification system to the NAICS system when utilizing U.S. Census data. Whereas this study utilized data based on the SIC system, future studies will need to utilize data based on NAICS. Although definitions for most categories remain unchanged, a few categories are worth noting. For example, the SIC system classifies materials recovery facilities (MRF's) under SIC 4953, Refuse Systems, which includes landfills and other waste handling facilities. The new NAICS system code, 56292, is specifically for MRF's. Therefore, the data for MRF's may be gathered by examining Census data rather than through surveys. An example of a category for which it may be more difficult to utilize existing data is nonferrous secondary smelting and refining mills. The NAICS definition for this category includes a few miscellaneous activities, such as alloying of zinc paste, that were not included in the SIC definition and should not be included in estimates of recycling-related activities.
- For future replication, narrow the definition of compost and organics producers and find listings of facilities through sources other than the Downing and Associates list.[21] Although the Downing and Associates list was thorough and complete, the definition of compost and organics was very broad, resulting in a large number of listings that were municipal mulching operations or only a small portion of a larger facility, such as a MRF or transfer station. *BioCycle* regularly publishes lists of various types of composting programs. Although it typically publishes only the program name, city, and state, it may be possible to make special arrangements to gain more detailed contact information.
- Make every attempt before mailing surveys to correctly classify establishments that are in survey categories. Due to the diverse nature of the sources used to compile the database and the lack of classification for some electronic lists, a large number of establishments were misclassified, resulting in additional efforts during the surveying process and a smaller number of establishments in some categories than was initially expected.
- Redesign the survey form to allow one establishment to be classified in more than one category and allow the employment, payroll, and receipts amounts to be divided among the selected categories.

[21] Please refer to Appendix B for a listing and evaluation of all sources used.

- Conduct more and better research on the industrial characteristics of recycling and reuse firms to improve the explanatory power of I-O models. This research should focus on the following areas:
  - Input-output tables (use, make, total requirements) for critical recycling and reuse industries so that inter-industrial transactions are better understood. Furthermore, constructing similar tables for non-recycling industries will better allow comparisons between recycling and non-recycling businesses.
  - Tracking the throughput of major recycling commodities at state levels to the production of a final industrial or household good. For many industries there is not good information on the propensity of recyclables being purchased, processed, and manufactured into a consumer good within a state or region.
  - A comparison of critical costs associated with the flow of recycled products into goods for final use.

Finally, follow-up study that would be useful and interesting should be considered, including:

- Additional research to better document intermediate input statistics for recycling businesses and to enable comparisons between recycling and non-recycling businesses in the same industry;
- Estimating the amount of economic activity that can be attributed to public policy over the past decade; and
- Determining the amount of growth over today's baseline (as measured through this report) that could be realized by additional levels of recycling and reuse.

APPENDIX A
DESCRIPTION OF RECYCLING AND REUSE BUSINESS CATEGORIES

Table A-1 provides detailed descriptions of 30 recycling and reuse business categories, grouped into 3 industry segments. The table is intended to comprehensively include all business establishments undertaking recycling and reuse economic activities, as defined in Section 2. Note that recycling processors and manufacturers are grouped into a single industry segment. This is because many of the establishments in these categories undertake both processing and manufacturing.

Table A-1 lists *Standard Industrial Classification* (SIC) codes for each category. These codes were identified by comparing each category to the official definitions listed in the *Standard Industrial Classification Manual, 1987*, prepared by the Executive Office of the President, Office of Management and Budget. Note that in most cases, the listed SIC category also includes businesses not involved in recycling and reuse. Beginning in 1997 the SIC system will gradually be phased out and replaced by the new *North American Industry Classification* (NAIC) System, which is harmonious with systems used in Mexico and Canada, in accordance with the North American Free Trade Agreement. Table A-1 also lists the NAIC codes that correspond to the traditional SIC codes. Where the NAIC categories differ significantly, the new category name is provided. Notable changes in the NAIC system include a new category for material recovery facilities, and a division of SIC 4953, Refuse Systems into separate categories for haulers and disposal facility operators handling hazardous, solid and other wastes.

Table A-1 Descriptions of Industry Segments and Business Categories of the Recycling and Reuse Industries

Industry Segment	Business Categories in Segment	Typical SIC Code Assignments	Typical NAIC Code Assignments
Recycling Collection	**1. Government Staffed Residential Curbside Collection** Programs staffed by municipal, state or other government agencies which provide curbside, drop-off or other recycling collection services. Does not include programs focused on education, market development or other activities not directly supporting collection programs. Does not include municipal programs staffed by private contractors.	4212 Local Trucking Without Storage	562111 Solid Waste Collection (without disposal)
	2. Private Staffed Residential Curbside Collection Private sector establishments which provide recycling collection services to residential waste generators, sometimes under contract to municipal or state government agencies. The primary activity of many of these establishments is waste hauling.	4212 Local Trucking Without Storage	562111 Solid Waste Collection (without disposal)

Industry Segment	Business Categories in Segment	Typical SIC Code Assignments	Typical NAIC Code Assignments
Recycling Processing and Manufacture	**3. Compost and Miscellaneous Organics Producers** Establishments which produce compost, mulch, bark, and other soil amendment or landscaping products from source separated yard trimmings, discarded wood and food, biosolids and other organic feedstocks. This category also includes vermiculture.	2875 Fertilizers (mixing only)	325314 Fertilizers (mixing only)
	4. Materials Recovery Facilities Establishments which accept mixed and/or source separated recyclables, typically from municipal curbside and drop-off collection programs. Activities include sorting, baling, grinding, densifying and/or brokering recyclables for wholesale distribution. May also segregate recyclables from mixed solid waste. This category is intended to be defined consistently with the new NAIC category for materials recovery facilities.	4953 Refuse Systems	56292 Material Recovery Facilities
	5. Recyclable Material Wholesalers Establishments which process recycled materials by sorting, grading, densifying, removing contaminants and otherwise preparing the materials for shipment to manufacturing facilities for use in industrial production. Examples include paper stock dealers and scrap metal processors. These establishments may also provide recycling collection services. This category is intended to be defined consistently with the new NAIC category for recyclable material wholesalers.	5093 Scrap & Waste Material Wholesalers	42193 Recyclable Material Wholesalers
	6. Glass Container Manufacturing Plants Establishments which produce finished glass containers for shipment to bottlers, using recycled glass cullet as a feedstock. May also undertake beneficiation activities on site.	3221 Glass Containers	327213 Glass Containers
	7. Glass Product Producers (other recycled uses) Establishments which produce products other than containers, using recycled glass as a feedstock. Examples include fiberglass, decorative tiles, glassware, and construction blocks.	3229 Pressed and Blown Glass and Glassware	327212 Pressed and Blown Glass and Glassware
	8. Nonferrous Secondary Smelting and Refining Mills Establishments involved in the recovery and alloying of nonferrous metals. Activities include grading, sorting, detinning, refining. and other processes. Produce intermediate products such as ingot. May also include fabrication of basic products. Note that primary smelters of nonferrous metals, excluding aluminum and copper, process scrap in addition to virgin materials. Primary aluminum and copper smelters do not process scrap.	3341 Secondary smelting and refining of nonferrous metals 3339 Primary smelting and refining of nonferrous metals, except copper and aluminum	331314, 331423, 331492 Miscellaneous Secondary Nonferrous Smelting, Refining and Alloying.

Industry Segment	Business Categories in Segment	Typical SIC Code Assignments	Typical NAIC Code Assignments
Recycling Processing and Manufacture (Continued)	**9. Nonferrous Product Producers** Establishments which produce a wide range of intermediate products through extrusion processes, primarily from billet manufactured in smelting operations. Many of these plants may also operate in-house casting operations which process unrefined nonferrous scrap.	3351 - 3356 Miscellaneous Nonferrous Products	331421, 331315, 331315, 331316, 331319 Miscellaneous Nonferrous Products
	10. Nonferrous Foundries Establishments which produce castings and die-castings of various non ferrous metals and alloys. Note that many manufacturers of specific end-products, e.g., automobiles, may operate foundries and purchase scrap.	3363 - 3369 Nonferrous Foundries	331521 – 331528 Nonferrous Foundries
	11. Paper and Paperboard Mills/Deinked Market Pulp Producers Establishments which deink discarded paper sproduce first stage intermediate paper and paper board products (e.g., paper rolls) using discarded paper or deinked market pulp as a feedstock. Also includes establishments which deink discarded paper and produce market pulp for sale to paper and paperboard mills.	2621 Paper Mills 2631 Paperboard Mills	322121 Paper Mills (Except newsprint) 322122 Newsprint Mills 32213 Paperboard Mills
	12. Paper-based Product Manufacturers Establishments which produce paper products other than traditional paper and paperboard products, using discarded paper as a feedstock. Examples include cellulose insulation, molded fiber products, construction board, hydro-seeding mulch or animal bedding.	2679 Miscellaneous Converted Paper and Paperboard Products	322215 Non-Folding Sanitary Food Container Manufacturing (egg cartons) 322298 Other Converted Paper Product Manufacturing 325221 Cellulose Organic Fiber Manufacturing
	13. Pavement Mix Producers (asphalt and aggregate) Establishments which produce asphalt paving mix and aggregate for use in road construction using recycled pavement, asphalt, rubber modified asphalt and/or glass, in addition to virgin materials.	2951 Asphalt paving mixtures and blocks	324121 Asphalt paving mixtures and blocks

Industry Segment	Business Categories in Segment	Typical SIC Code Assignments	Typical NAIC Code Assignments
Recycling Processing and Manufacture (Continued)	**14. Plastics Reclaimers** Establishments which produce plastic pellets or granulated plastic suitable for use by plastics product manufacturers. Activities include separating, washing, grinding, flaking and/or pelletizing. This category also includes establishments which manufacture intermediate products directly from unprocessed recycled plastic, such as plastic lumber products.	3087 Custom Compounding of Purchased Plastics Resins 3085 Plastics Bottles Mfg	325991 Custom Compounding of Purchased Plastics Resins 42261 Plastics Bottles Mfg
	15. Plastic Converters Establishments which produce intermediate plastic products (e.g., molded products and components, sheet and fiber) using recycled pellets or granulated plastic as a feedstock.	3081 – 3083, 3086 Miscellaneous Plastics Products	326113, 326121, 32613, 326112, 32616, 32615, 32614, 325991, 326191, 326122, 326121, 326199
	16. Rubber Product Manufacturers Establishments which produce first-stage intermediate products or end products using crumb rubber as a feedstock.	3069 Miscellaneous fabricated rubber products 3011 Tires and inner tubes 3021 Rubber and plastics footwear 3052 Rubber & plastics hose & belting 3053 Gaskets, packing and sealing devices	326211, 316211, 32622, 339991, 326291, 31332, 326192, 326299
	17. Steel Mills Basic oxygen furnaces (BOF) producing raw steel in various forms using a mix of scrap and molten iron made in blast furnaces from scrap and raw materials (iron ore, coke, limestone) and also electric arc furnaces (EAF) using scrap. Products from EAF mills are primarily slabs, billets or rebar. Products from BOF mills are primarily flat or rolled products. Activities include grading scrap, detinning, refining and product fabrication. Additional fabrication and assembly of final stage products may occur at these facilities.	3312 Steel works, Blast Furnaces and Rolling Mills	331111 Iron and Steel Mills

Industry Segment	Business Categories in Segment	Typical SIC Code Assignments	Typical NAIC Code Assignments
Recycling Processing and Manufacture (Continued)	**18. Iron and steel foundries** Establishments which produce a wide range of cast steel products using unrefined scrap and steel ingot produced in steel mills. Activities may include grading scrap, refining and casting.	3321 - 3325 Iron and Steel Foundries	331511 – 331513 Iron and Steel Foundries
	19. Other recycling processors and manufacturers Other recycling processors and manufacturers, not elsewhere classified. May include used oil refiners, household hazardous waste processors, agricultural facilities or landscapers using ash or paper mill sludge, engineering applications of tires, and other users of materials not elsewhere classified.	Varied.	Varied.
Reuse and Remanufacturing	**20. Computer and Electronic Appliance Demanufacturers** Establishments which sort, classify, grade and remanufacture used electronic appliances, primarily computers. Remanufacture may encompass entire appliances or components. These establishments may also recycle materials not suitable for remanufacture.	36, if on a factory basis	
	21. Motor Vehicle Parts Establishments which clean, sort, inspect and remanufacture used motor vehicle parts.	5015 Wholesale Used Motor Vehicle Parts	42114
	22. Retail Used Merchandise Sales Establishments which operate retail sales facilities dedicated to reused products. Activities may include providing drop-off or pick-up collection services for used products; cleaning, repairing and otherwise preparing products for resale. Includes "thrift" stores, reusable product depots, reuse centers and product-specific stores such as used clothing and used sporting goods, not elsewhere classified.	5932 Used Merchandise Stores (retail)	45331 Used Merchandise Stores (excluding pawn shops)
	23. Tire Retreaders Establishments which sort, clean, buff and remanufacture used tires by adding new tread. These establishments produce crumb rubber as a by-product.	7534 Tire Retreading and Repair Shops	326212 Tire Retreading
	24. Wood Reuse Establishments which produce graded lumber and/or finished goods by cleaning, grading, and otherwise processing used wood. Includes establishments which purchase used, damaged pallets and remanufacture for reuse. Does not include establishments whose primary product is fuel.	2448 Wood Pallets and Skids 2499 Wood Products, NEC	32192 321999
	25. Materials Exchange Services Establishments which provide listings and otherwise facilitate the reuse of products and materials, primarily by commercial and industrial establishments.	7389 Business Services NEC	54199 All Other Professional, Scientific, and Technical Services

Industry Segment	Business Categories in Segment	Typical SIC Code Assignments	Typical NAIC Code Assignments
Reuse and Remanufacturing (continued)	**26. Other Reuse** Establishments, not elsewhere classified, which purchase used equipment or merchandise and remanufacture, clean and otherwise prepare the used products for distribution.	5082-5084 Wholesale Machinery, Equipment, and Supplies	42181-42183 Wholesale Machinery, Equipment, and Supplies
Support Businesses	**27. Recycling and Reuse Equipment Manufacturers and Vendors** Establishments that produce the primary equipment used by recycling businesses. Includes all significant equipment used by collection and intermediate processing establishments, such as trucks, balers, conveyors, magnets, automated sortation devices, grinders, choppers, etc. Also includes specialized equipment used specifically to accommodate recycled materials in manufacturing processes, or to process or remanufacture used products. Examples include plastic bottle washing, sorting and pelletizing systems, wastepaper deinking systems, tire processing equipment, glass bottle washing systems, etc. This category does not include standard processing and manufacturing equipment not specifically designed for recycling or reuse.	3511 - 3599 Industrial Machinery and Equipment	333 Machinery Manufacturing
	28. Consulting and Engineering Services Establishments that provide technical research and development services and engineering services to recycling collectors and intermediate processors, and reuse establishments, and which provide specialized services essential to the recycling or reuse process in manufacturing facilities. Examples include engineering services to develop deinking plants, composting facilities and plastics processing facilities. Broad consulting services to government or non-profits which does not directly support establishments listed above are not included.	8733 Noncommercial Research Organizations 8711 Engineering services 8742 Management consulting services	54133 Engineering Services 541611- 541614 Management consulting services
	29. Brokers Establishments that purchase recycled materials or reusable products for purposes of resale without processing or otherwise adding value. Includes export brokerage services.	5093 Scrap and Waste Material Wholesalers 5099, 5199 Commodity Contract Brokers and Dealers 4731 Shipping brokers	52314 Commodity Brokerage 48851 Freight Transportation Arrangement
	30. Transporters Establishments that transport recovered materials or reusable products to intermediate processing facilities and/or processing and end-use facilities by air, truck, sea or rail.	4011 – 4499 Freight Services	481 – 484 Air, Rail, Water, and Truck Transportation

CHANGES IN METHODOLOGY FROM THE *RECYCLING ECONOMIC INFORMATION PROJECT FINAL REPORT*

Table B-1 summarizes the changes that were made during the implementation of the original *Recycling Economic Information Project Final Report*[1] recommendations. Originally, the study targeted 45 different categories of businesses in five different sectors. After refinement of the methodology during implementation, the study targeted 26 categories in the two sectors of:

1. Recycling Collection, Processing, and Manufacturing; and
2. Reuse and Remanufacturing.

Four other categories of support businesses are frequently considered to be part of the recycling and reuse industries. Data for the four support categories noted in Table B-1 are included in Section 5.

Table B-1
Explanation of Changes in Methodology from
Recycling Economic Information Project Final Report

	Original Business Category	Original NERC REI Recommendations	Refinements to Original REI Recommendations
Recycling Collection			
1	Government collection	Derivation	Derivation
2	Hauler collection	Algorithm	Derivation
3	Disposal facility collection	Algorithm	Deleted
4	Commercial facility collection	Algorithm	Deleted
5	Manufacturer/industrial collection	Algorithm	Deleted
Recycling Processing and Manufacturing			
6	Recyclable material wholesalers	Existing	Existing
7	Materials recovery facilities	Existing	Survey
8	Construction and demolition debris processors	Survey	Merge with Recyclable material wholesalers
9	Deinked market pulp producers	Existing	Merge with Paper and paperboard mills
10	Paper and paperboard mills	Existing	Existing
11	Other paper product producers	Survey	Survey
12	Beneficiation facilities	Survey	Merge with Recyclable material wholesalers
13	Glass container manufacturing plants	Survey	Survey
14	Fiberglass insulation producers	Survey	Merge with Other recycled glass product producers
15	Other recycled glass product producers	Survey	Survey
16	Detinning facilities	Survey	Merge with Smelting and refining mills
17	Steel mills	Existing	Existing

[1] Prepared by the Northeast Recycling Council, April 10, 1998.

Original Business Category		Original NERC REI Recommendations	Refinements to Original REI Recommendations
18	Iron and steel foundries	Existing	Existing
19	Smelting and refining mills	Existing	Existing
20	Nonferrous extruded product producers	Existing	Existing
21	Nonferrous foundries	Existing	Existing
22	Plastics reclaimers	Other	Other – use APC database and existing data
23	Plastics converters	Survey	Existing
24	Crumb rubber producers	Survey	Merge with Recyclable material wholesalers
25	Miscellaneous rubber product manufacturers	Survey	Survey
26	Compost producers	Survey	Survey
27	Miscellaneous organics product producers	Survey	Merge with Compost producers
28	Aggregate and pavement mix producers	Survey	Survey
29	Textile processors	Existing	Merge with Recyclable material wholesalers
30	Used oil refiners (non-fuel)	Survey	Merge with Other recycling processors/manufacturers
31	Household hazardous waste processors	Survey	Merge with Other recycling processors/manufacturers
32	Other recycling processors/manufacturers	Survey	Survey
Wholesale Reuse			
33	Tire retreaders	Existing	Existing
34	Electronic appliance demanufacturers	Survey	Survey
35	Wood reuse	Survey	Survey
36	Materials exchange services	Survey	Survey
37	Motor vehicle parts	Existing	Existing
38	Equipment remanufacturers	Existing	Deleted because of lack of state-level data
39	Other reuse	Survey	Survey
Retail Reuse			
40	Miscellaneous used merchandise sales (retail)	Existing	Existing
41	Repair and used product shops	Existing	Deleted
Support Businesses			
42	Recycling and reuse equipment manufacturers	Survey	Survey
43	Consulting/engineering	Derivation	Modeling
44	Brokers	Derivation	Modeling
45	Transporters	Derivation	Modeling

EVALUATION OF DATA SOURCES

				Resource Use			
Resource Number	Resource/Directory	Source Organization	Types of Businesses Included	Survey	Existing Data	Not Used	Evaluation
1	*Aluminum Statistical Review*	The Aluminum Association	Aluminum manufacturers			✓	Contains statistics including number of plants, primary aluminum production and scrap consumption and recovery but not on a state level. Recycling statistics are specific to aluminum cans.
2	*Aluminum Extrusion Press Directory*	The Aluminum Association	Aluminum manufacturers			✓	Comprehensive listing of extruders and plants.
3	*Paper Matcher*	American Forest and Paper Association	Paper and paperboard mills, paper dealers, recycling centers		✓		Useful source to evaluate number mills utilizing recovered paper.
4	*Wood Recycling Directory - 1996*	American Forest and Paper Association	C&D processors, miscellaneous organic products, compost producers	✓			Good for wood reuse contact list.
5	*Casting Source Directory*	American Foundrymen's Association	Non-ferrous processing and manufacture			✓	Comprehensive listing of foundries. Use existing data.
6	*Directory of Iron and Steel Plants*	American Iron and Steel Engineers	Ferrous metals manufacture			✓	Listing of iron and steel plants by state with contact information, plant capacity, and types of furnaces.
7	*Annual Statistical Report*	American Iron and Steel Institute	Ferrous metals industry			✓	Most extensive source of industry statistics but no state-level data. Use USGS and census data.
8	*Handler/Reclaimer Database*	American Plastics Council	Plastics handlers, reclaimers		✓		Will use for APC cooperative effort.
9	*Recycled Plastic Products Source Book*	American Plastics Council	Recycled material converters, distributors			✓	Limited use, focuses on distributors, retailers, reclaimers already in H/R database. Lists some converters.
10	*ARM Directory and Buyers Guide*	American Recycling Markets	Collectors, intermediate processors, processors, manufacturers, brokers and equipment dealers	✓			Good general resource.
11	*Membership Directory*	American Retreaders Association	Tire retreaders			✓	Organization name has changed; information is old.
12	*1998-1999 Directory*	Asphalt Recycling and Reclaiming Association	Aggregate producers and pavement mix, specialized reuse and recycling equipment manufacturers, consulting and engineering services	✓			Good directory for listing of aggregate and pavement mix producers.
13	*Membership Directory*	Association of Battery Recyclers	Collection and intermediate processing			✓	Small organization, does not distribute its directory to non-members.
14	*Membership Directory*	Association of Post-Consumer Plastic Recyclers	Collectors, processors, and end-users of post-consumer plastics			✓	Less comprehensive than other resources.
15	*Membership Directory*	Automobile Recyclers Association	Auto recyclers			✓	Duplicate with other resources.
16	*1997 APRA Membership Directory*	Automotive Parts Rebuilders Association	Lists all members-auto parts rebuilders			✓	Use census as a source of existing data instead.
17	*National Recycling Rate Study*	Battery Council International	Processing and manufacture, collection and intermediate processing			✓	Duplicate with other resources.
18	*Recycling Product News*	Baum Publications	Recycling equipment manufacturers	✓			Small listing of equipment manufacturers.

				Resource Use			
Resource Number	Resource/Directory	Source Organization	Types of Businesses Included	Survey	Existing Data	Not Used	Evaluation
19	*The Remanufacturing Industry: Hidden Giant*	Boston University – Professor Robert Lund	Equipment Remanufacturing			✓	Statistics include number of firms, employees, and annual sales for over 46 product areas. Data may overlap with businesses in other categories (motor vehicle shops, tire retreaders).
20	*Subscribers List*	C&D Debris Recycling Magazine	C&D processing and manufacture, specialized equipment manufacture (200 NE)			✓	Duplicate of other resources.
21	*Directory, 1995*	Can Manufacturers Institute	Can manufacturers			✓	Finished product conversion.
22	*Manufacturer Database (Access)*	Cellulose Insulation Manufacturers Association	Cellulose insulation manufacturers	✓			Good database.
23	*Reuse Directory for Western Massachusetts*	Center for Ecological Technology	Primarily retail reuse	✓			Useful for a few categories.
24	*Choose to Reuse (Reuse Encyclopedia)*	Ceres Press	Book of wholesale reuse, retail reuse, other reuse, materials exchange services			✓	3 years old, 200 categories, somewhat difficult to relate categories to this study.
25	*Directory & Atlas of Solid Waste Disposal Facilities, 1997*	Chartwell Information Services, Inc.	Salvage operations (up to 4,000 landfills and incinerators where salvage may occur)			✓	Limited use for estimates.
26	*MA Recycling & Reused Product Mfgs.*	Chelsea Center	Database of recycling and reused product businesses	✓			Good list for surveying.
27	*Recycling Technology Assistance Program*	Clean Washington Center	Wood waste, plastics, organics, tire and rubber, other categories.			✓	Directory is no longer produced. Last version was 1993.
28	*Membership List*	Composting Council	Organics processing and manufacture. Access database.			✓	896 of 3800 facilities, old data. Use Downing and Associates data source.
29	*Business Recycling — C&D Facilities*	Connecticut DEP	List of C&D recyclers			✓	Good list; not surveying C&D recyclers.
30	*Business Recycling — Scrap Metal*	Connecticut DEP	List of scrap metal dealers			✓	Good list; not surveying scrap metal dealers.
31	*Business Recycling — Waste Paper*	Connecticut DEP	List of waste paper processors			✓	Good list; not surveying waste paper processors.
32	*Compost Connections*	Connecticut DEP	List of private compost facilities	✓			Good resource.
33	*Connecticut Intermediate Processing Ctrs.*	Connecticut DEP	List of MRFs	✓			Good resource.
34	*Registered Processing Facilities*	Connecticut DEP	List of various processors/brush sites	✓			Good resource.
35	*Volume Red. Facilities. — Bulky Waste*	Connecticut DEP	List of various processors for C&D and other matls.	✓			Good resource.
36	*Industry/Member List*	Council for Scrap Textile Recycling	Textile processing			✓	Use existing data.
37	*Reuse/Recycling of Glass Cullet for Non-Container Uses*	Dane County DPW	Manufacturers of recycled glass products other than containers	✓			Good resource.
38	*Delaware Recycling Directory*	Delaware Economic Development Office	Directory of Delaware recycling businesses	✓			Good resource.
39	*Directory of Florida Dealer/Processors and Industrial Users of Recyclable Materials (1990)*	Department of Environmental Regulation				✓	Information is outdated.
40	*Product and Equipment Specifications Reports*	Downing & Associates	Compost and wood waste, recycling and solid waste equipment manufacturers	✓			Good resource.

Appendix C
Northeast Recycling Council
Recycling Economic Information Study

				Resource Use			
Resource Number	Resource/Directory	Source Organization	Types of Businesses Included	Survey	Existing Data	Not Used	Evaluation
41	*Organics Mailing List*	Downing & Associates	Compost and wood waste, recycling and solid waste	✓			3,800 listings, comprehensive source.
42	*Resource Guide to C&D in the Northeast*	Fundamental Action to Conserve Energy (F.A.C.E.)	N.E. construction and demolition debris processors	✓			Good resource, though dated.
43	*Markets List*	Glass Packaging Institute (GPI)	Glass beneficiation facilities/Glass container plants; Glass container manufacturing plants	✓			Good resource.
44	*MRF Yearbook*	Governmental Advisory Associates	MRFs and mixed waste processing facilities in US	✓			Good contact information for surveying.
45	*Harris Directory*	The Harris Reports	Miscellaneous processing and manufacture, remanufacturing and wholesale sales, materials exchange services (focused on building, interior, garden products)	✓			Contains 1,000 records. Focus on reuse.
46	*Membership Directory*	International Tire and Rubber Association	Tire retreaders			✓	Contact information for members; duplicate with other sources.
47	*Weaving Textile Reuse into Waste Reduction*	Institute for Local Self-Reliance	Textile processing			✓	Other directories are more comprehensive.
48	*Electronics Reuse and Recycling*	Institute for Local Self-Reliance	Electronic appliance demanufacture			✓	EPA directory is more comprehensive.
49	*Pallet Reuse/ Recycling Operations*	Institute for Local Self-Reliance	Pallet reuse processors			✓	193 processors; duplicate of other resources.
50	*Membership List*	Institute of Scrap Recycling Industries	Processing and manufacture, Equipment manufacture, Consultants, Collection and intermediate processing, Specialized reuse and recycling equipment manufacturers			✓	Contact information for members, represents sizable portion of the industry. Use census data.
51	*Iowa Recycling Directory*	Iowa Department of Natural Resources	Database of processors and manufacturers	✓			Good resource.
52	*Materials Exchanges on the Web*	KY Industrial Materials Exchange	List of material exchanges	✓			Good resource.
53	*1994 Lead Recycling Directory*	Lead Industries Association, Inc.	Non-ferrous metals processing and manufacture, lead acid battery processors	✓			Good resource.
54	*Maine Recycling Businesses*	Maine	Database of various Maine recycling businesses	✓			Good resource.
55	*Waste Management Services Directory*	Maine Planning Office	Directory of various Maine recycling businesses	✓			Good resource.
56	*Recycled Materials Market Directory*	MAC/REDO	MRFs, processors, and end-users in various categories	✓			Good for MRFs & End-users in DC, DE, MD, PA, VA, and WV.
57	*Lockwood Post Directory of the Pulp Paper and Allied Trades*	Miller Freeman Publishing, Inc.	Pulp & paper mills, converting plants, paper merchants/distributors, wastepaper stock suppliers			✓	Comprehensive but not for the types of data required for this study.
58	*Molded Pulp Product Manufacturers*	Molded Pulp Environmental Association	Molded pulp producers	✓			Good resource.
59	*Postconsumer PET Plastic Market List*	National Association of PET Container Resources (NAPCOR)	Plastics reclaimers, converters and brokers			✓	Duplicate of more extensive lists.
60	*Purchasing Guide for Recycled PET Plastic Products*	National Association of Plastic Container Recyclers (NAPCOR)	Sellers of recycled PET products			✓	Duplicate of more extensive lists.

				Resource Use			
Resource Number	**Resource/Directory**	**Source Organization**	**Types of Businesses Included**	**Survey**	**Existing Data**	**Not Used**	**Evaluation**
61	*Member List*	National Oil Recyclers Association	Used oil collection and refining			✓	Good resource, but mostly collection or fuel use.
62	*1995/1996 Compost- Wood Waste Product & Equipment Specifications*	National Register of Recycling Equipment				✓	More updated version by Downing & Associates
63	*Member List*	National Wood and Pallet Container Association	List also includes 350 non-recycling manufacturers and represents approx. 17% of US capacity			✓	Good, though partial, resource; couldn't obtain.
64	*NH Recycling Businesses*	New Hampshire	List of additional recycling & reuse businesses	✓			Good resource.
65	*Directory of New Hampshire Recycled Content Manufacturers*	New Hampshire Recycling Market Development Office	Directory includes manufacturers and distributors	✓			Good resource.
66	*NJDEP List of Class B Recycling Centers*	NJDEP Bur. of Landfill & Rec. Mgt.	List of C&D and yard waste recyclers	✓			Good resource.
67	*NJ Intermediate Processing Facilities*	NJDEP Bur. of Recyc. & Planning	List of MRFs	✓			Good resource.
68	*Greening the Garden State*	New Jersey Office of Sustainability	Profiles & lists of recycled and reused product bus.	✓			Good resource.
69	*Member List*	North American Insulation Manufacturing Association	Fiberglass insulation producers	✓			Good resource.
70	*Database*	Northeast Recycling Council	Extensive mail list database of businesses	✓			Extensive database.
71	*C&D Debris in the NEWMOA States*	Northeast Waste Management Officials Association (NEWMOA)	C&D Processors			✓	Already incorporated by NERC into database.
72	*Pallet Enterprise Magazine*	Pallet Enterprise	Pallet industry survey/database			✓	Good resource but unable to obtain.
73	*Pennsylvania Recycling Centers*	Pennsylvania DEP	Database of Penn. recycling businesses	✓			Extensive database.
74	*Philadelphia Recycling Businesses*	Philadelphia	Database of Philadelphia recycling businesses	✓			Good, although contains many scrap dealers & waste paper processors not being surveyed.
75	*Member list*	Plastic Loosefill Council	Manufacturers of plastic loosefill			✓	Duplicate of better resources.
76	*Member list*	Plastic Lumber Trade Association	Plastics reclaimers or plastic converter			✓	Duplicate of better resources.
77	*Database Search Results*	Polystyrene Packaging Council	Collection and intermediate processing, plastics processing and manufacture. Original source is APC database			✓	Duplicate of better resources.
78	*Scrap Tire and Rubber Users Directory*	Recycling Research Institute	Tire and rubber recyclers, equipment providers, general info	✓			Good resource.
79	*Buyers Guide 1998*	Recycling Today Magazine	Equipment manufacturers	✓			Good resource.
80	*Mailing List*	Resource Recycling, Inc	Over 41,000 records in numerous categories	✓			Good resource.
81	*1996 Directory of U.S. and Canadian Scrap Plastics Processors and Buyers*	Resource Recycling, Inc	Commercial recycling collectors and intermediate processors, Plastics processing and manufacture, Specialized reuse and recycling equipment manufacturers, Brokers	✓			Good resource.

				Resource Use			
Resource Number	**Resource/Directory**	**Source Organization**	**Types of Businesses Included**	**Survey**	**Existing Data**	**Not Used**	**Evaluation**
82	*1997-98 Equipment Directory*	Resource Recycling, Inc	Recycling collection and intermediate processing equipment manufacturers, specialized reuse and recycling equipment manufacturers	✓			Good resource.
83	*Recycling Company List*	RI Dept. of Environmental Mgmt.	List of all kinds of businesses, including transfer stations	✓			Good resource.
84	*Western Massachusetts Directory of Regional Manufacturers and Distributors of Recycled Products*	Solid Waste Education and Enterprise Program (SWEEP)	Manufacturers, distributors	✓			Good resource.
85	*1998 SMA Membership Directory*	Steel Manufacturers Association	Steel mills, Iron and steel foundries, Specialized reuse and recycling equipment manufacturers		✓		Contact and facility information for members; good information on electric arc furnaces.
86	*Database*	Steel Recycling Institute	Collection and intermediate processing, ferrous metals processing and manufacture			✓	Only contains information on curbside and drop-off programs. Not useful for this study.
87	*Recycling Directory: Computers and Electronics*	Texas General Land Office	Electronic appliance demanufacture, wholesale reuse, retail reuse	✓			Old; EPA list is more comprehensive.
88	*Member List*	Used Oil Management Association	Used oil processors	✓			Only five members; National Oil Recyclers Assoc. is a better resource.
89	*Standard Statistical Establishments List (SSEL)*	US Census Department	Covers all businesses		✓		Good resource for categories with corresponding SIC codes.
90	*Census of Manufactures*	US Census Department	Various manufacturing industries		✓		Contains more detail than *SSEL* on production workers and value added by manufacture for selected industries. Useful for estimates.
91	*Current Industrial Reports – Manufacturing Profiles*	US Census Department	Various manufacturing industries		✓		Contains some data on material throughput. Useful for estimates.
92	*Electronics Reuse and Recycling Directory*	US EPA	Electronic appliance demanufacturers. Includes donation, reuse, remanufacture, recycling of computers.	✓			Good resource.
93	*Recycling Hotline*	US EPA	Collection and intermediate processing (drop off facilities, municipal & private ownership)			✓	Educational and program information only.
94	*Converters of Post-Consumer/Industrial Plastics Converters (RCRA Research Library)*	US EPA, Region I	Compiled from multiple sources			✓	Largely duplicates existing sources of data.
95	*What Can I Do With My Old Computer Equipment*	US EPA, Region I	Electronics recyclers	✓			Largely duplicates national EPA document.
96	*Mineral Commodity Reports*	US Geological Survey	Ferrous and non-ferrous metals recycling statistics		✓		Good resource for scrap consumption data.
97	*Vermont Markets Directory*	Vermont Agency of Natl. Resources	List from database of recycling markets	✓			Good resource.

				Resource Use			
Resource Number	**Resource/Directory**	**Source Organization**	**Types of Businesses Included**	**Survey**	**Existing Data**	**Not Used**	**Evaluation**
98	*Database*	Virtual Trade Exchange Company LLC	Internet database of companies reusing or exchanging wood			✓	Searchable database of companies on internet. No easy way to obtain complete mailing list. Duplicate of better resources.
99	*Recycling Services Directory*	WasteCap of Massachusetts	Database of Massachusetts recycling businesses	✓			Extensive database.
100	*Massachusetts Business' Guide to Reuse*	WasteCap of Massachusetts	Guide of reuse businesses	✓			Good resource.
101	*1998 NH Recycled & Reused Products Directory*	WasteCap New Hampshire	Processors and end-users in various categories	✓			Good resource.
102	*1998 Source Guide*	Waste Dynamics of the Northeast	Recycling collection and intermediate processing equipment manufacturers, specialized reuse and recycling equipment manufacturers, brokers, consulting and engineering services, transporters	✓			Good resource.
103	*1997 WASTEC Products and Services Directory*	Waste Equipment Technology Association	Recycling collection and intermediate equipment processing manufacturers, specialized reuse and recycling equipment manufacturers, Consulting and engineering services	✓			Good resource.
104	*Mailing list*	Waste News	Various categories			✓	Duplicate of better resources.
105	*Resource 1998*	Waste News	Equipment guide, waste focus	✓			Good resource.
106	*List of HHW Contractors*	Waste Watch Center	Household hazardous waste processing			✓	Good resource, but mainly disposal.
107	*1997 World Wastes Buyers' Guide Edition*	World Wastes	Collectors and intermediate processors, Recycling collection and intermediate processing equipment manufacturers, Specialized reuse and recycling equipment manufacturers	✓			Good for resource.
108	*Recycling Directory*	Yellow Page Publishers Association (YPPA)	Commercial recycling centers and intermediate processors, Paper processing and manufacture, Brokers which deal with old directories	✓			Good resource for other paper users.

Appendix D
Sample of Raw Data from
U. S. Census Bureau's *Standard Statistical Establishments List*

NUMBER OF FIRMS, ESTABLISHMENTS, EMPLOYMENT, ANNUAL PAYROLL, AND ESTIMATED RECEIPTS FOR SPECIFIED 4 DIGIT SIC's FOR ALL STATES BY EMPLOYMENT SIZE OF FIRM

					Employment Size of Firm								
STATE	SIC		TYPE OF DATA	TOTAL	0	1-4	5-9	10-19	<20	20-99	100-499	<500	500+
DE	2621	Paper mills	01 Firms	2	0	0	0	0	0	0	0	0	2
DE	2621	Paper mills	03 Establishments	2	0	0	0	0	0	0	0	0	2
DE	2621	Paper mills	05 Employment	[c]	0	0	0	0	0	0	0	0	[c]
DE	2621	Paper mills	07 Annual Payroll ($1,000)	(D)	0	0	0	0	0	0	0	0	(D)
DE	2621	Paper mills	09 Estimated Reciepts ($1,000)	(D)	0	0	0	0	0	0	0	0	(D)
DE	3296	Mineral wool	01 Firms	1	0	0	0	0	0	0	0	0	1
DE	3296	Mineral wool	03 Establishments	1	0	0	0	0	0	0	0	0	1
DE	3296	Mineral wool	05 Employment	[c]	0	0	0	0	0	0	0	0	[c]
DE	3296	Mineral wool	07 Annual Payroll ($1,000)	(D)	0	0	0	0	0	0	0	0	(D)
DE	3296	Mineral wool	09 Estimated Reciepts ($1,000)	(D)	0	0	0	0	0	0	0	0	(D)
DE	3312	Blast furnace and steel mills	01 Firms	1	0	0	0	0	0	0	1	1	0
DE	3312	Blast furnace and steel mills	03 Establishments	1	0	0	0	0	0	0	1	1	0
DE	3312	Blast furnace and steel mills	05 Employment	[e]	0	0	0	0	0	0	[e]	[e]	0
DE	3312	Blast furnace and steel mills	07 Annual Payroll ($1,000)	(D)	0	0	0	0	0	0	(D)	(D)	0
DE	3312	Blast furnace and steel mills	09 Estimated Reciepts ($1,000)	(D)	0	0	0	0	0	0	(D)	(D)	0
DE	3339	Primary nonferrous metals, nec	01 Firms	1	0	1	0	0	1	0	0	1	0
DE	3339	Primary nonferrous metals, nec	03 Establishments	1	0	1	0	0	1	0	0	1	0
DE	3339	Primary nonferrous metals, nec	05 Employment	[a]	0	[a]	0	0	[a]	0	0	[a]	0
DE	3339	Primary nonferrous metals, nec	07 Annual Payroll ($1,000)	(D)	0	(D)	0	0	(D)	0	0	(D)	0
DE	3339	Primary nonferrous metals, nec	09 Estimated Reciepts ($1,000)	(D)	0	(D)	0	0	(D)	0	0	(D)	0
DE	3341	Secondary nonferrous metals	01 Firms	1	0	1	0	0	1	0	0	1	0
DE	3341	Secondary nonferrous metals	03 Establishments	1	0	1	0	0	1	0	0	1	0
DE	3341	Secondary nonferrous metals	05 Employment	[a]	0	[a]	0	0	[a]	0	0	[a]	0
DE	3341	Secondary nonferrous metals	07 Annual Payroll ($1,000)	(D)	0	(D)	0	0	(D)	0	0	(D)	0
DE	3341	Secondary nonferrous metals	09 Estimated Reciepts ($1,000)	(D)	0	(D)	0	0	(D)	0	0	(D)	0
DE	3356	Nonferrous rolling and drawing, nec	01 Firms	1	0	0	1	0	1	0	0	1	0
DE	3356	Nonferrous rolling and drawing, nec	03 Establishments	1	0	0	1	0	1	0	0	1	0
DE	3356	Nonferrous rolling and drawing, nec	05 Employment	[a]	0	0	[a]	0	[a]	0	0	[a]	0
DE	3356	Nonferrous rolling and drawing, nec	07 Annual Payroll ($1,000)	(D)	0	0	(D)	0	(D)	0	0	(D)	0
DE	3356	Nonferrous rolling and drawing, nec	09 Estimated Reciepts ($1,000)	(D)	0	0	(D)	0	(D)	0	0	(D)	0
DE	4212	Local trucking, without storage	01 Firms	151	21	76	28	9	134	12	3	149	2
DE	4212	Local trucking, without storage	03 Establishments	153	21	76	28	9	134	13	3	150	3
DE	4212	Local trucking, without storage	05 Employment	1161	[a]	[c]	[c]	[c]	[e]	448	[c]	[g]	[b]
DE	4212	Local trucking, without storage	07 Annual Payroll ($1,000)	26818	(D)	(D)	(D)	(D)	(D)	9802	(D)	(D)	(D)
DE	4212	Local trucking, without storage	09 Estimated Reciepts ($1,000)	110632	(D)	(D)	(D)	(D)	(D)	37140	(D)	(D)	(D)
DE	4953	Refuse systems	01 Firms	8	0	2	0	2	4	1	1	6	2
DE	4953	Refuse systems	03 Establishments	8	0	2	0	2	4	1	1	6	2

Appendix D
Sample of Raw Data from
U. S. Census Bureau's *Standard Statistical Establishments List*

						Employment Size of Firm								
STATE	SIC		TYPE OF DATA		TOTAL	0	1-4	5-9	10-19	<20	20-99	100-499	<500	500+
DE	4953	Refuse systems	05	Employment	[c]	0	[a]	0	[b]	[b]	[b]	[a]	[b]	[b]
DE	4953	Refuse systems	07	Annual Payroll ($1,000)	(D)	0	(D)	0	(D)	(D)	(D)	(D)	(D)	(D)
DE	4953	Refuse systems	09	Estimated Reciepts ($1,000)	(D)	0	(D)	0	(D)	(D)	(D)	(D)	(D)	(D)
DE	5015	Motor vehicle parts, used	01	Firms	29	0	16	6	5	27	2	0	29	0
DE	5015	Motor vehicle parts, used	03	Establishments	29	0	16	6	5	27	2	0	29	0
DE	5015	Motor vehicle parts, used	05	Employment	183	0	[b]	[b]	52	[c]	[b]	0	183	0
DE	5015	Motor vehicle parts, used	07	Annual Payroll ($1,000)	3843	0	(D)	(D)	1592	(D)	(D)	0	3843	0
DE	5015	Motor vehicle parts, used	09	Estimated Reciepts ($1,000)	19129	0	(D)	(D)	7345	(D)	(D)	0	19129	0
DE	5093	Scrap and waste materials	01	Firms	31	2	14	4	9	29	1	0	30	1
DE	5093	Scrap and waste materials	03	Establishments	33	2	14	4	10	30	1	0	31	2
DE	5093	Scrap and waste materials	05	Employment	290	[a]	[b]	[b]	[c]	[c]	[b]	0	[e]	[b]
DE	5093	Scrap and waste materials	07	Annual Payroll ($1,000)	6024	(D)	(D)	(D)	(D)	(D)	(D)	0	(D)	(D)
DE	5093	Scrap and waste materials	09	Estimated Reciepts ($1,000)	70090	(D)	(D)	(D)	(D)	(D)	(D)	0	(D)	(D)
DE	5932	Used merchandise stores	01	Firms	50	7	32	4	2	45	2	2	49	1
DE	5932	Used merchandise stores	03	Establishments	60	7	32	4	2	45	3	4	52	8
DE	5932	Used merchandise stores	05	Employment	306	0	[b]	29	[b]	[c]	[b]	[b]	[c]	[b]
DE	5932	Used merchandise stores	07	Annual Payroll ($1,000)	3470	33	(D)	293	(D)	(D)	(D)	(D)	(D)	(D)
DE	5932	Used merchandise stores	09	Estimated Reciepts ($1,000)	17006	162	(D)	1443	(D)	(D)	(D)	(D)	(D)	(D)
DE	6221	Commodity contracts brokers, dealers	01	Firms	1	0	1	0	0	1	0	0	1	0
DE	6221	Commodity contracts brokers, dealers	03	Establishments	1	0	1	0	0	1	0	0	1	0
DE	6221	Commodity contracts brokers, dealers	05	Employment	[a]	0	[a]	0	0	[a]	0	0	[a]	0
DE	6221	Commodity contracts brokers, dealers	07	Annual Payroll ($1,000)	(D)	0	(D)	0	0	(D)	0	0	(D)	0
DE	6221	Commodity contracts brokers, dealers	09	Estimated Reciepts ($1,000)	(D)	0	(D)	0	0	(D)	0	0	(D)	0
DE	7378	Computer maintenance & repair	01	Firms	15	4	6	2	1	13	0	0	13	2
DE	7378	Computer maintenance & repair	03	Establishments	15	4	6	2	1	13	0	0	13	2
DE	7378	Computer maintenance & repair	05	Employment	68	0	7	[a]	[a]	[b]	0	0	[b]	[b]
DE	7378	Computer maintenance & repair	07	Annual Payroll ($1,000)	2494	64	210	(D)	(D)	(D)	0	0	(D)	(D)
DE	7378	Computer maintenance & repair	09	Estimated Reciepts ($1,000)	8227	203	912	(D)	(D)	(D)	0	0	(D)	(D)
DE	7532	Top & body repair & paint shops	01	Firms	96	3	54	22	13	92	3	1	96	0
DE	7532	Top & body repair & paint shops	03	Establishments	96	3	54	22	13	92	3	1	96	0
DE	7532	Top & body repair & paint shops	05	Employment	502	[a]	[c]	141	[c]	444	[b]	[a]	502	0
DE	7532	Top & body repair & paint shops	07	Annual Payroll ($1,000)	12739	(D)	(D)	3759	(D)	11525	(D)	(D)	12739	0
DE	7532	Top & body repair & paint shops	09	Estimated Reciepts ($1,000)	44379	(D)	(D)	12636	(D)	40561	(D)	(D)	44379	0
DE	7533	Auto exhaust system repair shops	01	Firms	13	0	6	5	1	12	0	0	12	1
DE	7533	Auto exhaust system repair shops	03	Establishments	14	0	6	5	1	12	0	0	12	2
DE	7533	Auto exhaust system repair shops	05	Employment	[b]	0	[a]	26	[a]	47	0	0	47	[b]
DE	7533	Auto exhaust system repair shops	07	Annual Payroll ($1,000)	(D)	0	(D)	748	(D)	1464	0	0	1464	(D)
DE	7533	Auto exhaust system repair shops	09	Estimated Reciepts ($1,000)	(D)	0	(D)	2903	(D)	5916	0	0	5916	(D)
DE	7534	Tire retreading and repair shops	01	Firms	3	0	2	0	0	2	0	1	3	0
DE	7534	Tire retreading and repair shops	03	Establishments	3	0	2	0	0	2	0	1	3	0
DE	7534	Tire retreading and repair shops	05	Employment	[b]	0	[a]	0	0	[a]	0	[b]	[b]	0

Appendix D
Sample of Raw Data from
U. S. Census Bureau's *Standard Statistical Establishments List*

					Employment Size of Firm								
STATE	SIC		TYPE OF DATA	TOTAL	0	1-4	5-9	10-19	<20	20-99	100-499	<500	500+
DE	7534	Tire retreading and repair shops	07 Annual Payroll ($1,000)	(D)	0	(D)	0	0	(D)	0	(D)	(D)	0
DE	7534	Tire retreading and repair shops	09 Estimated Reciepts ($1,000)	(D)	0	(D)	0	0	(D)	0	(D)	(D)	0

APPENDIX E

SURVEY MATERIALS

NORTHEAST RECYCLING COUNCIL NERC

NATIONAL RECYCLING COALITION INC.

January 29, 1999

Subject: U.S. Recycling Economic Information Study

Dear Colleague:

We're writing to ask your assistance in responding to the enclosed, brief survey. This important survey is designed to gather key economic statistics on the nation's recycling and reuse industries.

The survey requests information about your firm's activities involving the processing of recyclable and reusable materials/products, manufacturing of new products from recycled materials, or manufacturing equipment used in the recycling and reuse industries. Additional survey forms have been enclosed if you have more than one facility. (Please use a separate form for each facility.) We want to emphasize that **the information you provide will be held strictly confidential – under no circumstances will company-specific data be released**. Your responses will be aggregated with data provided by other businesses, and only released as aggregated, statewide or industry-wide totals.

Our organizations, the Northeast Recycling Council (NERC) and the National Recycling Coalition (NRC), have retained R.W. Beck, Inc., a nationally recognized management consulting firm, to conduct the first ever U.S. Recycling Economic Information Study. As part of the study, R.W. Beck is surveying businesses like yours from throughout the nation, beginning with the Northeastern states.

Once complete, NERC and NRC will publish the study results and use them to promote the growth of the recycling and reuse industries. By sharing aggregate statistics with the financial community, the information will be used to help leverage the availability of capital to assist recycling entrepreneurs grow their businesses. By targeting state and federal officials, the information will help secure government action (or inaction) favorable to recycling and reuse businesses. The information will also be useful in educating the general public about the benefits your industry provides to our economy and environment.

If you have any questions regarding the enclosed survey form, please contact Tim Buwalda of R. W. Beck at (800) 873-6532. If you wish, you may fax your completed survey to R.W. Beck at (407) 648-8382. We would appreciate a response by February 15, 1999. Thank you for your assistance.

Sincerely,

Edward Boisson
Executive Director,
Northeast Recycling Council

William Ferretti
Executive Director,
National Recycling Coalition

National Recycling Coalition Inc.

U. S. Recycling Economic Information Study

Company	Blair County IRC Composting Facility
Subsidiary of	
Mailing Address (location where contact can be reached)	423 Allegheny Street Suite 36 Hollidaysburg, PA 16648
Physical Address (establishment location)	East 6th Ave Rd Altonna, PA 16601
Establishment Telephone Number	_____ *Ext* _____ Please provide at least an area code that corresponds to the PHYSICAL ADDRESS.
Contact Name	Edward Smith
Title	Recycling Director
Contact Telephone Number	(814) 949-2566 *Ext* _____
Fax Number	
E-mail Address	

Be sure that the ZIP CODE for the physical address is NOT for a Post Office Box.

If you have any questions about this form or the U. S. Recycling Economic Information Study, please call Tim Buwalda of R. W. Beck at (800) 873-6532.

- Please make any necessary changes and spelling corrections to the information above
- Our records show that you also have facilities at the following location(s):

Buckhorn **PA**

- If we are missing one or more of your facilities, please list them below

A. Name _____ City/State _____

B. Name _____ City/State _____

C. Name _____ City/State _____

Please return to: Tim Buwalda / R. W. Beck, Inc. / P.O. Box 538817 / Orlando, Florida 32853-8817 / or FAX to (407) 648-8382.

NORTHEAST RECYCLING COUNCIL NERC

National Recycling Coalition Inc.

U. S. Recycling Economic Information Study

CONFIDENTIAL SURVEY — no establishment-specific data will be released.

1. Please identify the categories that best match your establishment (check all that apply).

ESTABLISHMENT CATEGORIES

Recycling Processing and Manufacturing		Code
	Compost/organics processor	1
	Construction and demolition debris processor	17
	Fiberglass insulation producer	2
	Glass beneficiation facility	18
	Glass container manufacturing plant	3
	Glass product producer (other recycled uses)	4
	Household hazardous waste processor	5
	Materials recovery facility (commingled matls.)	6
	Nonferrous extruded product producer	19
	Nonferrous foundry	20
	Nonferrous smelting or refining mill	21
	Oil processor	7
	Paper, paperboard, or market pulp mill	22
	Paper-based product mfg. (e.g. insulation, bedding)	8
	Pavement mix producer (asphalt or aggregate)	9
	Plastics converter	23
	Plastics reclaimer	24
	Recyclable materials processors (e.g. paper, metal)	25
	Rubber product manufacturer	10
	Rubber/tire recycler (crumb/cuttings producer)	26
	Steel or Iron foundry	27
	Steel mill	28
	Textile processor	29

Recycling Collection		Code
	Private-staffed collection	30
	Government-staffed collection	31
Reuse and Remanufacturing		
	Computer/electronic appliance demanufacturer	12
	Equipment or toner cartridge remanufacturer	32
	Motor vehicle parts remanufacturer	33
	Repair shop	34
	Retail used merchandise sales	35
	Tire retreader	36
	Wood reuse or pallet rebuilder	13
Support Businesses		
	Broker	37
	Consulting/engineering company	38
	Materials exchange services	14
	Recycling and reuse equipment manufacturer	15
	Transporter	39
Other (describe below)		
	Other recycling processor/manufacturer	11
	Other reuse/remanufacturer	16
	Other (none of the above)	40
Describe your establishment here:		

2. Please write the code of the establishment category found above that best represents the primary recycling, manufacturing (using recycled materials), reuse (refurbish or rebuild), or recycling equipment manufacturing part of your establishment (choose only one). _____

If your answer to question 2 was a number from:

- **1-16 or 24**, please continue and complete the remaining three questions on the next page as they apply to your establishment as a recycling, manufacturing (using recycled materials), reuse, or recycling equipment manufacturer. Those questions are not intended to quantify in-house programs that recover self-generated scrap materials or reuse reusable products.
- **17-23 or 25-40**, you may stop and return this survey in the postage-paid envelope. Thank you!

NORTHEAST RECYCLING COUNCIL NERC

National Recycling Coalition Inc.

U. S. Recycling Economic Information Study

CONFIDENTIAL SURVEY — no establishment-specific data will be released.

3. Establishment Size Information (this location):

Total Number of Employees:

- ☐ *0 – 9*
- ☐ *10 – 24*
- ☐ *25 – 49*
- ☐ *50 - 99*
- ☐ *100 – 199*
- ☐ *200 – 299*
- ☐ *300 – 399*
- ☐ *400 – 499*
- ☐ *500 – 1,000*

_____ *Please fill in value if greater than 1,000*

Most Recent Total Annual Payroll: [1]

- ☐ *$0 - $49,999*
- ☐ *$50,000 - $149,999*
- ☐ *$150,000 – $499,999*
- ☐ *$500,000 – $999,999*
- ☐ *$1,000,000 – $2,499,999*
- ☐ *$2,500,000 – $4,999,999*
- ☐ *$5,000,000 – $9,999,999*
- ☐ *$10,000,000 – $19,999,999*
- ☐ *$20,000,000 – $30,000,000*

*$*_____ *Please fill in value if greater than $30,000,000*

Most Recent Total Annual Receipts : [2]

- ☐ *$0 - $99,999*
- ☐ *$100,000 - $249,999*
- ☐ *$250,000 - $499,999*
- ☐ *$500,000 - $999,999*
- ☐ *$1,000,000 - $2,499,999*
- ☐ *$2,500,000 - $4,999,999*
- ☐ *$5,000,000 - $7,499,999*
- ☐ *$7,500,000 – $9,999,999*
- ☐ *$10,000,000 - $19,999,999*
- ☐ *$20,000,000 - $49,999,999*
- ☐ *$50,000,000 – $74,999,999*
- ☐ *$75,000,000 – $100,000,000*

*$*_____ *Please fill in value If greater than $100,000,000*

[1] Payroll includes total salary, hourly pay, bonuses, commissions, sick-leave pay, free meals, and benefits received by employees.
[2] Receipts include revenue of all forms (sales, fees, rents, commissions, interest, dividends) minus all local, state, and federal tax revenue collected.

4. Covered Activities Information (this location):

"**Covered activities**" are all activities that support:

- Transforming scrap materials or products into a recycled raw material
- Transforming recycled raw materials into a first intermediate product (e.g. sheet, fiber, roll)
- Transforming recycled raw materials directly into a finished product
- Preparing used products for reuse
- Manufacturing equipment for the recycling or reuse industries

Covered activities do not include converting a first intermediate product to finished products or preparing materials for fuel use.

Percent of Total Production Labor Time Spent on Covered Activities:

- ☐ *0 - 9%*
- ☐ *10 - 19%*
- ☐ *20 - 29%*
- ☐ *30 - 39%*
- ☐ *40 - 49%*
- ☐ *50 - 59%*
- ☐ *60 - 69%*
- ☐ *70 - 79%*
- ☐ *80 - 89%*
- ☐ *90 - 100%*

Percent of Total Receipts from Products of Covered Activities:

- ☐ *0 - 9%*
- ☐ *10 - 19%*
- ☐ *20 - 29%*
- ☐ *30 - 39%*
- ☐ *40 - 49%*
- ☐ *50 - 59%*
- ☐ *60 - 69%*
- ☐ *70 - 79%*
- ☐ *80 - 89%*
- ☐ *90 - 100%*

If your primary establishment code in Question 2 was 1-11, please complete the following table (Question 5).

5. Recycling or Recycled Product Manufacturing Annual Processing Information (this location):

Input Materials	*Unit of* **Measure**	*Input Quantity*	*Process Outputs*		
			Residue Disposed	Prepared or used for fuel	Recycled product or material
Example — oil	*gallons*	*1,000,000*	*5%*	*75%*	*20%*
Paper					
Plastics					
Glass					
Metals					
Tires or rubber					
Construction & demolition debris [1]					
Organics [2]					
Oil or household hazardous waste					
Other					

[1] Includes concrete, asphalt, non-yard wood waste, etc. from construction, demolition, and remodeling of roads and structures.
[2] Includes yard waste, food waste, sludge, land-clearing debris and wood waste including pallets, brush, stumps/tree trunks, sawdust, and mill scrap.

Thank you for completing this survey! Please return it to R. W. Beck in the postage-paid envelope.

Statistical Analysis of Survey Results

Survey data from ten Northeastern states[1] was analyzed in an attempt to identify the recycling characteristics of the region. Individual analyses were performed for six of these states[2], and a combined analysis was performed on data for the aggregate ten-state region. Survey data on three variables (number of employees, payroll, and receipts) provided the primary information analyzed.

Survey information obtained from over 600 randomly selected firms was used to estimate the number of employees[3] involved in recycling activities, as well as the dollar value of recycling payroll and receipts. Based on initial estimates and survey participation responses, R. W. Beck estimated the total number of firms engaged in recycling activities for each of fourteen survey categories in each state. In the combined ten-state area, nearly 1,600 firms are believed to be involved in recycling activities in these categories.

The procedure for estimating the total number of firms in each category consisted of several steps. From the initial count of businesses in each category, a random sample was developed. After examining the survey responses, those that were unrelated, unreachable, duplicate, or out of business were eliminated. Those businesses that were either completely or partially responsive to the survey, as well as those that declined to participate or were uncooperative were counted. Further adjustments were made for businesses that changed from one category to another.

The following example will illustrate the procedure used to develop the final estimate of 11 establishments in New York in category 16:

- From the initial list of 20 businesses for New York rubber product manufacturers (category #16), a random sample of fifteen (15) was contacted;
- Of these 15, one firm moved out of this recycling category, 2 moved into the category (from other categories) and 8 were eliminated (unrelated, unreachable, duplicate entries, or out of business), leaving 8 firms in this category.
- To these 8, we added 3 additional firms, based on the observed "success" rate of the attempted sample.[4]

For each variable (employment, payroll, and receipts), the sample mean, standard deviation, and other related statistics were calculated. Based on the sample size and

[1] Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont

[2] Delaware, Massachusetts, New Jersey, New York, Pennsylvania, and Vermont

[3] Employee responses were adjusted to a full-time equivalent basis. Thus, two employees each working 50% on recycling activities would be counted as one employee.

[4] Of the 15 firms we attempted to contact in this category, only 8 correctly belong in the category. We applied this 53% "success" ratio to the five (5) firms not contacted of the originally estimated 20 firms.

estimate of the total number of firms engaged in recycling in this business category, ranges were constructed that should contain the true average value for the typical recycling business in the category[5]. Finally, by multiplying this range by the estimate of the total number of recycling businesses in the category, we obtain a range for the total values for each variable.

Continuing with the previous example, the analysis was as follows:

- 7 responses were usable, as 1 of the 8 firms was unresponsive (but correctly categorized in business category #16);
- Average number of employees, payroll, and receipts for these 7 responses was calculated;
- Standard deviations and other related statistics necessary to determine a 95% confidence interval for the average of *all* firms in this business category was calculated; and
- The low, average, and high values for the confidence interval were then multiplied by the estimated total firms in this category (11) to yield the estimated range of the total number of employees, payroll, and receipts.

To finish this particular example, the sample of 7 firms employed (on average) 9½ persons per firm in recycling activities on a full-time equivalent basis. However, given the sample size and the estimate of the total number of firms in this business category in New York, the actual average number of employees per firm might range from a low of 6 to a high of 15. Thus, while approximately 105 employees are expected to be involved in recycling activities for the entire set of 11 firms in this business category in New York, there may be as few as 67 or as many as 164.

The previous example also illustrates a point related to small population sampling. Given the small number of total firms engaged in certain business categories at the state level, the low end of the estimates is often constrained by the fact that it cannot be less than the value already observed in the sample itself. In the example described above, the expected value of 105 employees is bounded by a low estimate of 67 because it is already known, through survey data, that 67 employees work for the firms sampled in this category. Even for the ten-state totals, several business categories are constrained in this way, because of the combination of relatively large sampling from a small number of businesses believed to be in these categories. As this issue affects the results, it serves to make certain estimates more accurate than would otherwise be possible. For example, in the most extreme cases, *all* the firms believed to exist in a given business category were surveyed. For these cases, the *exact* number of people employed, payrolls, and receipts are known because the entire relevant population was surveyed.

[5] Technically speaking, these ranges can be described as 95% confidence intervals.

APPENDIX G
TABLE G.1
METHODOLOGY FOR
GOVERNMENT STAFFED RESIDENTIAL CURBSIDE COLLECTION

Data Label	Data Type	Source	DE	MA	NJ	NY	PA	VT
A	Population with Curbside Collection	BioCycle (4/99)	5,000	4,758,000	7,300,000	17,230,000	8,800,000	111,000
B	Person per Household	US Census Bureau	2.54	2.52	2.69	2.61	2.54	2.46
C	Homes Collected per Truck per Day	R.W. Beck Estimate	900	900	900	900	900	900
D	Percent of Homes Collected by Public Sector	R.W. Beck Privatization Study	34%	34%	34%	34%	34%	34%
E	Avg Crew per Truck	R.W. Beck Estimate	1.5	1.5	1.5	1.5	1.5	1.5
F	Collection Days per Cycle	Assumes Once per Week Collection	5	5	5	5	5	5
G	Additional Percent Supervisory, etc.	R.W. Beck Estimate	10%	10%	10%	10%	10%	10%
H	Additional Percent Absenteeism	R.W. Beck Estimate	5%	5%	5%	5%	5%	5%
I	Average Payroll per Employee	1997 Economic Census - US Census Bureau	$ 26,418	$ 36,447	$ 35,270	$ 30,322	$ 27,424	$ 25,960
J	Recycling Collection Cost per Household per Month	R.W. Beck Estimate	$ 1.75	$ 2.40	$ 2.35	$ 1.75	$ 1.75	$ 1.75
K	Number of Curbside Programs	BioCycle (4/99)	3	156	510	1472	879	80
	Additional Data for Yard Waste Collection							
L	Homes Collected per Truck per Day	R.W. Beck Estimate	1000	1000	1000	1000	1000	1000
M	Avg Crew per Truck	R.W. Beck Estimate	2	2	2	2	2	2
N	Percent of Households with Yard Waste Collection	BioCycle (5/98) and R.W. Beck Estimate[1]	50%	100%	100%	50%	100%	50%
O	Percent of Year Collection Takes Place	R.W. Beck Estimate[2]	66%	66%	66%	66%	66%	66%
	Calculations Based on Data Shown							
	Number of Establishments	**K*D**	**1**	**53**	**173**	**500**	**299**	**27**
P	Number of Recycling Collection Employees	((A/(B*C*F))*D*E)*(1+G)*(1+H)	0	250	360	860	450	6
Q	Number of Yard Waste Collection Employees	((A/(B*L*F))*D*M*N*O)*(1+G)*(1+H)	0	200	280	340	360	0
R	**Total Curbside Recycling and Yard Waste Collection Employees**	**P+Q**	**0**	**450**	**640**	**1200**	**810**	**10**
	Total Payroll	**R*I**	**$ -**	**$ 16,401,200**	**$ 22,572,800**	**$ 36,386,400**	**$ 22,213,400**	**$ 259,600**
	Revenues	**(A/B)*D*J*12 months/year**	**$ 14,100**	**$ 18,488,200**	**$ 26,019,500**	**$ 47,134,900**	**$ 24,737,000**	**$ 322,200**

[1] Assumes 100% of Households have collection in states with a landfill ban, assumes that 50% of communities will collect yard waste under their own initiative.

[2] Assumes that yard waste is not collected during winter months.

APPENDIX G
TABLE G.1
METHODOLOGY FOR
GOVERNMENT STAFFED RESIDENTIAL CURBSIDE COLLECTION

Data Label	Data Type	Source	Total Other 4 NE	Total NE
A	Population with Curbside Collection	BioCycle (4/99)	4,963,000	
B	Person per Household	US Census Bureau	2.54	
C	Homes Collected per Truck per Day	R.W. Beck Estimate	900	
D	Percent of Homes Collected by Public Sector	R.W. Beck Privatization Study	34%	
E	Avg Crew per Truck	R.W. Beck Estimate	1.5	
F	Collection Days per Cycle	Assumes Once per Week Collection	5	
G	Additional Percent Supervisory, etc.	R.W. Beck Estimate	10%	
H	Additional Percent Absenteeism	R.W. Beck Estimate	5%	
I	Average Payroll per Employee	1997 Economic Census - US Census Bureau	$ 32,278	
J	Recycling Collection Cost per Household per Month	R.W. Beck Estimate	$ 2.25	
K	Number of Curbside Programs	BioCycle (4/99)	317	
	Additional Data for Yard Waste Collection			
L	Homes Collected per Truck per Day	R.W. Beck Estimate	1000	
M	Avg Crew per Truck	R.W. Beck Estimate	2	
N	Percent of Households with Yard Waste Collection	BioCycle (5/98) and R.W. Beck Estimate[1]	75%	
O	Percent of Year Collection Takes Place	R.W. Beck Estimate[2]	66%	
	Calculations Based on Data Shown			
	Number of Establishments	**K*D**	**108**	**1,162**
P	Number of Recycling Collection Employees	((A/(B*C*F))*D*E)*(1+G)*(1+H)	**250**	**2,176**
Q	Number of Yard Waste Collection Employees	((A/(B*L*F))*D*M*N*O)*(1+G)*(1+H)	**180**	**1,360**
R	**Total Curbside Recycling and Yard Waste Collection Employees**	**P+Q**	**430**	**3,540**
	Total Payroll	**R*I**	**$ 16,211,500**	**$ 114,044,900**
	Revenues	**(A/B)*D*J*12 months/year**	**$ 19,530,100**	**$ 136,246,000**

[1] Assumes 100% of Households have collection in states with a landfill ban, assumes that 50% of communities will collect yard waste under their own initiative.
[2] Assumes that yard waste is not collected during winter months.

GLOSSARY OF TERMS

AF&PA – American Forest and Paper Association

Annual payroll - Total annual payroll includes all forms of compensation, such as salaries, wages, commissions, bonuses, vacation allowances, sick-leave pay, and the value of payments in kind (e.g., free meals and lodgings) paid during the year to all employees.

APC – American Plastics Council

Covered activities - Defined as all activities that support:

- Transforming pre-consumer scrap materials or post-consumer products into a recycled material;
- Transforming recycled materials into a first intermediate product (e.g. sheet, fiber, roll);
- Transforming recycled materials directly into a finished product;
- Preparing used products for reuse; and
- Manufacturing equipment for the recycling or reuse industries.

Covered activities *do not* include converting a first intermediate product to finished or semi-finished products or preparing materials for fuel use.

Direct effects - refer to the operational characteristics of the firms or institutions that are studied. This study measured the apparent value of twenty-six categories of recycling and reuse establishments. The direct output of these entities is, therefore, their reported gross sales. The direct jobs are the jobs that the firms that were surveyed in the states listed. The direct personal income contains their reported payments to all employees, plus an additional estimate of benefit values and of returns to sole proprietors. The estimate of benefit values and returns to sole proprietors were based on industrial averages in industries that are similar to the recycling and reuse industries included in this study.

Employment - Paid employment consists of full and part-time employees, including salaried officers and executives of corporations. Included are employees on sick leave, holidays, and vacations; not included are proprietors and partners of unincorporated businesses.

Establishment - A single physical location where business is conducted or where services or industrial operations are performed.

GPI – Glass Packaging Institute

I-O – Input-Output, in relation to economic modeling

Indirect effects - measure the value of additional economic demands that the direct firms or institutions place on supplying industries in the region. When firms produce goods or conduct business or when public entities provide public goods or services, they must make many purchases. Some of these are from suppliers in the area. Some are not. Public utilities, communications systems, fuel, wholesale goods and services, manufactured goods, financial and legal services, raw and processed commodities, and a variety of professional services are necessary to produce the direct values described above.

IMPLAN – A basic input-output economic modeling program used in this study that is published by the Minnesota IMPLAN Group, Inc.

Induced effects - accrue when workers in the direct and indirect industries spend their earnings on goods and services in the region. Induced effects can also be called household effects, and the terms are often used inter-changeably. When workers in direct and indirect industries purchase goods and services for household consumption, they, in turn, stimulate another layer of the economy. Most induced activity accrues to retail, services, and finance, insurance, and housing spending. Because employment is stimulated in these industries as well, *their* demands for inputs increase, yielding an additional round or additional rounds of indirect purchases and additional rounds of induced activity.

ISRI – Institute of Scrap Recycling Industries

Multiplier or Multiplier effect - is frequently used when referring to economic effects or economic impacts. There are different kinds of multipliers -- this study reports two types. The *Type I* multiplier identifies the value of direct and indirect transactions -- e.g., the output of a business category and all other output that it purchases from its suppliers in the region – relative to the value of only the direct transactions. The *Type II* multiplier identifies the value of <u>all</u> economic transactions (direct, indirect, and induced) that are stimulated in the economy by an industry under study, including the personal spending of employees throughout the supply chain whose economic activity is apportioned to the industry, relative to the value of only the direct transactions.

NAICS – North American Industrial Classification System, a new system introduced by the U.S. Department of Commerce, Bureau of the Census, in 1997 to classify businesses by their primary industrial activity. It replaces the SIC system and is compatible with systems used in Canada and Mexico.

NERC – Northeast Recycling Council

Own-source – means revenues collected through the state revenue system and not received, for example, as a state disbursement of funds collected through the federal revenue system.

Personal income - includes the wages and salaries of employees and proprietors, normal profits to sole proprietors, and an estimate of the cash value of all benefits (e.g., social insurance, retirement, and medical benefits).

Receipts - Receipts (net of taxes) are defined as the revenue for goods produced, distributed, or services provided, including revenue earned from premiums, commissions and fees, rents, interest, dividends, and royalties. Receipts excludes all revenue collected for local, state, and federal taxes. For these tabulations, receipts have been estimated using payroll to receipts ratios developed from the 1992 Economic Censuses.

REI – Recycling Economic Information

SIC – Standard Industrial Classification, a classification system used by the U.S. Census Bureau to identify businesses by their primary industrial activity.

SPI – Society of the Plastics Industry

SRI – Steel Recycling Institute

SSEL – Standard Statistical Establishment List, a database of economic data maintained by the U.S. Census Bureau

Total economic effects - The sum of direct, indirect, and induced effects. They are all of the transactions attributable, either directly or indirectly, to the activities of establishments in the business categories included in this study.

Total industrial output - For most private industries is simply gross sales. For public or quasi-public institutions this normally includes all public outlays, along with the value of government sales and other subsidies received, to isolate the current economic value of their output to the citizens or the area served.

USGS – U.S. Geological Survey

Value added - A measure of gross regional product. It includes all personal income (employment compensation, incomes to sole proprietors) plus property incomes (dividends, interests, and rents), and indirect tax payments (primarily excise and sales taxes paid by individuals to businesses).